QUALITY MANAGEMENT

Expanding the quality concept to satisfy consumer demand

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Abstract

Personal disposable income has a significant impact on the food consumers purchase, where they buy it and where they consume it. With increasing income there is a corresponding increase in the desire for more convenience, a greater variety of food and higher quality food. Quality can be conceptualized at five levels. At its most basic level, quality captures the consumers' requirement for food that is nutritious, safe to eat and true to description. The intrinsic quality considers the physical attributes of the product. Extrinsic quality considers the value that the brand, the package, the place of purchase and the price add to the product. As attributes such as taste, texture and flavour can only be ascertained after purchase, such are described as the experiential quality attributes. The credence attributes are those that consider how the food was produced. With rising income, consumers want to know where the food was produced, what it contains and how it was produced. Concern for the environment, sustainable production and worker welfare and animal welfare are expected to become more influential in consumer decisions to purchase as they become more affluent.

Introduction

Personal disposable income has a significant impact on the food consumers purchase, where they buy it and where they consume it. With rising income comes a greater desire for more variety, more expensive and higher value foods in the diet (OECD–FAO, 2005). In general, as income increases, there is an increase in the consumption of meat, sugar, vegetable oils and dairy products and a parallel decrease in the consumption of roots and tubers, cereals and coarse grains. These changing consumption patterns tend to accelerate as the population becomes increasingly urbanized.

Rapid urbanization has also contributed to changes in lifestyles and food preferences (OECD–FAO, 2005). As their purchasing power has grown, city dwellers have increased their demand not only for more dietary diversity, but also for more convenient products that require less time to prepare and to consume. Hughes (1999) demonstrates how, since 1934, food preparation time in the home has declined from 2.5 hours to 15 minutes (in 1994), and by 2010, it is expected to decline to eight minutes. This implies substantial growth in the market for prepared and semiprepared food and increasing expenditure on food away from the home. In this respect, convenience is also associated with eating "on the run"; products that do not make a mess; and products that can be eaten in one hand (Martech, 2005). Parallel with the desire for greater convenience is an increase in more trendy sophisticated foods, as well as snacking, cafés and 24-hour food sales.

Food is sold either through retail stores or food service establishments. While over 40 percent of the total value of global food sales is currently made through the food service sector, sales through the food service sector are expected to overtake retail food sales in the immediate future (Gehlhar and Regmi, 2005). Furthermore, at the retail level, food can be broken down into two broad categories: fresh and processed. Packaged food already accounts for more than half of total food expenditure in the industrialized countries, but a third or less in the developing countries.

With increasing income and the desire for greater convenience, a greater quantity of food is purchased from supermarkets. Supermarkets are perceived to be cleaner and more hygienic, and the extended shopping hours provide greater opportunity for time-constrained consumers to purchase. Research indicates that most consumers visit a supermarket at least twice a week, with most shopping during the weekend (79 percent) (Glover, 1999). For those buying during the week, most shop between 16.00 and 21.30.

Product diversity is also increasing as producers, food manufacturers and retailers strive to meet the demands of increasingly sophisticated consumers (Martech, 2005). Products are being differentiated on the basis of what they contain and or what they do not contain (Centrec, 1999). Some attributes are based on the methods of production, the place of production, the way in which the product has been processed or handled, and the impact that either the production or processing of the product has had on the environment and society. With such an increasing array of products, supermarkets provide an opportunity for consumers to interact with the product with no obligation to buy (Irving, 1999).

While there is an implicit assumption that food is safe to eat, with the increasing reliance on convenience foods and greater consumption of food away from the home, the incidence of food poisoning is increasing, even in the world's most developed economies. Centralized food processing and mass catering provide greater opportunities for food to become contaminated from a wider range of pathogens (Kaferstein, 2003). More intensive animal production systems potentially encourage the spread of zoonotic micro-organisms. Moreover, the food safety problem is rapidly becoming a global problem because of the increasing international trade in food and animal feed. Tourism may also contribute to the increasing spread of food-borne disease, for people can acquire an infection in one part of the world and spread the causative agent in another.

Studies of food and culture indicate that the taste for raw food is based on the belief that such food is healthy and invigorating (Kaferstein, 2003). However, such food is not always safe to consume. With increasing affluence, the consumption of "blue" steak, sashimi and raw shellfish increase, thereby exposing consumers to considerable risk. Furthermore, consumers are demanding foods that are minimally processed, without the use of preservatives. The prolonged storage of such foods can result in the growth of pathogens, even at refrigeration temperatures, thus increasing the risk of disease. With more consumers relying upon processed food and with more meals being consumed away from the home, a lack of education in the basic rules for the hygienic preparation of food is a major factor contributing to the increasing incidence of food-borne disease in the home. Finally, as the population ages, a larger sector of the population has a lower resistance to disease and is therefore more vulnerable to food-borne illness.

Not only must the food be safe to eat, but as income increases, consumers expect their food to be produced and processed in a manner that is safe for the environment. While such issues as chemical residues, soil erosion and contamination of water resources predominate, in the world's most discerning markets, animal welfare, biodiversity, ecoefficiency, fair trade and social accountability are growing in importance (Baines, 2002; van Berkel, 2002).

It is also important to appreciate that as income increases, expenditure on food, as a proportion of the household budget, decreases (Gehlhar and Regmi, 2005). During the last decade, consumers in the high income countries spent an average of 13 percent of their total household income on food, whereas consumers in the low income countries spent an average of 43 percent. As there is a limit to how much food an individual can consume, with increasing disposable income, the demand for food is driven by an increasing desire for higher quality products. Hughes (1999) describes how leisure shoppers are purchasing for an important meal or social occasion and are much less concerned about price. The product taste and provenance of the food become much more important. Purchasing more exotic food from faraway places is part of the romance of leisure shopping.

Defining the quality concept in the fresh produce sector

Quality is the key concept in building customer value and satisfaction (Oude Ophuis and van Tripp, 1995). However, quality is a multifaceted concept which is defined in many different ways.

From the utilitarian perspective, Peri (2006) defines quality as fitness for consumption. Quality can thus be described as the requirements necessary to satisfy the needs and expectations of the consumer. To some, quality is considered synonymous with innate excellence which cannot be analysed, but only recognised through experience (Oude Ophuis and van Tripp, 1995). At the other extreme, quality refers to some measurable comparison to some predetermined or ideal standard. However, as quality means different things to different people, quality is best evaluated at an individual level. Aaker (1991) defines perceived quality as the customer's perception of the overall quality or superiority of the product with respect to its intended purpose, relative to the alternatives. Perceived quality is therefore, an intangible, overall feeling about the product, which is usually based on some underlying dimensions including such variables as product reliability and performance.

Even so, quality is a multifaceted concept, based on several dimensions that cannot all be evaluated by the consumer prior to purchase (Oude Ophuis and van Tripp, 1995). Consumers therefore must use surrogate or indirect indicators of quality to make a judgement of perceived product quality from an array of product-related attributes. These quality cues may be categorized as either intrinsic or extrinsic. Intrinsic cues are part of the physical product. Extrinsic cues, although related to the product, are not physically part of it. A further distinction is made between experience quality attributes and credence quality attributes. Experience attributes can be ascertained on the basis of actual experience whereas credence attributes cannot.

Intrinsic quality
Intrinsic quality attributes are closely related to the product and cannot be changed without also changing the physical characteristics of the product (Oude Ophuis and van Tripp, 1995). Appearance, colour, size and shape often serve as intrinsic quality indicators for fresh fruit. The Horticulture Research and Development Corporation identified freshness, firmness, colour, variety and size as the most important attributes that helped consumers select fruit (HRDC, 1990).

Extrinsic quality
Price is the most well known extrinsic indicator of quality (Oude Ophuis and van Tripp, 1995). When no other information is available and the consumer must judge the quality of two similar products, the higher-priced alternative is generally expected to deliver superior quality. However, there is also evidence to suggest that most consumers rate quality as being more important than price (Batt and Sadler, 1998).

For the majority of consumers, quality means recognizable brands (Glover, 1999). Much of the value of a brand is determined by the quality of the product that the brand purports to deliver to consumers (Aaker, 1996). While this is most often associated with the tangible product features, as consumer incomes increase, consumers' wants expand to incorporate a greater variety of both intangible and credence attributes. The product must not only look appealing, but it must also deliver the desired taste and it must have been produced in a manner that minimizes the impact on the environment.

For the majority of horticultural products, branding means identifying the product with a label (Pay *et al.*, 1995). Bowbrick (1992) suggests that a label attached to products from a specific producer, distributor or retailer aims to convey information to or to persuade a potential customer about the quality, reliability, social status, value for money or safety of the product. Perceived quality, associations and a well-known name may not only provide reasons to purchase and affect use satisfaction, but may also have the potential to provide significant price premiums for producers (Aaker, 1991).

While the use of brands, particularly generic in-store brands, is rapidly increasing in the retail sector (Fearne and Hughes, 1999), branding fresh produce remains problematic. In Australia, most growers are labelling apples, irrespective of the quality, resulting in mixed grades and no guarantee of delivering premium quality (Batt and Sadler, 1999). However, other variables are involved. The product is perishable, thus irrespective of quality at the time of branding the product will deteriorate because of inappropriate post-harvest treatments or poor product handling. With each grower having his or her own perception of quality, fruit of vastly different quality standards will emerge on the retail shelf, so even if individual growers do differentiate between grades, quality differences will be lost at the retail level.

In what is rapidly becoming a global food market, the most widely used means of branding fresh produce is country of origin. Consumers differentiate between products from different countries on the basis of product-country images. These images, which may be based on actual product experience or information gathered through advertising and other sources of market information, provide consumers with a basis for evaluating perceived product quality (Verlegh *et al.*, 2005).

Country of origin is believed to influence consumer product evaluations most when the consumer's level of involvement in the purchase decision is low (Verlegh *et al.*, 2005). As the purchase of food is most often considered to be a routine, low involvement decision, consumers can be expected to place considerable importance on the country of origin. However, before producers seek to benefit from the country-of-origin effect, some consideration must be given towards the perception, favourable or unfavourable, that consumers may already hold. Not only is the country-of-origin effect product-specific, but it is to a large extent, uncontrollable. Negative publicity and unrelated low quality products from the same country of origin can seriously damage the brand or an unrelated product. Especially where attempts are made to differentiate the product in the market on the basis of some intangible or credence attribute, consumers may seriously question whether the country of origin has the capability to deliver what is promised.

Increasingly, consumers want to know that their food is safe, where it came from, how it was produced and who handled it (Martech, 2005). Proof of claims is becoming a key requirement, especially with regard to the health benefits and the various credence attributes such as how the product was produced (organic, hydroponic), the means by which it was processed (*halal*), the environmental quality (conservation, sustainability), or social equity (worker welfare, child labour, fair trade). Labelling is also required to provide nutritional information and to identify what components have been added to the food, including the presence of genetically modified organisms (GMOs).

The product packaging system must facilitate product recognition, marketing and use (Peri, 2006). The quality associated with packaging will include aesthetic requirements concerning its presentation and the information conveyed by the label. Ease of use has become a decisive factor, whether it concerns the transportation, conservation, preparation or use of the product.

Experiential quality

For food, taste is the most important experience attribute (Oude Ophuis and van Tripp, 1995). While the interaction of several intrinsic and extrinsic quality cues with taste and flavour has been documented, Batt and Sadler (1999) suggest that the physical attributes most often used by consumers to select fresh fruit from a retail store are poor indicators of eating quality.

In most instances, the consumer preference for fruit is derived from the interaction between taste, texture and flavour (Harker, 2001). Texture relates to the mechanical properties of the flesh, mouth-feel and juiciness. However, Codron *et al.* (2005) consider that appearance should also be considered as a sensory attribute, for there is anecdotal evidence to suggest that most "consumers eat with their eyes" (Hughes, 1999). Peri (2006) further expands on the sensory attributes to include memory, culture, values and emotions, for these bring together the consumer's knowledge or memory of food and the consumer's sensory reactions to it.

Credence quality

The credence attributes are desirable product benefits like nutritional value and wholesomeness that cannot be experienced directly (Oude Ophuis and van Tripp, 1995). To assess the credence attributes, consumers must rely on the judgement or information

of others that the product contains the desired attribute. Health is a typical credence quality attribute that is becoming more important as consumers' disposable income increases. While most consumers are aware of the link between eating and health, they do not expect the consumption of a product on a single occasion to have a health implication that they can experience (Codron *et al.*, 2005). Nevertheless, most consumers are aware of the adverse implications of regularly consuming foods high in fats, sugar and salt, and there is growing evidence of the consumers desire to avoid those foods containing preservatives, artificial colours and flavours (Batt *et al.*, 2006).

There is however an implicit assumption that the food that reaches the supermarket shelves is safe to eat (Codron *et al.*, 2005). Following an alarming increase in the incidence of food poisoning, most governments have responded by enacting a raft of legislation which requires retail buyers to take all reasonable steps to ensure that the food they sell is safe (Wilson, 1996). As a result, most major supermarkets now require fresh produce to come from suppliers who have an appropriate accredited quality management system. A genuine and visible quality management programme is a prerequisite for any fresh produce company which wishes to supply the supermarkets (Fearne and Hughes, 1999).

The increasing desire for safe food not only encourages consumers to purchase more familiar brands and prepackaged products (McCann-Hiltz, 2004), but for them to take a greater interest in the holistic characteristics of the food that they purchase (Batt *et al.*, 2006). Environmental values are becoming increasingly aligned with a greater suspicion of industrial food processes and the desire to support environmentally sustainable farming practices.

With regard to the environmental impacts, Martech (2005) differentiate between the "eco-impact" and the "eco-image". The eco-impact considers the contamination of soil and water resources with the consequent loss of fitness for both current and future uses. The eco-image is influenced by the consumer's value system and includes such issues as animal welfare and responsible consumption. This includes recycling, sustainable production practices, a perception that natural is better (non-GMO) and a sense that native flora and fauna need to be protected. Furthermore, the need to recognize and protect indigenous culture and values is increasing in importance.

In Australia, most consumers show little concern towards the possible presence of chemical residues because most consumers wash the fresh fruit and vegetables they have purchased prior to consumption (Batt and Giblett, 1999). However, there is also an implicit assumption that under the various quality management systems that most modern supermarkets operate, growers have adhered to the prescribed withholding periods and applied chemicals at the appropriate rates. Within many of the transitional economies, given the chemicals currently available, the growers' lack of knowledge and the high incidence of pests and disease, such assumptions are ill-founded. Anecdotal evidence from Kapatagan (a *barangay* on the slopes of Mount Apo in Southern Mindanao), suggests that farmers seldom eat the vegetables they have grown because of the high quantities of chemicals applied (Batt, 2004). Some consumers reportedly look for produce which has been eaten by insects on the grounds that these are indicators that the produce had not been sprayed excessively. However, freedom from chemical

residues is seldom an issue unless consumers are prompted. As a latent variable, freedom from chemical residues will only become an issue when visible residues are present on the produce, thus bringing it to the consumer's attention or when consumers demonstrate an express desire for organically grown produce.

It is also important to realize that food carries symbolic meanings and has psychological significance beyond its nutritional value (Sijtsema *et al.*, 2002). Not only do certain products have different meanings for different religions, but the amount and the time at which food is consumed can have meaning. Religious norms often specify what food may be consumed and which is forbidden.

Food preference constitutes one of the strongest single predictors of food choice and preference. Food ideology is a combination of attitudes, beliefs, customs and taboos affecting the diet of a given group (Fieldhouse, 1995). Food habits evolve from learned experience, which in turn leads to the development of attitudes. Food binds people to their faiths through powerful links between food and memory, which both solidifies group membership and sets groups apart. Personal ideology may also incorporate many political beliefs and concerns that individuals may possess (Pollard *et al*., 2002).

Conclusions and implications

Consumers' assessments of fresh fruit and vegetable quality vary considerably according to country, sex, age, socioeconomic status and other factors (Shepherd, 2006). Nevertheless, criteria such as appearance, colour, uniformity, ripeness and freshness are invariably the major variables that influence the consumer's decision to purchase. While other quality criteria such as flavour, aroma and texture cannot be assessed prior to purchase, consumers base their purchase decisions on previous experience.

In some cases it may be possible to judge the internal quality from external appearance. By looking at fruit, for example, it may be possible to tell whether it is ripe or unripe and, therefore, whether it is sweet or sour. Where consumers are permitted to touch fruit, the intrinsic quality can be assessed by smell, the degree of hardness and even sound, but repeatedly touching the fruit can also have a negative impact on quality. However, it is rarely possible for consumers to identify that produce which may be unsafe when it is on retail display.

For those consumers who are concerned about food safety and can afford to do something about it, they may choose to purchase from supermarkets (Shepherd, 2006). Others may purposefully select preferred brands, preferred varieties or select produce on the basis of the country in which it was produced. While the majority of the consumer concern is directed towards the dangers arising from pesticide residues, most consumers are completely unaware of the potential threat of microbial and parasitic contamination. Most consumers erroneously believe that produce that is fresh, clean and packed is also safe to eat.

However, for the majority of low income consumers, price is the dominant factor in the decision to purchase. Despite the inherent risks, many consumers are unable to pay

more for safer produce and must buy whatever is available in the market. Furthermore, store location and convenience may be more important than quality (Shepherd, 2006). In such circumstances, consumers purchase fruits and vegetables at prices they can afford and, at those prices, make purchase decisions on the basis of intrinsic quality criteria. Food safety does not appear to play a vital role in the consumer's choice, except among the higher income groups.

Even among the higher income groups, while consumers may be interested in all four types of quality attributes, many believe them to be, at least partly, incompatible. For example, the high fat content in a dairy product may be regarded as an indicator of both superior taste and inferior health (Codron *et al.*, 2005). Organic products may be desired as a form of production but at the same time be perceived as being less healthy by some consumers because of the application of animal manures. Convenience products with a high degree of processing may be regarded as undesirable in terms of their industrial methods of production and yet without minimal processing, many fruits such as oranges, mangoes and pineapples present major problems for consumers. While fresh fruit and vegetables make for healthy living, many consumers believe more health-giving vitamins can be obtained in a tablet and that tomato sauce has more antioxidants than fresh tomatoes (Hughes, 1999).

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"Executive Flower Management", a unique quality performance management concept to regain trust and satisfaction of global flower consumers

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Abstract

The floricultural world is changing fast. Southern global areas are producing for northern global markets. National production-driven supply chains are converting to closed international market-driven supply chains. Product flows are increasingly decoupled from information and sales flows. More information in the supply chain is known and decisions have to be made in shorter time. Often, the only market information a producer receives are client orders, but these are subject to rapid changes, especially in the flower sector where weather conditions can have a huge impact on customer demands. Uncertainty leads to inefficient processing and non-value adding activities. Distances between production, the market place and final consumers are still increasing, so logistical performance becomes more important but seldom meets its objectives. For this reason, there is an increasing interest in optimization of chain performance to prevent inefficiencies and quality losses. "Executive Flower Management" is a concept developed continuously to monitor the gap between actual measured and wanted target product and process key performance indicators in flower supply chains. These key performance indicators are based on plant physiological and managerial standards. Early observation of unacceptable differences between actual and target performance can result in early and efficient managerial actions. This all leads to more reliable performance which enables producers to serve final customers better with high-quality flowers.

Global floricultural production and trade: a dynamic environment

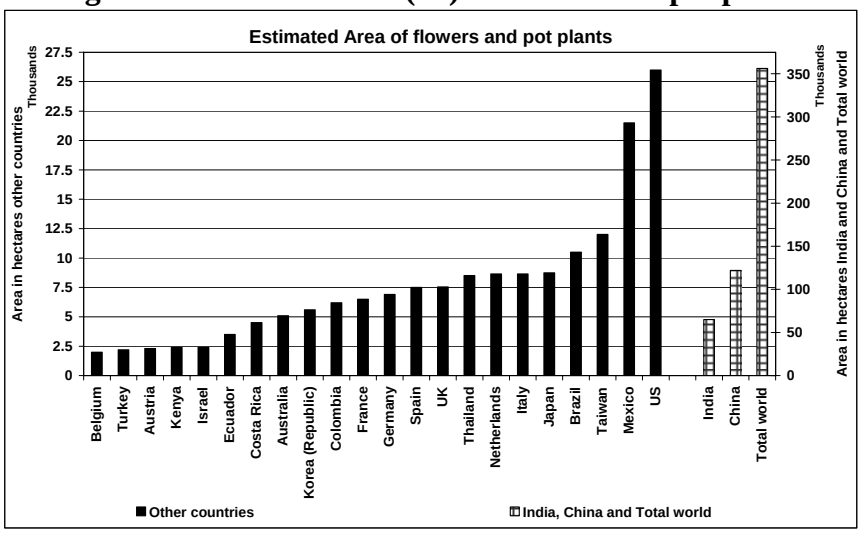
The horticultural world is very dynamic and rapidly changing. The distance between production, the market and the final consumer is still increasing: southern parts of the globe are producing for northern markets.

Global floricultural production

Figure 1 shows the worldwide production area in countries with more than 1 500 ha devoted to flowers. Global production is put in black bars and shown on the left axis. The People's Republic of China (122 600 ha) and India (65 000 ha) have the majority of the land area devoted to cut flower and pot plant production. However, we can consider much of this area as non-professional production: in the People's Republic of China and India, production takes place on a very small scale (0.5 ha per family), and sales and consumption are within the same region and do not play any role in the international ornamental plant trade. We must also mention that the data is not completely reliable,

since it may be influenced by errors in invoicing systems and incomplete statistics provided by the countries.

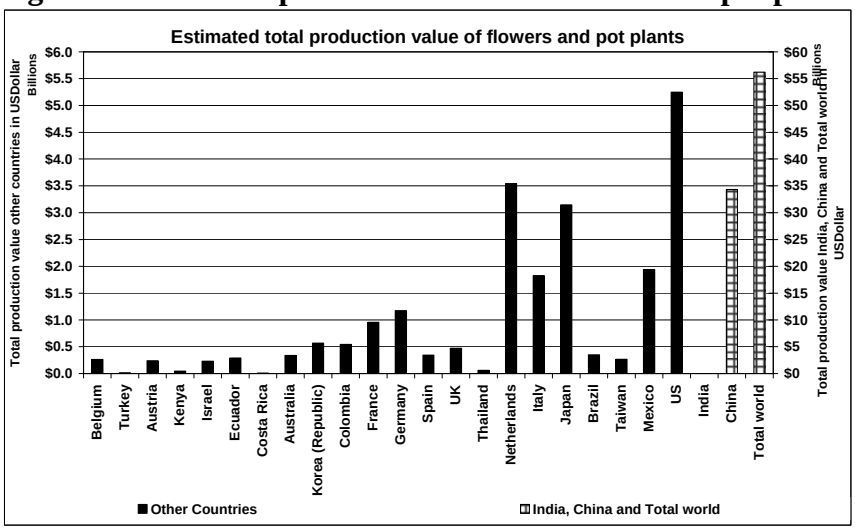
Figure 1: Estimated area (ha) of flowers and pot plants



Source: Wijnands (2005) and AIPH (2004)

Another angle from which to look at the world flower business is the production value (Figure 2).

Figure 2: Estimated production value of flowers and pot plants



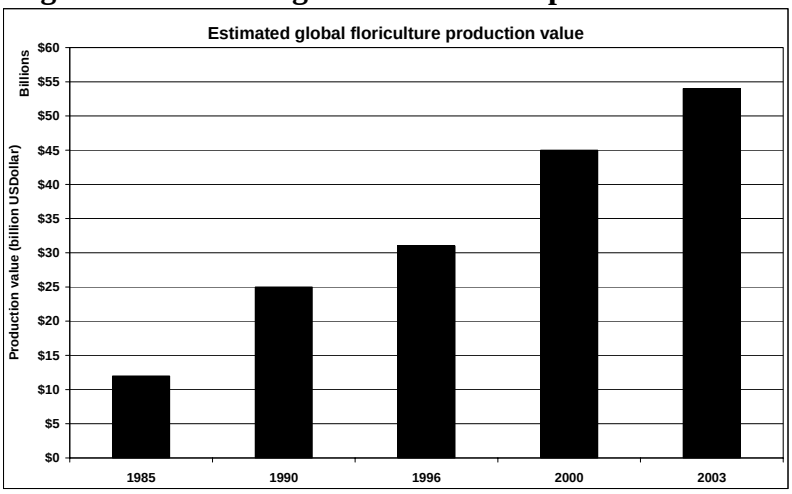
Source: Wijnands (2005) and AIPH (2004)

Unfortunately, the available statistics are not reliable for Mexico, Costa Rica or Ecuador. The production value for these three countries has been estimated by multiplying the area by the production value per ha in Colombia. The production value for the People's Republic of China (€34.3 billion) is far larger than that of the United States of America, and data for India is not available. The differences in total production value can be explained by differences in the production value per hectare (Wijnands, 2005).

Global floricultural consumption

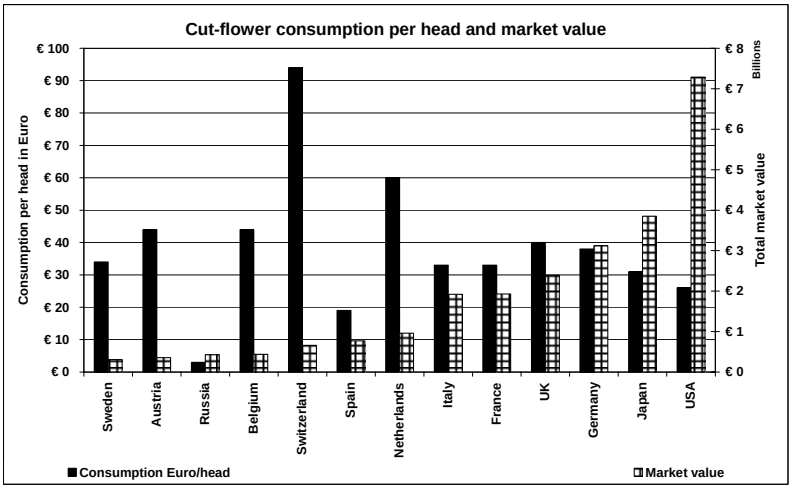
The production value has steadily increased over years, as shown in Figure 3. The total market for cut flowers in a country depends on the average consumption per capita and the number of inhabitants. The annual consumption per head ranges from a few euros in Russia to €90 per year in Switzerland. The market value is high in the United States of America, Japan, Germany and the United Kingdom, depending more on the number of inhabitants than consumption per capita, which is shown in Figure 4 (de Groot, 2004; Wijnands, 2005). Aiming at these high-value markets is the challenge for flower-exporting countries.

Figure 3: Estimated global floriculture production value



Source: De Groot (2004)

Figure 4: Cut-flower consumption per head and total market value



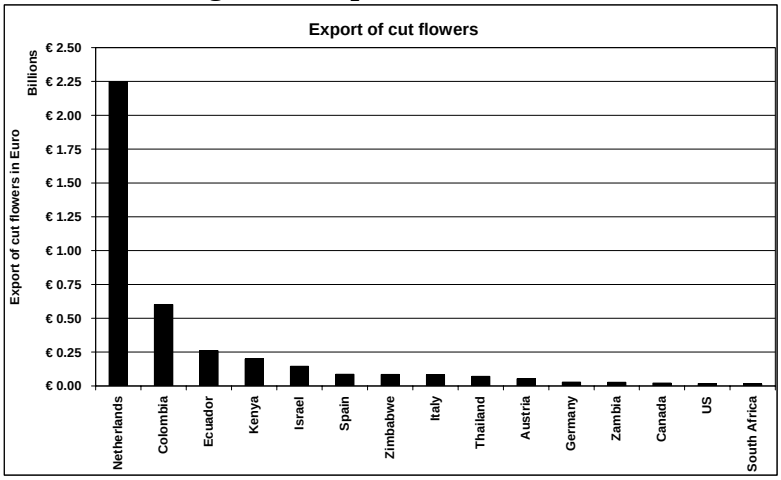
Source: Wijnands (2005) and AIPH (2004)

Global floricultural trade

Worldwide, there are three main flower consumption centres: the United States of America, Japan and Europe. Domestic floricultural production is the main source, but the quantity of imports is increasing. The United States of America is mainly supplied by Colombia and Ecuador. In Europe, the Netherlands is the dominant supplier, but domestic production is combined with imported product, mainly from Africa.

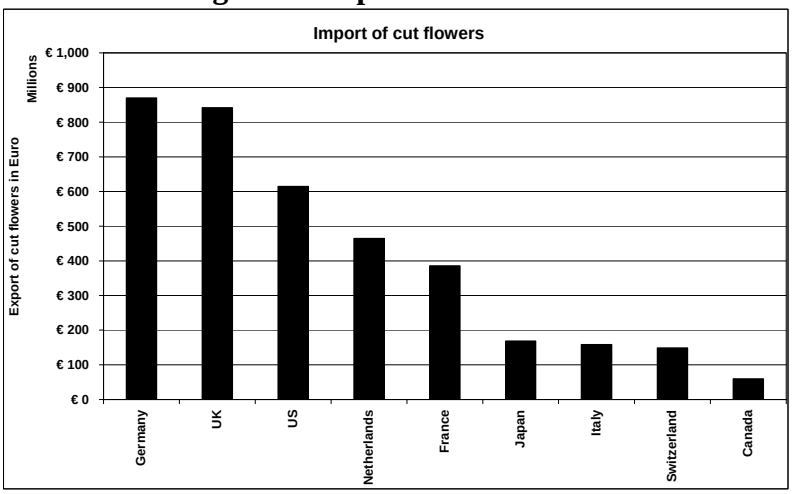
Nowadays, production alone is not enough to be part of global commodity chains. International trade flows are of more importance. Figure 5 shows the exports of cut flowers from the major exporting countries. The Netherlands continues to hold the dominant position with around 45 percent of the world trade in 2002. Colombia, the second largest exporting country, has a share of 12 percent and Ecuador about 5 percent. The main flower importers are the developed countries (Figure 6). In these statistics, no figures from Eastern Europe are mentioned, due to limited and unreliable data. However, this market is thought to be worth €500 million.

Figure 5: Export of cut flowers



Source: Wijnands (2005) and AIPH (2004)

Figure 6: Import of cut flowers



Source: Wijnands (2005) and AIPH (2004)

In some developed countries, flower sales are dominated by flower shops and in others by supermarket chains. In the United Kingdom and the United States of America, the supermarkets have the largest share, whereas in Germany, the specialist florist shop is the major outlet (Wijnands, 2005).

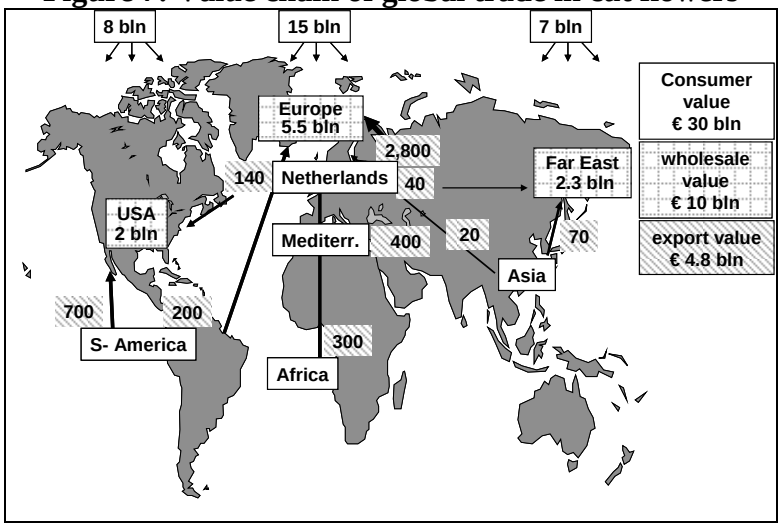
Figure 7 shows that the total export value of the global trade in cut flowers is estimated at €4.8 billion. One step downstream in the supply chain towards final customers, this

value increases to €10 billion globally. At the final consumer market, the value has increased to €30 billion. The conclusion is that the value chain for cut flowers multiplies about six times from production towards the final consumer.

Global floricultural business trends

Generally speaking, there are more producers than buyers for floricultural products. Flower growers compete with each other to become the preferred supplier for particular buyers. Each grower tries to be recognizable in the market by means of product availability and quality, for example by delivery at the right moment with extra services. Most of the time, buyers can choose from a set of growers all offering the same product and they choose the quality–price combination which is most favorable for them. Combined with so called "soft" factors such as grower's reliability, track record and relationships, this will result in a certain market price which the grower can expect based on total global supply and total global demand.

Figure 7: Value chain of global trade in cut flowers



Source: Rikken and Botden (2006)

Trends in changing flower supply chains

In the global cut flower business, trends such as the increase in production volume, product quality, diversity and availability, up-scaling, cost reduction activities and horizontal and vertical chain integration can be observed each day (Rabobank, 2002).

Supermarkets and garden centres are expected to increase their market shares. The concentration on the demand side will have major impacts on the marketing system (Wijnands, 2005). It is expected that the open and transparent market like, for example the Dutch flower auctions, will step-by-step be replaced by more closed market chains. The network structure of supply and demand will be replaced by closed supplier-buyer relationships. Moreover, whereas the open market is mainly driven by supply, these closed market chains will be driven by demand (Botden, 2006; Rabobank, 2002).

Since flowers are products of Mother Nature, flower production can be irregular and difficult to forecast. Flower consumption can also be irregular and is influenced by the

weather, seasonal patterns and the presence of personal or religious celebration days. Consumption is hard to forecast. Moreover, supply chains that transport perishables from producers to consumers are not always reliable. When this irregular production, consumption and supply chain performance are combined, a very complex market emerges where the value of reliable information is very high.

The turbulent, uncertain and highly competitive global floricultural environment forces links in the flower supply chain (FSC) to be more efficient and effective. This results most of the time in a redesign of the FSC. Some major factors behind this are:

Market structure: There is a worldwide reduction of trade barriers and development of regional, supranational economic zones (globalization).
Increase of decision-making uncertainty: Changes in markets, products, technology, and competitors are occurring at an increasingly rapid speed. As a result, decisions must be made in less time, with less information and with higher penalty costs.
The need to redesign flower supply chains: The keys to long-term competitive advantage in today's market are flexibility and rapid customer response. To maximize a competitive advantage, all members in a FSC should work seamlessly together to serve the final customer. The knowledge that other actors in the FSC can damage all the efforts taken to preserve high product quality leads to a thorough understanding of the necessity to perform well as a total FSC.

By creating a responsive customer-driven FSC, profitability can improve drastically (Rabobank, 2002; van der Vorst, 2000; Chainge, 2002). Customers wish more and more for value to be added to the floricultural products they buy. To serve these consumers, companies have to work together. There is a need for transparency in the chain to make value-adding processes profitable and effective. As not all companies and chains will achieve this transparency, two groups of companies will emerge in the international flower market:

Product-providers: Companies that are incapable of acting flexibly will continue to trade huge amounts of flowers with low added value with many customers and chains. Margins will be low but so will the transaction costs.

Value-providers: The cost price of the product will be lower as a result of more effective processes in the chain. This is possible because chains are transparent and companies are working closely together to serve the consumer. This lower cost price is reinvested in service and will lead to more direct sales in fixed chains and more long-term profits (Rabobank, 2002; Botden, 2002).

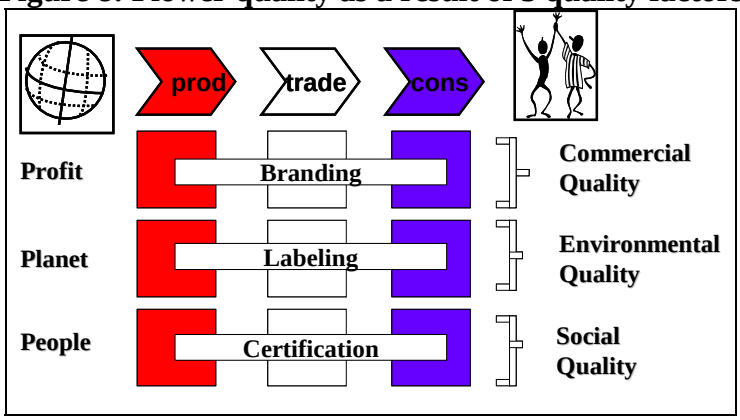
Trends in process and product quality demand
Worldwide, social opinions are changing. Society demands from companies active in the horticultural sector that they be socially responsible. The impact and speed of these changes is accelerating and leads to strategy changes by producers of flowers or companies active in the chain, in order to reach the flower-buying consumer. When current strategies cannot be changed, this may lead to a loss of the connection with society and the market. All links in a flower supply chain must be aware of this social

responsibility, because the performance of the chain is based on the performance of the individual links (Rabobank, 2002).

For consumers, exclusivity, freedom of choice and good experience with a product are still the main factors when buying flowers. Environmentally friendly production, vase life and convenience are becoming more important. To guarantee these aspects, traceability and certification are becoming more popular. Product responsibility is increasing and adding value to products will be more important in the future. Transparency of the whole chain is more important and will lead to more close cooperation between companies.

In the past, flower quality was mostly defined by product quality. However, these days, flower quality is defined more by process quality. Flower buyers demand that producers respect the environment, the workers (health care, safe working conditions), that they comply with the demands made by the retail sector (profit) and that this is all regularly checked (labelling, certification). Performing well on environmental quality levels and social quality levels will give a licence to perform on commercial quality levels. This is shown in Figure 8.

Figure 8: Flower quality as a result of 3 quality factors



Source: De Boon (2003)

We define flower quality as the extent to which the buyers' expectations before purchase are met or exceeded by their experience postpurchase. In the past, this flower quality was mostly defined by product quality. Product quality is created until the moment of harvest. After harvest, everything should be done to maintain this initial product quality or to minimize any decrease in quality. When the distance to the market is large, even more attention should be paid to quality aspects in order to compete with other suppliers in the market.

The main quality problems in cut flowers which can occur in post-harvest phases, are: heterogeneous maturity, mechanical damage, fungal infections, bacterial growth, problems with flower opening, wilting and overheating during transport (Botden, 2002; Terhürne, 2004; van Houtte, 2000).

The need for optimized redesign of flower supply chains

The keys to long-term competitive advantage in today's market are flexibility and rapid customer response. To maximize a competitive advantage, all members of a flower supply chain should work seamlessly together to serve the final customer. Unfortunately, most flower supply chains are not performing at their optimum levels so customers' experiences often fail to meet their expectations. It is estimated, for example, that 30 percent of the flowers harvested in Africa are lost in the supply chain before reaching the final customer.

In the United States of America, it is reported that, despite a substantial increase in total sales of flowers over the past four decades and a considerable reduction in real retail prices, per capita consumption of cut flowers is low compared to that in other major markets. This may be explained partly by differences in lifestyle and culture, but a major component of the low sales of cut flowers in the United States of America is customer dissatisfaction with quality, particularly vase life. Poor vase life is the result of long transportation times, excessive storage and poor temperature management in the supply chain (Reid, 2005). American customers don't complain; they simply choose substitutes for flowers when they are not satisfied. The result of this trend is that 80 percent of flower sales and profit is concentrated around some special events like Valentine's Day (van Kooten, 2006).

A similar trend to the one described for the United States of America is visible in Europe also. Only by rebuilding customer satisfaction can trust be regained. This is only possible by optimization of the sector where customer demand is the central issue and sustainable linkages are built between the producers and consumers of flowers (Botden, 2005).

To rebuild customers' confidence, the whole supply chain must cooperate, preferably through both horizontal and vertical chain integration. When trust in the product is restored, customers will be willing to pay more for the same product when combined with higher levels of service and convenience (van Kooten, 2006).

"Executive Flower Management": a concept to regain trust and satisfaction

Today, markets ask for transparency in information concerning production, post-harvest and logistical performance, in order to decrease uncertainty. This enables buyers to provide their downstream customers with the highest achievable product quality and service and ultimately to fulfill the final flower-buying consumers' expectations. However, product and process quality often fails to meet its objectives, leading to distrust and dissatisfaction. This situation has led to the development of a unique quality performance management system, called Executive Flower Management (EFM) which is a joint activity between two Dutch companies, Florence Creations BV and HortiSolutions BV.

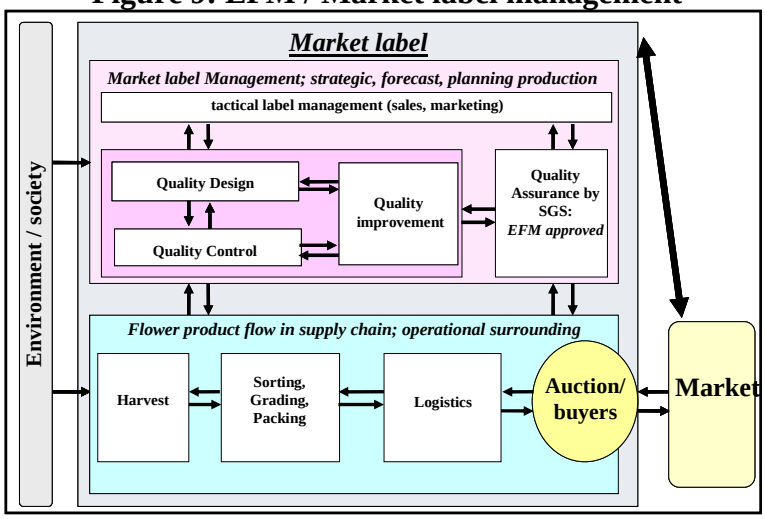
EFM

EFM is an SGS-certified quality management system. EFM enables growers to strengthen their market position by meeting product and process performance

expectations more reliably. EFM is a concept developed to monitor continuously the gap between actual measured and desired farm individual or group target performances in product and process key performance indicators. These key performance indicators are based on plant physiological and managerial standards. Early observation of unacceptable differences between actual and target performance allows efficient managerial actions to be taken to improve performance. This leads to more reliable performance which enables the whole supply chain to serve final customers better (Figure 9).

EFM shows the performance of each company on a daily basis by monitoring a large set of key performance indicators. This enables each individual company to move towards company-specific or agreed group standards. EFM will provide reliable, independent information about the flowers at point of sale, in order to monitor the performance of the total supply chain.

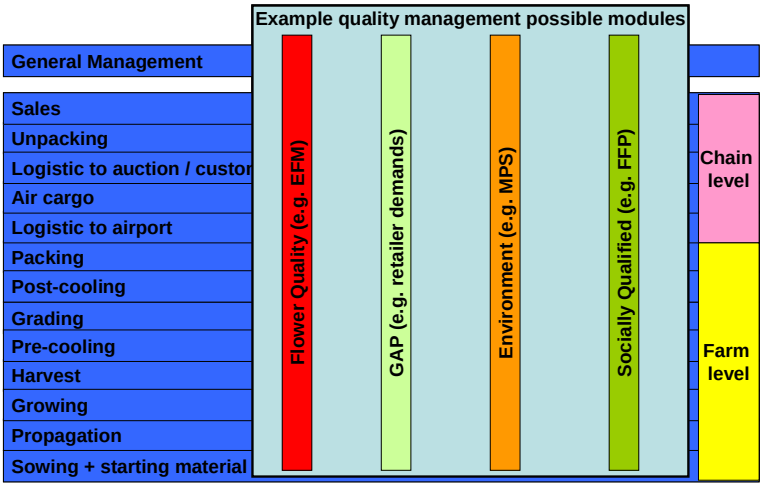
Figure 9: EFM / Market label management



EFM quality design

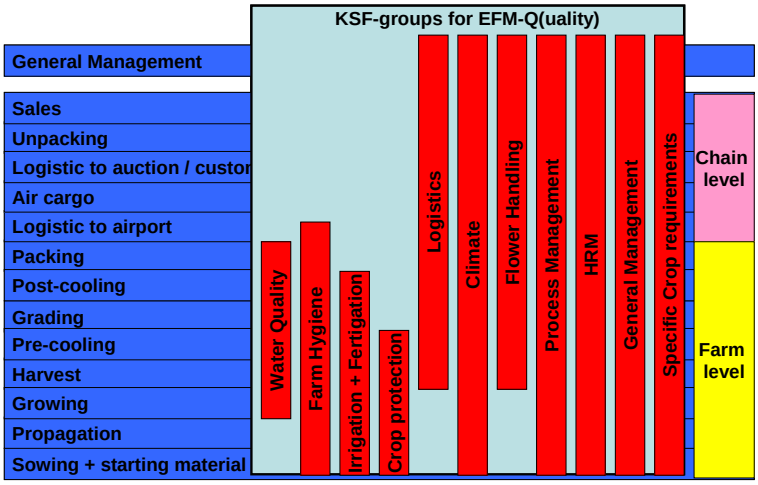
Flower quality is a combination of environmental, social and commercial quality performance. As it is almost impossible to improve every quality aspect at once, EFM specializes on the commercial quality aspects and focuses on the specific product and process factors which directly influence the post-harvest quality of flowers. For environmental and social aspects, there are other systems already available (Figure 10).

Figure 10: Example quality management modules



EFM formulated standards for product and process quality, together with growers. Based on scientific knowledge, key performance indicators (KPI) were developed. As several KPIs belong together, these were grouped to form key success factors (KSF). These KSFs focus on different parts of the supply chain from the field until the final auction clock if applicable (Figure 11).

Figure 11: EFM-Q(uality) KSF-configuration



The total set (about 160 KPI) for product and process quality is spread over four EFM implementation phases, where EFM-Q phase 1 is a small set to start with. When a farm successfully implements these standards, a next set can be added. A snapshot of the total list is shown in Figure 12.

Figure 12: Snapshot of Process Quality KPI parameters

KPI Ident					TQM Level				Criteria						
volg nr	Use	Department	KSF	KPI nr	TQM Phase 1	TQM Phase 2	TQM Phase 3	TQM Phase 4	Criteria	Method	1: Bad	2: Moderate	3: Average	4: Good	5: Excellent
31		04: Harvest	01: Water Quality	12	x	x	x	x	Use of chlorine in harvestbuckets	Check status of this rule	no		sometimes		always
32		04: Harvest	01: Water Quality	13			x	x	Dose of chlorine in harvest bucket or harvestwagon (concentration chlorine)	Measure concentration of the chlorine	No (0 ppm) or too much chlorine (120 ppm)	Hardly any chlorine (0 - 4 ppm)	Little chlorine (4 - 12 ppm)	Sufficient amount of chlorine (12 - 40 ppm) or (100 - 120 ppm)	Good amount of chlorine (40-100 ppm)
33		04: Harvest	01: Water Quality	14		x	x	x	When chlorine in the harvest bucket, pH of the water in the harvest bucket	Measure pH of the water in the harvest bucket?	> 7 of < 4,5	6,5 - 7	6 - 6,5	5,5 -6	4,5 - 5,5
34		04: Harvest	01: Water Quality	15	x	x	x	x	Loose leaves are taken out of the water	Check status of this rule	no		sometimes		always
35		04: Harvest	02: Farm Hygiene	01					Frequency of cleaning harvest tools such as knives	Check status of this rule	< 1x / 2 weeks	1x / 2 weeks	1 x / week	2x / week	1x / day
36		04: Harvest	02: Farm Hygiene	02	x	x	x		Cleaning harvest tools such as knives with desinfectant	Check status of this rule	< 1x / 2 weeks	1x / 2 weeks	1 x / week	2x / week	1x / day
37		04: Harvest	05: Logistics	01			x	x	Time between filling of harvest buckets with water and filling with flowers	Average lead time of three harvest buckets from moment of water filling and moment that flowers are put in	> 60 min	< 60 min	< 45 min	< 30 min	< 20 min

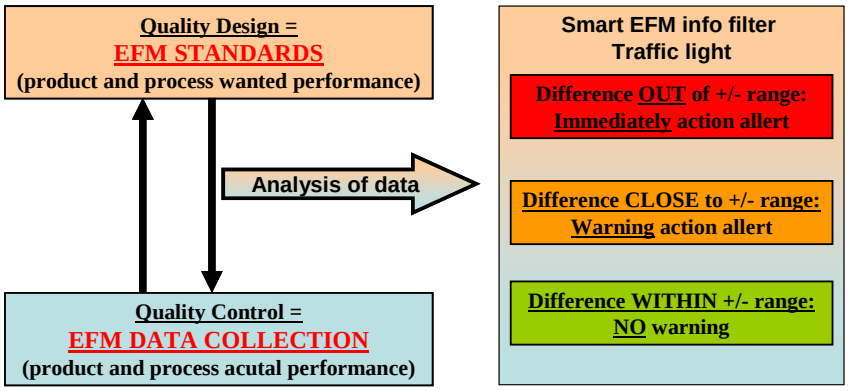
EFM quality control

The KPIs for product and process quality are measured with different frequencies. Some are quantitative (for example, temperature) whereas others are qualitative (source of water). The EFM quality control procedures go along with EFM manuals which describe how to measure actual performance of an EFM parameter and why this KPI parameter is important. Measured values are submitted in Microsoft Excel format to EFM management for further processing and analysis.

EFM continuously monitoring and improving ICT infrastructure

The current trend in floriculture is for farm or chain managers to get more and more information each day through improved ICT. It is important that the huge amount of information is filtered, and that only information which is not within the range of set standards is communicated. EFM is realizing this by an online internet-based analysis of the differences between actual values and the KPI standard. In general, this works like a funnel and a traffic light (Figure 13):

Figure 13: Configuration of smart internet-based total quality management information filter



- **Green.** KPI performance is within standard range. Information is not going through the smart EFM filter and is not reaching the manager.
- **Orange:** KPI performance is within standard range, but reaching boundaries. Information goes through the smart EFM filter and reaches the manager as a "warning".
- **Red:** KPI performance is out of range. Information goes through the smart EFM filter and reaches the manager as an "alarm".

The result is an online management tool which generates management information based on the actual performance of the company. EFM is currently serving two Dutch rose brand labels, Dutch United and Florence, which produce 200 million rose stems per annum from 80 hectares. The growers and chain partners who have access to the online EFM portal will see management dashboards where the performance of the KPI is indicated with a traffic light. Instant graphics, reports, trend analyses, benchmarking with other drilldowns can be generated, printed and exported to MS Excel or MS Powerpoint.

Based on trend analysis and EFM data in the online total quality management database, strategies for further improvement of the farm or chain can be defined and implemented. If farms or chain links are working according to their own or internationally recognized standards, they become much more reliable and stable, thus realizing trust and confidence among their buyers leading to long lasting buyer-supplier relationships.

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The response of traditional marketing channels to the growth of supermarkets and to the demand for safer and higher quality fruit and vegetables, with particular reference to Asia

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Abstract

While the supermarket growth rates witnessed in OECD countries and Latin America have yet to be replicated and to have a major impact in Asia, there is clear evidence of significant growth in some countries, such as the People's Republic of China and Malaysia. Although growth in the marketing of fresh horticultural produce by supermarkets tends to lag behind that for other food products, hypermarkets and supermarkets are likely to become important fruit and vegetable retailers in much of the region. Within Asia, there is growing concern about food safety issues, brought on by evidence of food poisoning in some countries and high pesticide residues in almost all countries in the region. Supermarkets in Asia have tended to mirror the concerns in other regions over produce safety and this has been one of the factors causing some retailers to establish separate supply chains that bypass traditional marketing channels. The capacity of traditional channels to address food safety concerns has, to date, been extremely limited. Based on research conducted for FAO on the quality and safety of fruit and vegetables in traditional marketing systems in Asia and studies of supermarket development in Asia, this paper briefly reviews supermarket growth and procurement practices, the main problems encountered in addressing quality and food safety in traditional marketing chains and the reasons why it has been difficult to effect improvements. Drawing on experience from other regions, particularly Latin America, the paper then considers the adjustments that wholesale markets and wholesalers in Asia will need to make if they are to play a role in supplying supermarkets and the related steps they need to take to improve food safety and quality. The paper concludes that wholesalers must take on many of the characteristics of supermarket procurement, such as working with preferred suppliers and farmer groups, and using branding to promote quality characteristics. Wholesale markets will need to improve their infrastructure, operations and management and to seek imaginative ways of attracting business.

Supermarket growth and fresh produce

There has been rapid growth in the role of supermarkets in many parts of the world (Reardon *et al.*, 2003), although measuring exact market share is complicated by the lack of reliable data. While the quantities sold by supermarkets can be accurately

calculated, it is difficult in most countries to know the quantity of fruit and vegetables being sold through traditional marketing channels, although some work has been carried out to extrapolate data from discussions with a sample of wholesalers (Cadilhon *et al.*, 2006).

Although conventional supermarkets are important in some Asian countries, there has been a trend toward increased penetration of large hypermarkets and small convenience stores. In the People's Republic of China, 40 percent of urban shoppers already claim to spend more in hypermarkets than elsewhere. Japan leads the way in the development of convenience stores. Such local stores still have plenty of room for development in several countries and offer a significant threat to the traditional grocery store. For example, Tops in Thailand moved to counter the impact of competitive supermarket chains by opening smaller outlets in inner-city areas that combine the features of convenience stores and supermarkets (Chen *et al.*, 2005).

However, care must be taken in drawing conclusions about the impact of these changing retail trends on fruit and vegetable producers. Firstly, retail sales do not equate to total consumption. Institutions bypass the retail sector, as do caterers, although in some Asian countries, supermarket-style cash-and-carry wholesale chains, which handle fresh produce and supply the catering sector, are beginning to develop. Secondly, growth in sales of fresh fruit and vegetables by supermarkets tends to lag behind the growth in sales of processed food products. Thirdly, while there has certainly been growth in fresh produce marketing by Asian supermarkets, imported produce accounts for a significant proportion of their fruit and vegetable sales. Furthermore, supermarket supply chains for domestically grown produce may be relatively easy to develop for produce that is less perishable, such as watermelons, but much more difficult for produce that has a limited shelf life or requires a cold chain. Indeed, many smaller supermarkets stock only those fresh products that have a long shelf life (Digal and Concepcion, 2004). Finally, such developments must be seen within the context of a significant increase in demand for both fruit and vegetables.

Malaysia is probably that developing country where the supermarket trend is most advanced for horticultural produce. Not far behind is Thailand, where 40 percent of retail sales of fruit and 30 percent of vegetables were sold through supermarkets and hypermarkets in the Bangkok area, but a lower percentage in the context of the country as a whole. In the People's Republic of China, less than 10 percent of fruit and vegetables were sold through supermarkets in 2002, although the rate of supermarket growth continues to be rapid (Chen *et al.*, 2005). In the Philippines, 15 percent of vegetables are said to be sold through supermarkets in metro Manila, but a smaller percentage in the country as a whole (Digal and Concepcion, 2004). In the Republic of Korea, there has been a rapid growth in hypermarkets since 1993, but, even so, such stores still account for only 11 percent of fresh produce sales (Lee, 2005). In Indonesia, the figure is also put at around 10 percent (Natawidjaja and Reardon, 2006).

Thus most Asian households continue to buy fruit and vegetables from traditional retailers, even though they may use supermarkets for other products. The perception, and possibly the reality, is that wet market supplies are fresher and often cheaper. This is recognized by one chain in Thailand that focuses on fresh produce and aims to create

stores that resemble “shopping at the wet market near home” (Wiboonpongse and Sriboonchitta, 2004). Wet markets are usually more convenient for consumers accustomed to walking to make daily purchases. Supermarkets often lack a sufficient range of horticultural produce to encourage consumers to switch from wet markets, particularly outside the major cities (Digal and Concepcion, 2004).

Many factors have contributed to the changing food distribution systems in Asia, both on the demand and supply sides. These include the rapid increase in the number of people owning refrigerators, which has induced a shift from daily shopping in traditional retail outlets to weekly shopping in modern stores; the increasing number of motor vehicle owners, which has prompted larger volume grocery shopping at more distant locations; the entry of women into the workforce, which has increased the opportunity cost of women’s time and their incentive to seek fast and convenient grocery shopping; and changing consumer eating habits with an emphasis on easy-to-prepare meals. Changes in the family structure in Asia are being witnessed, with a growing number of nuclear families and one-person households, as opposed to extended families. An upward trend in the use of credit cards, which are still rarely accepted by corner shops or traditional wet markets, may also have had an impact. In addition, the development of supermarket chains has been spurred by infrastructure development, such as highways, retail technology and logistics.

Changing procurement practices

Modern fruit and vegetable distribution necessarily calls for improved efficiency in the ways transactions between producers and their buyers are organized. Supermarkets are particularly concerned with the need to secure a steady flow of quality products that meet both the attributes required by their customers and can be priced at a competitive level. Characteristics of these transactions cover volume, frequency, price determination, payment conditions, logistics, delivery schedules, product standards, packaging and policies to deal with supplies that do not meet specifications (Chen *et al.*, 2005).

In many countries around the world there has been a shift from procurement by individual supermarkets, which may involve purchasing from wholesale markets, to a system involving a central buying office, with one or more distribution centres in a country. To date, relatively few chains in Asia have adopted centralized buying for fruit and vegetables, in part because they presently operate an insufficient number of stores to make a distribution centre viable. At present, there often remains a wide gap between retail expectations and the services actually being delivered by suppliers. Supermarket chains aim to increase both food safety and quality and reduce costs while increasing the volumes sold, but they have a difficult time meeting those objectives when using the traditional wholesale sector. Some notable drawbacks of traditional wholesalers are the inadequate use of refrigerated storage; packaging materials that undermine preservation of product quality; and the heavy reliance on manual labour, with poor handling that contributes to heavy losses. Market intermediaries also face problems in dealing with supermarkets. Purchase prices are often negotiated for a fixed period, such as a week, but can be renegotiated down by supermarkets if market prices decline in that period. Suppliers sometimes have to pay transportation charges from the distribution centre to

the individual stores and promotion fees where a product or range of fresh produce is featured in an in-store promotion. Discounts are required when new stores are opened. Penalties are invariably levied for failing to supply agreed quantities.

It is far better for a store to receive dependable deliveries from a few wholesalers or from a centralized distribution centre than to have to worry about buying from individual farmers or wholesale markets on a daily basis. In Thailand, 250 suppliers used to deliver perishable products directly to the backdoor of Tops supermarkets at least three times a week. “Incidents of out-of-stock were common and shrinkage in the store was high. The lead time between the farms and the supermarket shelves was up to 60 hours and due to the lack of pre-cooling and cooled transportation, the post-harvest losses were high. It was impossible to trace products back to the farm; there was no insight into farming practices and post-harvest practices. There were no clear uniform product specifications that could be communicated throughout the supply chain.” (Boselie and Buurma, 2003) Tops centralized its purchasing, but most other chains in Asia, for the time being at least, prefer to procure through a limited number of wholesalers, instead of establishing distribution centres. There is some evidence that some chains are having second-thoughts about the distribution centre concept, given the significant distances that would be involved in many countries.

Many smaller chains continue to use individual store purchasing systems. Others continue to purchase through traditional wholesalers, such that even in the relatively sophisticated market of Thailand, the leading wholesale market, Talad Thai, near Bangkok, reports no loss of business. However, some chains are gradually shifting from those traditional wholesalers to “specialized or dedicated wholesalers” that are specialized in a few products and dedicated to supplying only one supermarket chain (Natawidjaja and Reardon, 2006). The specialist wholesalers, usually operating outside wholesale markets, are generally more responsive to the quality, food safety and consistency requirements of supermarkets than the traditional wholesalers who aggregate produce from many producers and may not be able to supply the quantities or qualities required. Other approaches include purchases from cooperatives or from farmer groups that may be coordinated by a leading farmer (Wiboonpongse and Sriboonchitta, 2004).

Capacity of traditional channels to meet safety and quality criteria

Case studies indicate that in most Asian countries the main emphasis for the majority of poor consumers is on price. Nevertheless, in many countries, there is a growing demand among the upper middle class and in some, the middle class, for better quality fruit and vegetables, particularly fruit, which in many societies is considered a luxury item. In some countries, supermarkets are beginning to address this demand for quality, although “quality” is often seen in terms of appearance rather than eating quality. Attention paid by consumers to food safety is also growing, following recent health scares unrelated to horticultural produce (e.g. Avian Flu), as well as reported deaths and illnesses resulting from fruit and vegetable consumption. The main worry for consumers surrounds pesticide residues, but bacterial infections are increasingly causing concern. Between 1999 and 2002, there were a reported 250 deaths in the Mekong River delta of Viet Nam, caused by microbial infections, chemical contamination and natural toxins

associated with fruit and vegetable consumption (Giac Tam, 2005). China attributes 500 000 illnesses a year to pesticide residues with in excess of 500 deaths, but the percentage caused by fruit and vegetable consumption is unclear (World Bank, 2005). Surveys in almost all countries have identified high proportions of fresh produce with pesticide residues exceeding maximum residue limits (MRLs). Health scares have prompted special programmes, such as the "safe" vegetable programme in Viet Nam, the "Q" Mark in Thailand and the "green" and "pollution free" programmes in the People's Republic of China. However, traditional marketing channels are facing considerable problems in meeting such standards.

In marketing systems with many levels it is difficult to handle significantly different qualities at the same time, particularly if one of the quality criteria is safety. Marketing of safe food requires monitoring on-farm practices, pesticide use and water cleanliness, as well as the provision of advice to farmers. Cost renders regular testing for pesticide residues impossible. Where a wholesale market trader buys from unnamed farmers through rural traders, it is exceedingly difficult to develop traceability. Furthermore, rural traders and transporters are not equipped to keep different qualities separate. While some grading is carried out, usually on the basis of size, there is little quality differentiation as traders are rarely able to buy other than "fair average quality" and are thus unable to provide the necessary incentives for farmers to improve quality. Most traditional marketing systems are not presently equipped for separate handling of different qualities en route to the consumer. Furthermore, the standard of fruit and vegetable handling in the marketing chain is often so bad that even if it were possible for traders to buy different qualities from farmers, there may be little quality differentiation by the time the consumer makes the purchase. At the farm level, farmers face problems with polluted water and other contamination. They have inadequate information about the dangers of bacterial infection and pesticide misuse and are often illiterate and forced to rely on the local pesticide retailer as their main source of information. Pesticide use is often encouraged by horticultural produce buyers, because this can lead to "attractive" fruit with no blemishes, but recommended practices are rarely followed. Produce is often harvested too soon after the last chemical application.

In several countries, traders are constrained by the poor infrastructure of the markets in which they operate. Poor structural facilities are often compounded by inadequate management that results in haphazard operations and unsanitary facilities. Through their associations, traders can work with market management to improve operations of markets and, *inter alia*, to improve quality and safety. This usually involves relatively simple day-to-day matters, such as pointing out the need for maintenance and cleaning (Shepherd, 2005). In many cases, markets are also places where considerable post-harvest activities take place. Trimming and removal of outer leaves; removal of damaged produce; sorting and grading; ripening; repackaging; and watering to keep produce fresh or, at least, to give it an appearance of freshness, may all be carried out.

Waste disposal arrangements are often poor. Post-harvest activities frequently take place on the bare earth. In many countries, there is reluctance on the part of municipalities to invest in markets. While municipalities may, as a consequence of congestion, be prepared to construct new markets, it is often difficult to persuade them to make improvements to existing markets. Retail markets are often of poor quality or

non-existent. In the absence of organized markets, the number of street vendors and itinerant traders has sometimes grown rapidly.

Few traditional traders own vehicles for their trading operations. The frequently seasonal nature of their work, the investments required, the inability to secure sufficient product to fill a truck and the complexity of running a vehicle means that most prefer to hire transport. Unless they are able to hire an entire vehicle, they are not really in a position to control the way in which produce is handled. Smaller traders may thus find their produce being squeezed into a truck together with that of other traders, trampled on in the loading process and badly handled on arrival. Post-harvest handling training activities provided by governments and donors are nearly always targeted at farmers. Rarely is training offered to traders. Thus, they may not be fully aware of the causes of the quality problems that they experience on a daily basis and therefore unable to implement activities to improve product quality. Initiatives to promote safe food are generally not known by the trade. In the People's Republic of China, labels used for "green" food, "organic" food and "pollution-free" food are not well recognized by traders and many are unclear about their meaning (World Bank, 2005).

Response of traditional marketing channels

There are several examples of where Asian wholesale markets have taken steps to respond to supermarket growth. Talad Thai market in Bangkok is the largest fruit and vegetable wholesale market in Asia. Several supermarkets have established distribution centres in the market and there are six specialized wholesalers based there who deliver to supermarket chains. To address the concern of supermarkets for produce safety, in particular relating to pesticide residues, Talad Thai plans to establish a laboratory for pesticide residue testing. Shou Guang in Shandong Province is the largest vegetable wholesale market in China. Several distributors are equipped to supply supermarket chains. The Shou Guang Vegetable Distributor Co. has temperature-controlled storage rooms with a capacity of 1 500 tonnes and cold storage with a capacity of 1 000 tonnes as well as a 5 000 m^2 distribution centre. Similarly, Long Shan Wholesale Market in Shanghai has established a distribution centre to supply vegetables to supermarket chains. This centre presently accounts for 8 to 10 percent of the total market turnover (Chen *et al.,* 2005).

Lessons can also be learned from Japan where wholesale markets have faced "bypassing" pressure from large supermarket chains (Chen *et al.,* 2005). Approximately 80 percent of vegetables still go through wholesale markets, but this is expected to decline to around 70 percent. As a response, wholesalers have become more proactive. They pass market information onto producers and also provide management training and emphasize partnership building with farmers. Wholesalers are also merging and restructuring in order to cope with the increasing size of agricultural cooperatives and supermarket chains. Auction was once the dominant mechanism for price discovery in vegetables, but it now accounts for only 5 percent of the vegetables sold in the Ota wholesale market in Tokyo. This change occurred in the late 1980s and early 1990s. One of the reasons for this was that supermarkets required delivery in-store before 10.00, which is not considered possible under the auction system.

Some traditional marketing channels are already beginning to demand higher standards from farmers in response to consumer demand. However, Asian consumers remain very price-sensitive. While traders may tell farmers to produce better quality and may raise their minimum buying standards, those traders may not be in a position to pay more for higher quality. There is also some evidence that initial price premiums for higher quality or "safe" produce will erode over time. There is likely to be resistance from farmers if quality improvements require investments that are not rewarded, unless failure to make such investments results in an inability to make sales. Consolidation of horticultural farmers is perhaps inevitable, and is already being witnessed in other parts of the world.

If traditional channels are to offer higher quality and safer produce, it is likely to be through individual traders dedicating themselves to marketing high quality fruit and vegetables. This will require the development of linkages with farmers or farmer groups, mirroring what is already being done by supermarkets. This is being carried out in the Republic of Korea, where wholesalers contract directly with farmers and implement their own inspection system (Lee, 2005). Another example of such a development comes from Ho Chi Minh City, where a lettuce wholesaler carefully coordinates his supply chain in collaboration with a selected group of field collectors. The wholesaler shares information about market conditions with the collectors and makes orders five days in advance, to enable the collectors to identify the best sources of supply. He provides his collectors with training in harvesting and packing, so enabling him to obtain higher than average prices and reduce losses (Cadilhon *et al.*, 2005). There are also examples of similar developments from Latin America. Wholesalers from Antioquia in Colombia train their fruit suppliers on business management, clean production and quality assurance, with emphasis on compliance with packaging and MRL standards. In Argentina, the Buenos Aires wholesale market (*Corporación del Mercado Central de Buenos Aires)* also offers training on food quality and safety for fruit and vegetable producers. Employees from the quality control unit of this market have recently worked with producers from the province of Neuquen to improve the quality and safety of the leaf vegetables supplied (Gálvez, 2006).

Scope for future improvement

As noted above, a few wholesale markets in Asia are already beginning to offer large and modern facilities to companies dedicated to supplying supermarkets. Wholesale markets are likely to develop separate facilities to handle quality produce. The creation in the markets of what are known as "logistics platforms" to serve the needs of supermarket buyers, as has been done in Italy and Spain for example, is worthy of consideration. Some of the biggest Latin American wholesale markets (Buenos Aires, Sao Paulo, and Mexico City) have already made plans to develop logistic platforms to serve supermarkets and exporters better. In some cases, new market sites have been constructed to facilitate logistics platforms and other markets, such as Montevideo in Uruguay, Adelaide in Australia and Naples in Italy, are planning similar moves.

Small-scale retailers will continue to play an important role in Asia. With increasing affluence, people will eat out more. Both retailers and caterers will be attracted by the provision of wholesale cash-and-carry facilities. Such a store in a wholesale market

compound would enable traditional fruit and vegetable retailers to diversify into selling new products. Market logistics may need to be re-examined, together with trading hours, in order to maximize the convenience for customers and minimize the delay between harvest and sale. Wholesale markets need to look to their strengths. In some cases, for example, they should be able to supply fresher produce than supermarket chains. Clearly, such developments will be easier for markets in some countries than in others, but the countries where improvements will be easier to bring about are, by and large, those where traditional systems are under the most immediate threat from supermarkets.

In Beijing, farmers supplying the city's retail or wholesale markets sign an exclusive production contract, specifying the production base, implementing standardized production and taking responsibility for product safety. All over Asia, farmers wishing to access high-quality markets will almost certainly have to work together as members of formal or informal groups, following the same technical package. Individual small farmers cannot produce sufficient quantities to supply the needs of large buyers, and market intermediaries do not want to work with scattered farmers, preferring instead to buy from farmers in one particular location. Working in groups also offers the possibility to invest in appropriate post-harvest infrastructure, such as grading facilities and cool stores, and to develop a brand name. At present, the consumer relies on the supermarket to provide the assurance that produce meets certain standards; groups of farmers may in the future be able to provide that assurance by labelling their own products (Anh and Minh, 2005). Wholesale markets could also develop quality labels as is being done in Montevideo. The *Mercado Modelo de Montevideo* has implemented a voluntary quality control programme to ensure that fruit and vegetables sold in the market comply with the Mercosur quality standards. That produce which does not comply with these standards is still sold, but with an indication of non-compliance with the standards (*fuera de norma*). Consumers have responded well to this programme. At present, fruit and vegetables marked with the quality label obtain a premium of 8–16 percent above the price for non-labelled produce. Furthermore, the turnover of higher quality produce is much greater (Gálvez, 2006).

Over the years, FAO has devoted considerable effort to encouraging governments and municipalities to improve the infrastructure available for marketing. While there have been notable improvements in market infrastructure in some countries, in many Asian countries, the quality of assembly, wholesale and retail markets is far from adequate. Governments need to view markets as more than just sources of revenue, particularly if they wish to see traditional marketing channels survive in the face of competition from supermarkets. There is also scope for private investment in markets, possibly through some form of public-private partnership.

As already noted, supermarkets are moving to direct procurement arrangements, either working directly with farmers or farmers' groups, or working through dedicated wholesalers. Wholesalers working in traditional wholesale markets cannot dismiss these trends as a supermarket fad. They will need to strengthen linkages with farmers and improve logistical arrangements along the lines of the good commercial practices that supermarkets are beginning to insist on, which could include developing rural packing houses. To keep pace with the demands of modern buyers, farmers, assisted by their

traders, can adjust by: specializing in a particular commodity; consolidating fragmented land holdings to achieve scale economies where this is permitted by law; and forging stronger links with wholesalers. Assemblers, wholesalers and retailers can also adjust by paying more attention to managerial requirements and capacity building in areas such as contract negotiation, management of operations for contract compliance and monitoring of production performance, including environmental impact. In the Republic of Korea, for example, wholesale markets procure from cooperatives on the basis of contracts (Lee, 2005). An increased emphasis on quality and safety will be required, particularly in relation to pesticide residues. Direct linkages with farmers should also facilitate traceability in the event of problems.

Faced by a static or declining share of the market, traditional marketing systems can try to increase their share again, but this may be difficult. An alternative approach is to work to increase the total size of the market. Several countries have adopted "five-a-day" promotions to encourage people to have five servings of fruit and vegetables a day. Markets would appear to be the ideal organizations to develop such programmes and publicity campaigns. The wholesale market of Buenos Aires and the Argentinean 5-a-Day Foundation organized various activities to celebrate the "Healthy Eating Week" in October 2006, in order to promote the consumption of fruits and vegetables (Gálvez, field observations). This initiative is expected to be replicated every year at around the same time.

Finally, possible marketing channel improvements are not limited to wholesalers and wholesale markets. Retail markets can also respond to supermarket competition. In Honduras, for example, a farmers' market has improved security and provided shopping trolleys for market users (M. Lundy, pers comm.). In Malaysia, the Federal Agricultural Marketing Authority has promoted a successful network of weekend farmers' markets.

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Developing consumer trust in ethical food supply to meet increasing market interests in credence purchase

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Abstract

Trust is the key to ethical food marketing, where consumer "pull" is dominating demand and credence purchase supply. Consumer preferences, concerns, fears, politics and beliefs seem increasingly to govern new food marketing opportunities based on the nature of food production systems. Most of these "extrinsic" properties of food, relating to husbandry approaches and the production environment, are difficult to verify at the point of sale – requiring such credence purchases to be embedded in trust, confidence and ethical traceability both in the product and in systems of supply. Affluent consumers can also afford to pay more attention to such issues as environmental protection, animal welfare and social considerations underpinning this food production on farm. At the same time, these affluent consumers also pursue competing attributes such as "intrinsic" properties governing nutritional characteristics and health issues. The "food integration" concept embraces food safety, technical and credence attributes – but "extrinsic" properties arguably require much improved consumer communication. Projecting a "sense of caring" of benefit to society, through food supply, is commendable and an attractive approach to agrifood business, providing also opportunities for both "adding value" and product diversification. It can equally deliver a vehicle for Corporate Social Responsibility (CSR) strategies. This only applies, however, if such claims can be verified, and are transparent, honest and justifiable. Both quantitative and qualitative measures of assessment are recommended as a basis for ethical risk assessment. Fairtrade, Freedom Food, Assured Food Standards and the LEAF Marque schemes are explored. The basis for more ethical trading is examined – and an attempt is made to determine whether consumers "get what they expect" – and more importantly "get what they pay for".

Background

Ethical consumerism (Mintel, 2006) may only be a relatively small sector of mainstream retailing currently in many countries, but it is becoming an increasingly significant driver of consumer purchase choices in Europe (Davies and Baines, 2005). Consumer attitudes to food supply (both food manufacturing and retailing) back to primary production have changed considerably in recent years, in the United Kingdom especially, in contrast to public perceptions of many other industries (IGD, 2006a). Shoppers exhibiting ethical purchasing decisions have reportedly increased from 26 percent in 2004 to 39 percent in 2006 in the agrifood sector (IGD, 2006a). Ethical spending on food, transport, energy, travel and financial products has risen steadily over the last seven years in particular in the United Kingdom to reach a record high of £29.3 billion (pounds sterling) in 2005 (Co-operative Bank, 2006). Spending on organic and

fair trade food products alone has reportedly grown 62 percent since 2002, to a value of £2 billion in 2006 (Mintel, 2006). According to the IGD (2006a) 33 percent of shoppers in the United Kingdom are ethical activists, where beliefs and lifestyle determine consumer purchases, and 25 percent of shoppers in contrast are not ethically sensitive. Overall ethical spending increased by 11 percent between 2004 and 2005, and according to the Co-operative Bank (2006), "ethical" foods increased overall by 18 percent over the same time period to reach £5.4 billion.

Food supply is dominating ethical market growth commercially in the United Kingdom, but it raises many questions of consumer perceptions, trust, potential food fraud claims and retailing approaches. Can so-called ethical sourcing be trusted (Gabriel and Lang, 2006)? Is the label or brand a "seal of trust"? Do attitudes and lifestyle claims translate to actual food purchase decision-making? Our desire for "things to be better", which we hope can be secured (at least in part) by more ethical behaviour (including consumer behaviour) is grounded in trust. Can "soft" quality assurance schemes justify appropriate credence purchases – or is much of it a self-deception? Should we vest our trust in the retailer as "gatekeeper", rather than the brand or label – or are their projected ethical sourcing image-building just perhaps merely "green wash" (according to Justin King of Sainsbury's supermarkets).

This paper will comment on the growth of ethical food product supply, against a background of growing ethical consumerism, as a driver of agrifood business. Consumer perceptions, quality assurance and building consumer trust towards improving ethical supply will be explored.

Ethical perspectives

"Ethics" derived originally from the Greek word *ethos* meaning conduct, customs or character, involves the application of morals and beliefs to human activity (Manning *et al.*, 2006). FAO (2004) interprets ethics as the "principles and standards that define behaviour, actions or rules of action that are considered (by some) to be right, good and proper". Ethical norms of behaviour are based on "what ought to be"; "what ought to be done" and "how things should be done" by adherents. Most of these are deeply embedded in religious beliefs, tradition, social behaviour and regulation. Other ethical considerations are more "highly personal", based on diverse beliefs (Bhardwaj *et al.*, 2003).

There are several theories underpinning the study of ethics which focus, basically, on either "the morality of actions" the "consequences of sanctions" or the basis of "motives". They are grounded in those theories which emphasize "duties" (deontological); those (utilitarian) theories which emphasize "the greater good for the greatest number of beneficiaries", and those that deliver "egoism" emphasis in theories that address the "achievement of the greater good for the moral agent" (FAO, 2004). In practice, people and organizations express and exercise a mix of these emphases towards ecocentric behaviour (based on concerns for ecosystems and environments); biocentric actions (relating to concerns for particular species of animals or plants) and anthropocentric activities (focused on concerns for man and society). Quite clearly,

there is a multiplicity of religious, cultural, linguistic and traditional ethical beliefs globally – which makes the analysis and interpretation of these issues highly complex.

Ethical influences on food purchase can be grounded in intrinsic characteristics perceived, for example, to be beneficial to health and well-being by the customer, many of which are proven and promoted properties (some of which could be verified at the point of purchase, if required). Other perceived properties by the customer, based for example on the methods of food production that are considered ethically desirable, have so-called extrinsic characteristics (Davies and Baines, 2004; Hansford *et al.*, 2003). Labels, logos and credence can provide, in these instances, a better basis for consumer trust.

Ethical consciousness and consumerism

Recent surveys reveal an increasing consumer interest in ethical issues influencing product purchases, particularly in the agrifood industry sector (e.g. IGD, 2006a). The Institute for Grocery Distribution (IGD) reports that an ethical shopping emphasis is growing in the United Kingdom at a rate of 7.5 percent per year, which is a higher rate of growth reportedly than the conventional grocery trade. Approximately 85 percent of consumers in the United Kingdom believe, reportedly, that the food industry in particular should be leading corporate social responsibility initiatives based more on social, ethical and environmental principles (IGD, 2006a), as shown in Table 1.

Table 1: Comparison of ethical consumerism across some British industries

Main shoppers (percent) making ethical purchases		
Industry	**2004**	**2006**
Clothing manufactures	12	17
Car manufacturers	19	17
Pharmaceuticals	19	18
Food Service	15	17
Food and Drink Manufacturers	26	37
Food Retailers	35	60
Farmers	27	42

Source: IGD, 2006

Although there is a high level of consciousness of ethical issues, there does not always seem to be a good understanding of the issues of concern and how they may interrelate, as shown in Table 2 (IGD, 2006a).

Surveys rarely give the same answers, but successive studies by Mintel (2006) also suggest that ethical consciousness in the United Kingdom is increasing, as shown in Table 3.

Table 2: Shoppers who believe ethical issues are quite or very important to purchase decisions

Issue	Consumer (percent)
Recycling	74
Environment	73
Animal welfare	67
Fair trade	67
Free-range livestock	62
Organic production	45

Source: IGD, 2006: survey of 1 000 consumers.

Table 3: Increasing ethical consciousness in Britain

Consumer Response (percent)	2002	2006
Strongly believe that people have a duty to recycle	65	75
Consumers who buy "Fairtrade" products where available.	26	34
Buy "free-range" livestock products whenever possible.	33	40
Consumers who consider it worth paying more for "Fairtrade" organic and locally-sourced foods.	20	34

Source: Mintel, 2006

Consumer concerns

How and where people shop and reach purchase decisions is complex, and influenced by many factors. For some the local farmers' markets may be important; to others the family-owned corner shop, or the particular supermarket. It is often, for many, a mixture of these with consumer shopping promiscuity and less outlet loyalty, depending on needs, convenience and occasion.

The United Kingdom Food Standards Agency (2006) reveals, through surveys, that information sought on food labels is currently dominated by nutrition with ethically related information issues being less consulted. It seems, from labels, that ethical information (in the United Kingdom) is mostly being sought by a committed minority rather than the majority (Table 4).

What consumers "say" might be radically different from what they "do" (FSA, 2006) – as with the "5-a-day" scheme (Table 5).

Table 4: Information usually looked for on food labels in the United Kingdom

	Percent	
	2004	2005
Amount of fat	56	60
Amount of salt (sodium)	44	53
Best before or used date	64	49
Amount of sugar	44	48
Calories	28	28
Cooking or storage instructions	36	27
Country of origin	22	22
Health claims (e.g. “low fat” or “good for your heart”)	26	18
Quantity of the main ingredients	22	17
Whether the produce is of GM or non-GM origin	23	16
Vitamins	12	15
Production methods or other ethical information	19	15
List of ingredients for special reasons (medical, religious or dieting)	13	14
Name of the food	15	12
List of ingredients for specific allergy reasons	12	11
List of ingredients for other reasons	15	11
Whether the products are organic	13	8
Suitability for a vegetarian diet	9	7

Source: FSA, 2006: 2 650 respondents.

Table 5: Awareness in the United Kingdom of “how many portions of fruit and vegetables do you think you should eat every day?” i.e. “at least five portions of fruit and vegetables”

	Percent	
	Aware	How many have actually eaten “five a day”?
2000	43	26
2001	49	25
2002	51	25
2003	59	28
2004	58	51
2005	67	30

Source: FSA, 2006

Ethical diversity

Beliefs and ethical values can differ considerably, in different parts of the world, due to very many factors including (as mentioned) religious, cultural, linguistic and traditional values. In these circumstances different types of ethical retailing need to recognize market differentiation on the basis of credence values. Different attitudes to animal welfare considerations in livestock production across Europe, emphasizing contrasting

attitudes in the north and south, have previously been noted (Davies and Baines, 2004; 2005).

Religious belief is amongst the most powerful influence, with some religions precluding particular sourcing and food ingredients (Fieldhouse, 1986). These beliefs can also influence other attitudes, such as genetically modified (GM) crop adoption in the agrifood system leading to so-called "genetic" food production. These attitudes are little understood at present.

In the United Kingdom there is also a class consciousness in attitude to ethical concerns about foods, that may reflect wealth, product choice and lifestyle attributes (FSA, 2006), as shown in Table 6.

Table 6: Information sought on food labels in the United Kingdom by different social classes

	Social Grades (percent)		
	Upper classes better educated and more wealthy	Middle class	Lower class less educated poorer
	A, B	C 1, C2	D, E
Nutritional information	79	73	69
Ingredients	64	58	52
Ethical information	26	13	10

Source: FSA, 2006

Location in the United Kingdom has also been shown to influence the ethical marketplace in consumer purchases (IGD, 2006a), as shown in Table 7.

Table 7: Percentage of shoppers in different regions of the United Kingdom who believe organic production and foods are important

Region	Percent
London	71
South	46
Midlands	45
North	35
Wales	45
Scotland	30

Source: IGD, 2006a

Political support

Radical reforms of the Common Agricultural Policy (CAP) in the European Union in 2003 shifted the emphasis of support from quantity, and produce subsidies, to decoupled quality standards. High productivity goals, to prevent food shortages, have been replaced by higher standards of "environmentally friendly" land management, animal welfare and public health through so-called cross-compliance support

instruments (Fischer Boel, 2006). These changes provide a "strong incentive" for more "ethical" European farming (Fisher Boel, 2006).

The European Union is determined to promote the linkages of food "quality" perceptions to Europe's "agri-culture". Specific labelling identity, such as through Protected Geographical Indications (PGIs), command regional branding recognition and associated qualities considered to be worth a financial premium. Food product fame, built through years of production efforts in specific regions of Europe, is considered worthy (Fischer Boel, 2006) of separate and special recognition. Protected name status confirms authenticity and origin of recognized foods – addressing many ethical purchase objectives and lifestyle consumption demands of consumers. Currently 36 products are registered under this scheme including, from the United Kingdom, well-known and highly regarded Welsh Lamb, Jersey Royal Potatoes and Blue Stilton Cheese. These higher-value named products also have increased credibility in growing export markets seeking greater "quality" recognition (such as the People's Republic of China and India).

Traditional foods and drinks in Europe have long been enjoyed, and have significant reputations, and these qualities are now more consonant with agricultural policy change towards "quality" in its widest sense. Ethical traceability to inform consumer choices appropriately remains, however, a key supporting issue (Coffe, 2006; Barling, 2006).

Snapshots of ethical assurance schemes – features of some major ethical initiatives

Fairtrade Foundation (Hill, 2006; Barrientos and Dolan, 2006)

- To provide a better deal for third world producers;
- Fairtrade works with 500 producers' organisations in 58 countries, supporting over 5 million beneficiaries;
- Fairtrade Labelling Organization unites 21 national Fairtrade initiatives;
- Fairtrade scheme established in the United Kingdom in 1992 covered over 2 000 retail products and services in 2006;
- 50 percent of adult consumers recognize the Fairtrade trademark in the UK;
- More consumers (+ 15 percent) and sales (+27 percent) of Fairtrade products from 2004 to 2005;
- Fairtrade food and non-food sales in the United Kingdom reached £193.8 million in 2006.

Assured Food Standards (Clarke, 2006)

- To improve agreed standards of agricultural produce and provide greater consumer confidence;
- "Red Tractor" kitemark in the UK (launched 2000);
- "Assured Food Standards" (launched 2005) in UK;
- Includes 80 000 farm members and 350 companies licensed to use the Assured Food Standard's logo;
- Covers 90 percent of British pig production on farm; 70 percent cattle; 100 percent poultry production; 90 percent of British dairy production; 67 percent of

fruit; 91 percent of salad cropping, and 80 percent of the combinable crop production in the United Kingdom.

Freedom Food, RSPCA scheme (Grant, 2006)

- To "improve farm animal welfare";
- Freedom Food initiated in 1994 in the United Kingdom (the RSPCA was founded in 1824);
- Membership of 2 200 livestock farmers;
- "Animal" membership now 46 million (2006) from 17 million (in 2004);
- 55 percent of adult consumers in the United Kingdom give "animal welfare" as a significant ethical concern.

LEAF marque (Drummond, 2006)

- To "promote integrated farming systems: linking farming and improving environment";
- Whole Farming System emphasis;
- Involves 300 farmers and 5 million consumers in 2006 in the United Kingdom.
- Covers 68 000 ha of combinable arable crops (cereals, oilseeds, legumes) and 46 000 ha of fruit and vegetables in the United Kingdom;
- For example, sales worth £190 million of LEAF Marque certified products in British Waitrose Supermarkets.

Assurance and auditing of ethical claims

Penetration into ethical markets is based on consumers believing they know about the product and how it has been produced – this requires information linked to the product. It is also critical that they trust in this information and in those who provide it.

If the chain between producers and consumers is short and local, then much of this trust can be built up through personal relationships, with the consumer "knowing" the producer or purveyor and vice versa. This relationship can go further with consumers living next to production and having an intimate connection with that "environment" Furthermore, should any partner in the chain break that trust, then there is every chance that this will become known and this can affect the local market. Under such conditions it is the reputation of the supplier that is known and there is little need for any form of labelling beyond branding, and little need for certification.

The above relationship can break down, however, if several local suppliers are using a common brand. Under these circumstances, agreed codes of practice may be required and some form of assessment is needed. However, there may not be a need to establish a complete auditing and tracking system as it is still possible to maintain the ethical standards and claims through appropriate peer pressure. In other words the producer group can "police" individual members.

Maintaining these channels of trust and communicating the right message becomes difficult when group membership becomes large or when production and consumption are separated by longer distances. Under these circumstances it is important to underpin the claims with appropriate standards backed up by independent certification. As more

food is sourced globally and as ethical consumerism grows, so have ethical certification standards.

In order for an ethical standard to be successful the following attributes must be developed and known by all involved from production to consumption.

There must be a set of standards developed, which objectively address the issues of ethical supply. Often these standards will evolve through dialogue with interested stakeholders. From this set of standards, an audit protocol must be developed and a mechanism for inspection and certification developed. In order to harmonize with other standards' objectives (like food safety and quality) such standards should operate to ISO Guide 62 or 65 and be inspected by accredited certification bodies. Such audit protocols must have the capacity to withdraw certification from individuals who breach these standards.

The above integrity needs to be communicated to the end of the chain and consumers. This may require branding for recognition and promotional information to allow consumers to know and understand the ethical dimensions of the product.

It is also important to build in some form of review system to ensure the standard remains current in the eyes of ethical consumers.

Several standards have developed in this way, including organic standards, animal and worker welfare standards, standards for wildlife and biodiversity as well as religious certification standards.

A final development in this trust relationship is evolving in food retail and food service. In order to avoid the difficult task of understanding all of these standards, retailers and food service providers are developing a corporate ethical offering where they have made all of the sourcing decisions on behalf of their customers. Under these circumstances consumers trust and know their local store even though it may be a multinational sourcing from all around the world.

Conclusions

Consumer relationships with food, both production and supply, will remain both complex and intimate – but ethical dimensions influencing perceptions and purchasing decisions seem to be increasingly significant, at least in the United Kingdom. Opportunities for quality improvements of products and supply, giving greater sustainability benefits; bonuses for society and added-value premiums for producers are increasingly attractive.

In these supply systems greater ethical traceability is recommended to "capture and map the ethical dimensions of practices and processes in the food supply chain" (Coffe, 2006; Barling, 2006). To provide a basis for future ethical training, and to address consumer concerns better, five key issues have been highlighted in a 2006 European study (www.ethic-trace.net):

- "Ethical aspects of the (hi)story of foods are often hidden" but appropriate assurance schemes can help better tell the "story";
- Ethical issues in food supply chains are not well communicated, and need to be clarified for better consumer awareness;
- Relationships between stakeholders in food supply chains need to be strengthened from an ethical viewpoint, to provide a more coherent delivery system;
- Ethical traceability could help to prevent the communication of misleading and deceptive information to consumers;
- Consumer concerns should be more explicitly embraced in ethical decision-making in the food supply chain, through better partnerships and dialogue, to strengthen ethical supply.

This market sector will continue to grow – but, hopefully, in an appropriate and more genuine whole supply chain manner.

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Supermarket own-labels for fresh produce[27]

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Abstract

About 15 years ago, the number of prepacked produce lines increased to such a level that Tesco in the United Kingdom decided that a retailer's own-label was needed to create uniformity for customers. Previous to this, prepacks had come in a variety of supplier brands. The introduction of own-label produce was very important in the campaign to create a quality image for Tesco. In the United Kingdom all produce prepacks are now own-label. There are very few supplier brands to be seen, with the exception of bananas, pineapples and citrus. Producers around the world are growing crops for Tesco's own-label. However, the prepacking of own-labels tends to be done in places nearer to Tesco's distribution centres. Tesco is currently implementing trials to prepack own-label products in countries such as South Africa. This will reduce costs and better manage quality and date coding. In developing an own-label range, the key aims must be to develop customer trust in the value and quality of the brand. Tesco has also differentiated its own-labels with three different brands appealing to different consumer market segments. As producers work more in partnership with Tesco, their businesses tend to develop and grow in parallel with Tesco's. When producing own-label products they tend to be more efficient and put greater attention to detail than their competitors. Tesco Lotus has plans to start implementing an own-label strategy for fruit and vegetables sold in its Thai stores in the near future.

Tesco started business in the United Kingdom in the early 1920s with a vision that is still in place today. We are now operating in 14 countries around the world including the United Kingdom, the Republic of Ireland, the Czech Republic, Slovakia, Hungary, Poland, Thailand, Malaysia, the People's Republic of China, Japan, the Republic of Korea, and we will open in the United States of America in 2007.

Retail own-labelling is something that has been very strong in the United Kingdom and is something that Tesco is very proud of. Why we have our label and the Tesco name on most of our products is a bit of a mystery to many customers and many people, but it does give customers a huge amount of choice. It also encourages loyalty. They can only buy Tesco products in Tesco stores, so I suppose that is a bit of a win for Tesco trying to get people in through the doors. We help develop diversity, so we can give customers a real range of products across the whole range and it also gives us an opportunity to follow the lifestyle trends that are happening around the world.

[27] The following paper is an edited transcript of a presentation delivered to the International Symposium on Fresh Produce Supply Chain Management

However, Tesco doesn't just sell Tesco. We sell loose products, with no packaging and no brand name, just as you would find in a traditional market. Our value brand which is functional food, is the lower quality, but also the lowest price; the standard range is the mid-range, traditionally the European classifications of Class 1 and possibly Class 2; our finest is our very premium brand, which gives us an opportunity to promote varieties, countries of origin, and sources, and give more affluent customers more choice.

We also sell organic, "free from" which is free from wheat, gluten, etc., and we are heavily promoting Fairtrade. We believe in the philosophy behind it and we are proud to put the Fairtrade brand on our products. Healthy living, giving people a choice whether they want to eat a little more fat to get a little bit more taste, a little bit of extra sugar, a little bit of extra salt, we make it available so that they don't have to if they don't wish to. We have a kids' brand. Children are probably the most important factor for our business, because they are the consumers of the future, and there are billions around the world. But we want them to be around for the future, so we don't want them to be eating unhealthily. They also want a bit of fun in food as well.

We promote local. This is something new to the United Kingdom. The United Kingdom produces a significant amount of what Tesco sells within the country, and every region has its own preference, Jersey Royal potatoes or Cornish cauliflower for example. Consumers in their own region, just as they are around the world, are very proud to be associated with their region, and we believe that it is important that they can feel that sense of pride with the purchases that they make.

Wholefoods are built around the chefs and the people who want to break the ingredients out and not to buy composite meals, but actually want to buy the individual products. We want them to feel pretty good about it.

In our world, GI is glycemic index, not geographical indication. Glycemic index is a way of looking at food and eating more healthily to provide more sustained energy, like oatmeal porridge in the morning. It will have a slow release and a slow burn of the energy and help you feel fuller for longer and help you plan your diet through the day.

The Tesco brand also provides an opportunity for innovation. All of our products are tested through consumer panels which gives us a fairly high success rate. Up to 95 percent of the products that have been launched by Tesco are still selling today. There are some failures, as always, but the rate is much lower than in the past. In 2006, we launched 8 000 new lines. The development is not necessarily led by ourselves: we work very closely with our suppliers around the world to source the very best products from new locations, new sources, and new varieties, because consumers are very fickle people. We are all consumers and we all want to have the choice and the variety. We also monitor the competition and if somebody is selling a product from a certain region, we look at that product. If it satisfies our consumers, then we will probably enter that market as well.

At Tesco we have two values: "No one tries harder for customers", is right at the core of what we do. Our other value is to "Treat people as you would like to be treated", which

introduces the ethical values and the brand values that go behind everything that we put our name to. Tesco puts the customer and the product right at the heart of everything that it does.

Our core purpose as a retailer is to create value for customers to earn their lifetime loyalty. This is quite a powerful message and it is also quite a simple statement. Tesco has been around for some 80 years and we want to be around for the next 80. In global terms, 15 years ago, Tesco was the number four retailer in the United Kingdom. Through hard work, a lot of focus, a lot of energy around the consumer and the products and the brand, we have now developed from being number four in the United Kingdom to being number four in the world, with plans for expansion that will see more of our business generated outside the United Kingdom.

The philosophy behind Tesco is quite simple. We will do whatever customers want us to do to give the products and the prices that customers expect on a daily basis. Most of our stores operate 24 hours a day, seven days a week and the competition is very strong. Some people think that being a retailer is very easy, because all you do is collect the money. Actually, being a retailer is probably one of the most difficult parts of the supply chain. We strive to improve and to delight our customers on a daily basis. If we can deliver value, quality, service and a competitive price to all our customers, we may succeed in creating the value that they expect and earn for us their lifetime loyalty.

Customers expect a lot from retailers. They expect high standards like British Retail Consortium (BRC) or GLOBALGAP and high-quality products that are consistent, offer good value for money and protect our environment.

When we decide to run with a new product, we agree together with the supplier. Together we write the specifications. After first approval, we test the product to ensure that it complies with the specifications – do they have the quality or not? Then, after the product has run for around one year, we conduct a PMP (product monitoring programme). This test is conducted by a third-party referee to check the quality, focusing on chemical and microbiological contamination. Then we work closely with the consumers in store. We establish a monitoring programme for a surprise audit or a surprise visit to the supplier to make sure whether the quality is good or not. If we find a problem, we ask our supplier to investigate and discuss with them ways to improve the quality improvement. This is our system. This is our system to make sure that all the products we sell in Tesco are safe.

For fresh produce, we talk directly to the farmer. At the farm level, we establish good agriculture practices (GAPs). We control what chemicals may be applied, when and at what rates. In Thailand, many farmers are poorly educated, so we try to improve their understanding. We invite the government to assist and to train the farmers. At the packing house, we demand GAP and have established both good manufacturing practices and HACCP-based quality assurance systems. We can trace the product to its source. From the packing house to the distribution centre we use cool chain principles. The truck should be clean, based on HACCP also. After we send the product to the store we continue to check the quality of the product. We check around two times per year and focus on chemical, microbiological and physical contamination. If we find a

problem, we talk about it to the supplier. We investigate and we take preventative action. If we found that the same problem was reoccurring, then we evaluate our relationship with that supplier and potentially cease to do business with them, because we want the best-quality product.

In managing the supply chain, we set the standard for the farms and farm management. We audit and approve all vendors against national and European Union standards. These standards are checked at the control point and distribution centres. This means that we operate quality control at both the packing house and the distribution centre. For Tesco's supply chain, there are many benefits. First, we focus on the grower gaining a clear understanding of the customers' requirements. The vendor has to improve to meet their customers' needs. Growers and packers can benefit from a reduction in the discount. Growers are on a level playing field: all must meet the same standards, irrespective of the product origin.

Right now we have about 300 stores in Thailand. We have two distribution centres: one in Ayuthaya province and a new one in Nonthaburi province. During transport both to and from the distribution centre we use the cool chain. We control the temperature because we want the best quality. The product is very fresh. We appreciate what the customer wants: freshness, quality and freedom from chemicals. In 2004, we found that up to 11 percent of the produce inspected exceeded our pesticide residue limits. In 2005, this had fallen to two percent; and in 2006, we have not found any pesticide residuals. This is what Tesco stands for. These are our values. This is how we succeed in business.

Currently, we have around 60 vendors in Thailand, more than 500 contractor growers and around 500 products, valued at THB7.8 billion per year. Our own label shows the product name, the vendor's name and address, and displays the "best before" date. Next year we plan to add more nutritional information to encourage healthy eating.

DELEGATE: When Tesco is operating in developing countries, you demand from your suppliers' certification like GLOBALGAP and BRC. Is that not a problem?

MR SUTTON: Within the British market we are quite fortunate with a sophisticated supply base. Everything that we sell within the United Kingdom is 100 percent-certified BRC and GLOBALGAP, and we also have our own Tesco Nature's Choice which goes a little bit further than GLOBALGAP. In the developing countries, we try to work with producers to develop these standards. The standards can't be achieved overnight and we appreciate that. What Tesco and Tesco's consumers are looking for is a guarantee that the products they find in our stores are safe and legal and of the right quality. If that certification isn't available today, then we will underpin it with due diligence through the supply base and through ourselves by visits and monitoring.

Certified organic supply chains: the case of Swift Co. Ltd[28]

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Abstract

This article describes the relationships developed by the Swift Co. Ltd of Thailand with groups of farmers for the supply of organic-certified fresh produce. Success comes from cooperating with farmers and investing substantial amounts of time, money and human resources into their production systems, the logistics of the supply chain, traceability and quality control, and independent certification. As a result, Swift Co. Ltd is one of the leading fresh produce exporters of Thailand with a robust quality control system.

Let me give you a brief overview of our company first. We are a Thai company, fully owned by Thais. The company was established in 1986. It was, and it still is, a very small company, but we have a big dream. From the very beginning, the mission of our company was to supply premium quality produce to our consumers, no matter where they are. Irrespective of their ethnicity, if they buy our products, they must receive premium quality produce with the highest standards of food safety the world can offer. The second driving principle is that all the parties in our supply chain or value chain, if you include the consumer, must benefit fairly from our operation.

To achieve our goals we can only operate in one way. We have to organize our own farms or grower groups. We cannot buy from the market. To have the consistency in quality and the highest standards of food safety, we have to know exactly what the farmers do on the farm, what the current farming practices are, how they can grow it and how they transport it. To achieve our objectives, we set up a contract grower groups' model. Even before we started organizing the group, we checked potential sites. We checked the history of land use. We did the risk assessment. We checked the soil conditions, water conditions. Even though we are satisfied, every year we continue to check the soil condition and water condition; twice a year, in the rainy season and in the dry season.

At present, we have only one kind of farming practice that we adopted for all our members: everyone in the group must practice GLOBALGAP. In addition to that, everyone must practice chemical-free farming; not pesticide free, but refraining from using all agrochemicals. The top of the line is organic farming, fully certified under European Union, American and Japanese standards. Here, chemical-free farming may be the same as organic farming, but it cannot be certified as such, because of some rules and regulations or requirements. Let me give you one example. If you have a small plot of land and try to comply with the requirements of organic farming to create a buffer

[28] The following paper is an edited transcript of a presentation delivered to the International Symposium on Fresh Produce Supply Chain Management

zone around your farm, if you only have one acre or one-third of a hectare, when you have a buffer zone of 20 to 25 metres around your farm, then you don't have anything left.
Our grower group is spread out throughout the country, from the north to the south of Thailand, and from the Myanma border to the Cambodian border. We organize our growers and work with them as partners, not as a buyer and seller. We work together. We solve problems together and we share the benefits equitably. When problems arise like this year when flooding was widespread, we, as the stronger party, carried the burden to solve the problem. Now all those farmers who were affected by the flooding are back on their feet. Supply will resume from the end of this month onward.

To maintain premium quality we are concerned about freshness, taste, flavour, the appearance of our product and food safety standards we employ. We have established our own packing houses to shorten the travelling time from the farms to the pack house and to save on the costs of logistics. We want to be the lowest cost player in the field. All our processing facilities are purpose built, with good manufacturing practices certification. Our processing is certified under both HACCP and British Retail Consortium.

The organic processing line and the conventional processing line are totally separated. Our supply chain operates directly from the growers to our pack house, and then to the importer, retailer and consumers. There are no additional layers: we removed them all in order to have the highest standard of food safety and to provide premium quality consistently. We diversified our grower base throughout the country for two purposes: firstly, to be in the position to serve our customers better, no matter where they are. They must have consistency of supply in terms of quality and regularity. This year is a good example. Flooding was widespread in Thailand, but we were still able to supply our customers on schedule, even although the farm areas were very badly affected.

In our business, we try to minimize waste. As you know, this is a kind of cost saving, where we are able to pass the benefits to our growers, our packing houses and onto our consumers. In Thailand, it is not unusual for fresh produce to pass through as many as 14 layers. This is very inefficient. Nobody intended it to be this way, but because of the structure of landholding, everything happened this way. We have to change this in order to survive in a very competitive world. The effect of a multilayered chain is so great that every layer adds costs and profit taking, so that by the time the product finally reaches the consumer, its value at the farm gate (US$1) has risen to US$7–10.

Furthermore, each time fresh produce changes hands, its quality deteriorates, so by the time it reaches the consumer, the quality is so poor and the food safety standards have all but disappeared, no matter what the farmers try to do at the farm. In this system, everyone loses. Under the supply chain we have developed, there are no layers; it is direct from the farms to our pack house. We use the same model for our organically certified chain.

We started our operation in 2001. We began with only 47 farmers in two groups, and a planted area of organic asparagus of just 15.5 hectares. These growers did not have any experience in organic farming. They didn't even know asparagus. We spent almost two

years training them. All of them, after training, signed a written contract with us, to commit their farms to organic farming. We organized them in such a way that they will be in the position to carry on even if our company, by any chance, folded up tomorrow. With regard to the training, it is not training on organic farming *per se*. For that you need continuous training. We concentrate on training in the field. Our agronomist is out there working with them all the time to provide training and on-the-spot problem solving. Then we have to do follow-up training on how to manage the group successfully on a one-man one-vote basis. They select their own leaders. They select their own management committee. In this regard they are independent. Most important is the attitude development training. It's not the technical part or the organic farming practice *per se*, but training attitudes and training the group members on how to manage themselves.

In order to make sure that everything is done right according to the framework or the kind of agreement, we have agronomists conduct internal auditing daily. Six days a week, 365 days a year, minus the weekend, one day per week, we have another independent internal auditing agronomist from the head office. In the interval of three to four months, we would conduct a kind of separate, independent auditing. If the finding of some agronomists and the agronomist from the head office is different, they have to sit in front of the committee to explain why. Before they can go out and do the internal auditing, all these people have to be trained and certified on HACCP, GLOBALGAP and to study American, European Union and Japanese organic farm principles. Each year we are certified by the companies SGS and BCS.

Although we started out as a very, very small company with big dreams, we have always operated a traceability system. We began with a manual traceability system about 15 or 16 years ago, but more recently, it has been upgraded to a bar coding system with a computerized control process. The system has been designed to meet the company's requirement to trace both backwards and forwards, accurately and efficiently. We are trying to develop it to operate in real time. Our customer can check in themselves, if they want to. However, it's not so easy to implement. For those kinds of product that can be easily bundled together, it is easy. However, for those that cannot be bundled together, you must decide on the packaging, the container, and then you can solve all the problems. The product can be traced back to a farm, a subplot, and it can trace forward to each pack if need be, but it is costly. Even although we have the capability to do it, we cannot trace each punnet back to the farm as yet, but within hours we can trace where the produce came from and who was the grower.

Intentionally, we organized two small core groups for the organic farming. The income from the organic asparagus farm compared to other produce in the province lead to our success and to fast expansion. Right now, we have 250 hectares of organic asparagus and are increasing daily. New farms are being added as they are certified. The new farms will be certified as transitional. In the beginning, our farms were certified by OMIC of Japan, but OMIC is not acceptable in the European Union, because they do not operate under ISO guidelines. So we changed to BCS. BSC can certify under European Union, Japanese as well as the American standard. All of our members, no matter whether they do conventional farming or organic farming are certified under

Option Two. Option Two means group certification. If anyone in the group fails, the whole group fails.

On the logistics of the chain, delivery and traceability, we have set up collection stations in the growing areas. Every group has its own collection station. Right after harvest they can walk from their farm to deliver their produce. Weighing, grading and everything, is done in front of them transparently. Delivery is carried out by refrigerated trucks from the collection station to the packing house every day. Labelling the produce starts at the station: crop codes and growers names are recorded.

Transportation. This is critical and quite costly, because you cannot mix the organic produce with the conventional produce in the refrigerated trucks. The container has to be separate and only used for organic produce. The truck has to be clean; the basket or container has to be cleaned every day. They immediately unload when they reach the packing house in different bays.

On the organic processing line, all the facilities have been certified by BCS. All the equipment and facilities have to be completely separate in order to prevent any mixing of the produce from the farms on the processing lines. Even the loading and unloading bays have to be separated, and operators, in our case, have different uniforms. Storage and packaging is the same thing. You have to have a different cool room for organic produce and conventional produce. Packaging is separated for the finished products. Everything has to be labelled clearly.

In the organic market, you need official approval to import to countries like the United Kingdom. You have to be approved before you can label it as organic produce. We have been approved and thus you will find our product on the shelves of the leading grocery chains in the United Kingdom. Even then, every shipment has to be accompanied with a fresh original certificate from the certifying body specifying the quantity shipped on that occasion, and this certificate must accompany the goods.

I believe we have no weak links in our supply chain, and I think we have the shortest possible chain. Supermarkets and modern retailers are not only going for quality or fair-trade, but for the cheapest price as well. To survive, the business must be really lean. You have to be a low-cost player. In our case, we have no waste. If, in our fresh line we have something that is not acceptable for our fresh line, we divert it. We have a good frozen line and we have good dehydrated lines to manage all the waste from the processing line. Eventually, we believe that in the near future, the tail will wag the dog.

So this is the core of our operation and of our supply chain, and we believe that we have one of the best. We have full control, and we can assure our consumer, our importer, and our retailers that we have the best-quality produce with the highest standard of food safety. Currently, our packing house is operating 24 hours a day. All the produce comes from our own growers under long-term contracts, but mind you, they are not tied up with us: they choose to be with us. They are independent, and every year we discuss price and bargain with them. So even if our company folds up tomorrow, they can carry on themselves independently.

DELEGATE: Are you also cooperating with other Thai exporters to Europe, because both sea and airfreight is expensive?

MR UATHAVEEKUL: Yes, we try to do that. We have organized an association of fresh produce operators. This includes not only the exporters, but every kind of operator in the fresh produce sector. We try to work together to get a lower cost for transport. In our case, we have to pay between £5–6 million for air freight alone. We ship out seven to ten times a day to various destinations in Europe, Japan, Australia, New Zealand and many other countries. The major problem is that there is not enough cargo space to go around. The demand for space is so great.

Performance and technological capacity in fresh produce supply chains: the balance between prescription and learning

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Abstract

The capability to innovate is crucial for individual or allied companies to be able to compete in international markets. However, in the international markets for fresh produce, we observe a tendency to prescribe and standardize technologies and practices through the implementation of quality standards and safety regulations. This entails a strong focus on the transfer of technological fixes accompanied by prescribed practices rather than the development of innovative and resilient supply chain configurations finding solutions tailored to specific conditions and constraints. This unintended consequence of voluntary regulatory systems operational in agrifood chains may constrain companies and producers active in export-oriented supply to dovetail their competitive strategies with the competencies and resources available in their local environment. This paper describes this dilemma for a selection of performance-related tasks in fresh produce chains: solving quality problems, managing safety risks, monitoring performance, and installing traceability. The paper discusses the extent to which current modalities in horticultural chains act as configurations for innovation or whether the rules and routines unintentionally hamper socially embedded innovation. The paper uses the observed paradox between prescription and learning at farm level to challenge contemporary management styles, channel governance and institutional modalities attached to quality and safety requirements in the trade of fresh produce.

Introduction

The quality and safety requirements in cross border supply chains for fresh produce have become more strict and rigid. This is related both to public regulation, such as the European General Food Law, and private voluntary regulatory systems, such as GLOBALGAP. Increasingly, the quality requirements not only address basic food safety issues, related to the actual product, but also incorporate environmental sustainability and social welfare matters in the production processes (Vellema *et al.*, 2006).

This paper starts from the observation that, in the international markets for fresh produce, there is a tendency to prescribe and standardize technologies and practices through the implementation of quality standards and safety regulations. The question addressed in this paper is how this trend impacts on innovative capacity on the upstream side of the supply chain, particularly for primary producers supplying fresh produce. The paper examines the balance between prescribed practices and local learning in a selection of tasks apparent in supply chains: solving quality problems, managing safety risks, monitoring performance, and installing traceability. When describing these "technical" tasks the paper shifts the focus from content towards procedural and

institutional aspects of managing performance in supply chains. It observes a paradoxical situation between prescribed uniformity in farm management practices on one hand and tailor-made solutions to complex performance problems embedded in mutual learning processes on the other. Examining the supply chain tasks from the perspective of whether they can be managed differently outlines an approach to establishing good performance in supply chains grounded in local capacities and transparent negotiations and interactions between chain actors.

Solving quality problems

The globalization of agrifood chains, in combination with increased attention to product quality and safety, has fostered prominent and widespread institutional changes in the trade of fresh produce. These include the rise of contractual arrangements in horticultural supply chains replacing purchase in (deregulated) spot markets (Reardon and Barret, 2000; Eaton and Shepherd 2001). Companies contracting out production have to find ways to establish quality in the fields managed and owned by independent farmers.

A study of contract farming of asparagus in the Philippines (Vellema, 2002; 2003) shows that market demand can induce hierarchical and prescriptive patterns of behaviour in the contracting company. Initially, the company contracting out asparagus production adopted a hybrid management style, leaving room for patterns of entrepreneurial, reciprocal and brokered relationships. However, complaints in the export market about declining quality levels induced a shift to an exclusive top-down approach. This coincided with clear indications of rising production costs, which encouraged the company to intervene more directly in the farming practices and to revise the management of labour intensive tasks such as weeding and harvesting. Obviously, this altered the nature of the contractual relationship leaving less autonomy to the growers. This may also be an indication that the growers did not feel comfortable with the institutional implication of the change in management style, which made them less of a partner in the business scheme.

Establishing quality in horticultural production systems is not an easy task; it depends on committed and skilful farm managers. In the contract farming case, farmers did not appreciate the change nature of the contractual relationship due to a shift to greater control by the company of tasks such as weeding and harvesting. Also the company realized that it was dependent on motivated growers and combined its shift to stricter on-farm supervision with farm management seminars inviting growers to partake in solving production puzzles. However, creating space for the farmers' diagnoses of the quality problem, an indicator of hybridity between prescription and learning, proved to be difficult. Market pressures reduced space for time-consuming mutual learning, for example through joint evaluations of trials, and induced immediate action leading to new farm management practices prescribed by the company. Some interviewed farmers mentioned that the quality problem was much more complex than the shift in farming practices suggested by the company. They wondered whether the new harvesting procedures prescribed by the company would really change the situation and thus solve the quality problem that threatened profitability of both growers and company. Moreover, the proposed shift from manual to chemical weeding, in response to rising

labour costs, was risky because of strict regulation on maximum residue limits in the export market. Nevertheless, the company favoured this trajectory, and tried to manage possible risks by taking farm management responsibilities out of the hands of growers, leading to a strong hierarchical relationship.

This case study shows how, in the case of contract farming, quality requirements in the end-markets had an effect on the working relationships between two partners in the supply chain. Although contract farming arrangements do not necessarily preclude mutual learning, fierce competition in the market for fresh asparagus did not leave much room for adopting flexible management styles to solve solving complex quality problems. Hence, the question remains; what kind of management styles and organizational procedures are best able to include different chain actors in solving complex quality and safety problems? In the next section, the Hazard Analysis and Critical Control Point (HACCP) procedure will be described to see how it manages food safety risks.

Managing risks

In the food industry, HACCP has been introduced to assure food safety (Fouayzi *et al.*, 2006; Soriano *et al.*, 2002). Visscher and Vellema (2007; Hambrecht *et al.*, 2005) analysed the evolution of the HACCP protocols with an interest in sustainability in commodity chains. They appreciate in HACCP the idea that problems can be managed through a process of self-control and monitoring and through clear procedures that encourage embedded learning and problem solving. Although the sustainability of the primary production process entails a less focused point of control, because it includes multiple dimensions (social, environmental and economic) and scales (field, farm, community), the procedural and institutional aspects of implementing HACCP can still inform the upscaling processes of monitoring quality and sustainability.

The original idea of a HACCP system was to encourage learning and monitoring by the organization itself. A central element of the HACCP approach is its reliance on the managerial and technological capacity of an individual organization to handle hazards or dangers. Accordingly, HACCP requires the presence of learning and correction capacity inside an individual company for achieving food safety objectives. In principle, it is up to the individual company to decide how to achieve these objectives, as long as the company is “in control”.

The latter appeared to be one of the major hurdles in implementing effective HACCP systems. Wilkinson and Wheelock (2004) observed the difficulty for companies to determine the significant hazards and the proper control points, which is the basis for a good HACCP system. Implementing HACCP appeared to be more complicated in the case of small- and medium-scale enterprises, connected in a layered supply chain.

To tackle the problems of scale and variety in food manufacturing, government and industry in the Netherlands developed standardized hygiene codes for different sectors in the food chain (VWA, 2005). These codes are officially approved by the government and define specific critical control points for individual products and supply chains; they are regularly revised. If a company complies with the code, it complies with the

law. These uniform and generic requirements were also meant to overcome difficulties in the governmental inspections of the HACCP system (De Sitter and van de Haar, 1998) and to ensure compliance with the criteria of the Global Food Safety Initiative. Consequently, the focus in managing food safety shifted from monitoring operational procedures inside the company to assessing the actual public health impact at the far end of the chain; e.g. setting a food safety objective specifying the level of the pathogen that can be consumed without an unacceptable impact on public health at the population level (Gorris, 2005).

The involvement of numerous small producers and processors in the mainstream supply chain of fresh fruit and vegetables suggests a parallel with unintended outcomes for small and medium enterprises in the food manufacturing industry: uniform and prescriptive food safety guidelines. Difficulties in meeting hard targets for food safety and quality undermined the credibility of the procedural verification of management systems based on the HACCP principles. Visscher and Vellema (2007) show that the interaction between the HACCP approach and public regulation resulted in a strong incorporation of the HACCP guidelines into generic regulations and laws on food safety, accompanied by the development of sector-specific hygiene codes.

The above suggests a shift from an autonomous HACCP approach, based on a selection of procedural principles guiding behaviour inside a company, to an integrated risk-based approach with more thorough control of potentially hazardous effects. The result is a shift from process guidelines to generic performance norms, with a stronger role for regulatory agencies and mandatory practices. The institutional implication is a change from decentralized forms of self control, combining self assessment and diagnosis with situation specific corrective measures, to a more integrated and centralized governance system, largely relying on uniform and expert-based practices. Yet, the original design of HACCP may still inspire a search for a feasible balance between these two modalities. Like in the contract farming case, the development of HACCP implementation also shows that specific managerial choices have been made in managing food safety risks, and the suggestion of this paper is to reflect the impact these choices have on the viability of working relationships in the chain. The next section elaborates on this dilemma by looking into the way performance is measured.

Monitoring performance

Private standards and certification procedures, like GLOBALGAP or BRC, play an increasingly important role in the cross-border trade of agricultural and food products. Usually, these voluntary regulatory systems are motivated by concerns and considerations in the OECD consumer markets about food safety and the environmental impact of agricultural production. These private standards introduced good agricultural standards, usually for specific product groups, such as fresh fruit and vegetables. The prescribed agricultural practices demonstrate an improvement direction to producers. However, the practice of monitoring and certification accompanying these standards may contradict the intended learning process. The implementation of performance standards in supply chains often goes together with outside expert assessment against preset indicators, using standardized procedures and tools to secure accountability and transparency (IDS, 1998). This may be a hindrance for learning in the field, because

producers and supporting services are tempted to pay most attention to following rules or complying to set guidelines rather than to finding tailor-made solutions to complex problems related to food safety, quality or sustainability.

Monitoring embedded processes of certification often serves the purpose of determining whether a specific producer or an association of producers complies with a given set of rules or standardized practices. The “measured performance” informs the decision whether to buy or not. In this sense, monitoring systems act as an “exclusive” system, capable of including or excluding producers from the market and providing traders and companies with a legitimate way of controlling the quality of products and production processes. The question is whether monitoring can be done in such a way that it both realizes accountability throughout the chain and enhances learning.

Jansen (2007) distinguishes two basic types of monitoring: compliance and result-based monitoring. The former is defined as checking whether the realized use of inputs, implementation of activities and production of outputs (i.e. products and services from activities, such as number of teachers hired) corresponds with planning (Binnendijk, 2000). The latter relates to measuring outcomes (i.e. improvement in performance of beneficiaries) and impacts (i.e. contribution to reaching goals) from activities and inputs (Kusek and Rist, 2004). The distinction between compliance and result-based monitoring relates to the level of control an individual or organization has over the subject of measurement or verification. Compliance monitoring deals with areas in which a practice or other intervention has a relatively high level of control and it can be used for measuring efficiency of a project. Result-based monitoring focuses on areas in which the outcomes of a certain practice or intervention is also dependent on external factors. Information on outcomes can be used to indicate the effectiveness of a practice or intervention at different scales in time, space and populations (Watson *et al.,* 2004). Accordingly, result-based indicators address complex technical or institutional processes, with no certain outcomes. Furthermore, there may be interdependencies and synergies producing the actual outcomes. This analytical complexity may offer an explanation for the common use of compliance indicators in monitoring processes in cross-border agrifood chains, which looks easier and more straightforward. Checking agreed-upon rules is relatively easy for auditors. These rules also provide farmers and processors with clear guidelines on how to adapt their practices into what certifiers consider as quality or sustainability. With compliance monitoring, however, it will be more difficult to install learning processes capacitating users – the subjects of monitoring – to cope with changes, and to diagnose and find solutions to persistent problems (Clay, 2005). Likewise, compliance monitoring may entail a loss of ownership, (Vogl *et al.,* 2005).

A combined approach to verification and learning may boil down to a monitoring system intended to track progress rather than check compliance with preset standards (Booth and Lucas, 2002). In this sense, indicators used in monitoring are carriers of information representing approximations of complex processes, events or developments. Their immediate measurable quality or value indicates a state of affairs of larger phenomenon (Guijt, 2000), which is particularly relevant for understanding performance in terms of sustainability. Accordingly, the recorded and documented information is subject to interpretation and therefore instrumental in learning processes.

The bias to compliance monitoring hampers building innovative capacity, which is seen as one of the crucial factors in ensuring a sustained impact on adaptive capacity of farmers to meet demands from the market and changes in their environment (Burns and Blowfield, 2000; Heemskerk and Wennink, 2004; Marsden and Smith, 2005).

Installing traceability

The previous section discusses a new mode of monitoring for establishing good, or better, agricultural practices. This discussion is also motivated by the concern that the bias to compliance may induce a sole preference to short supply chains, involving direct buying with preferred suppliers. This model contradicts with another reality in agrifood chains, which are layered and incorporate distributed producers and a variety of intermediary functions performed by different actors. A challenge for agribusiness and food industries is to find managerial strategies and business model that fit this reality. In this section we use the task of installing traceability to elaborate on this challenge.

Ensuring traceability has become an important element in cross-border trade, asked for by traders and retailers and recently anchored in the European General Food Law. The technologies used for this purpose are often based on applications of information technologies used in OECD countries: the use of barcodes and more recently, the introduction of RFID (Radio Frequency Identification) tags. The use of these technologies is closely linked with the issue of liability in case of problems with the safety of food products: it allows tracing the responsible actor. The trend in cross-border supply chains is to prescribe these technological fixes, as a condition for accessing markets and thus as a mean for arranging liability. However, how does this serve the aim of continuous improvement, which is related to installing feed back mechanisms that encourage learning and selection of the right corrective measures?

The way traceability is arranged in fresh produce supply chains often reflects strong dependence on perfect conditions and reliable, consistent chain relationships, which may fail under the persistent constraints smallholder producers operate under. The intervention logic reflects a bias to constructing a new environment, using fixed technological packages, rather than using socially embedded business models starting from constraints of low-income farmers for reengineering current practices. The so-called Bottom of the Pyramid approach (Prahalad, 2006; Prahalad and Hart, 2002), challenges this mode of operation by proposing to perceive producers in the upstream part of the chain as customers for tailor-made technologies and services rather than as passive adapters of fixed technological recipes. This argument places traceability in a more general strategy for making information accessible to low-income farmers and consequently changes the conditions for information exchange and feed back in supply chains.

A case study in the Indian soy chain (Annamalai and Rao, 2003) shows how a trading house used information technology to reengineer procurement practices, involving the activities of aggregation of volumes and quality control that can also be found in fresh produce supply chains. In this scheme, a local farmer operates an information centre linked to the internet in his village. This centre was linked to numerous transactions in the chain such as weighing, grading, or pricing. The access to information on

technology and markets supported the integration of farmers into the supply chain and resulted in a sustainable commercial engagement by providing a viable procurement practice. The viability was related to the opportunities the information centre offered for obtaining knowledge about weather conditions, for articulating crop-specific interventions the trading house might be able to provide, and for communicating information, making the price–quality relationship transparent. The trading house used the philosophy of modular increments acknowledging the specific conditions in the villages and the trading system. In this sense, it was reengineering rather than reconstructing procurement practices, and, consequently opened the opportunity of dovetailing technological interventions with the needs of farmers. This approach adopted in the Indian soybean chain built new networks and created trust among the actors in the commodity chain, and, accordingly, embedded innovation in new business models and management strategies (Vellema and Danse, 2007). It also suggests that promoting socially-embedded technological services improves the nature of the relationships between actors in the chain and, consequently, encourages transparent transactions between commercial partners.

Conclusions

The performance-related tasks discussed in the previous sections show that the demand for safety and quality in fresh produce supply chains creates an institutional paradox between prescription and learning. The paper suggests that in managing performance in fresh produce supply chains, the institutional arrangements either tend to disperse responsibilities or to concentrate them (Booth and Lucas, 2002). In international food trade, responsibilities for performance are increasingly decentralized under the umbrella of, for example, voluntary regulatory systems or contract farming arrangements. Simultaneously, however, buyers want to ensure compliance with performance requirements through strict and hierarchical modes of control. For example, a buying company may wish to monitor generic performance criteria to enhance its public accountability, and equally relies, for establishing quality, on the capacity of a contracted farmers' group to use information to adapt generic practices to specific agro-ecological and social conditions. This paper suggests that the institutional paradox is not a problem; a certain hybridity may even enhance the viability of cooperation as well as technological capacity in a supply chain. It becomes problematic when the institutional outcome of quality requirements in cross-border agrifood chains is biased towards one side of the paradox, leading to unidirectional technology transfer and the adoption of prescribed practices. This trend may contrast with the development of learning and innovative capacity in the upstream side of supply chains for fresh produce.

Thus, the question raised in this paper is whether a more hybrid structure, including different institutional modalities, may enhance viability of fresh produce chains as well as their innovative capacity. Hence, the managerial choice is not limited to selecting one exclusive modality; it may be more effective to find the right blend and to take the opportunity to build on existing social practices. This perspective proposes an open-ended view to tailoring solutions to local conditions and avoids generic solutions to complex performance problems. It also puts forward a result-based approach to monitoring; informing embedded learning processes, possibly in combination with a risk-based certification scheme looking into the learning and management capacities of

independent firms or (associated) producers. Finally, the paper introduced the idea of a new model for linking compliance with traceability requirements with offering technological innovations to low-income purchasers on the upstream side of supply chains.

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GAP, market access, farmers and field realities: making the connection through better farmer education in integrated production and pest management[29]

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Abstract

Globalization and freer trade have increased trade in fresh vegetables in Asia in recent years. Consumer demands and emergence of supermarkets are driving demands for quality assurances for food safety. Governments in Asia have initiated programmes to promote good agricultural practices (GAP) among its millions of smallholder fresh vegetable farmers producing for both domestic and export markets. Nevertheless, in many parts of Asia, farmers continue to rely heavily on inputs of agrochemicals, particularly pesticides, to produce their horticultural crops. Results in terms of real on-farm reduction of agrochemicals have so far been limited. Governments increasingly realize that real change has to originate from farmers making better decisions on what crop production and protection strategies to use to limit inputs of pesticides. GAP programmes stand to benefit from strengthening farmer education efforts and better farmer access to novel options for pest management. Vice versa, farmers trained in the application of integrated production and pest management practices through government farmer education programmes in Asia stand to gain from better functional linkages to GAP programmes for better market access. This presentation aims to explore such functional linkages for real on-farm reductions in the use of agrochemicals as to induce farmers to produce safer fresh vegetables for both domestic and export markets.

I am going to talk about good agriculture programmes (GAPs), market access, farmers and field realities here in Asia, and try to make some suggestions for improvement through better education and better integration of production and pest management.

We have had many presentations over the last few days demonstrating the huge impact that globalization has had on the fresh produce industry. Small-scale farmers in Thailand, the Philippines and elsewhere in the region are basically being pushed out of production as a result of cheap imports from the People's Republic of China. Furthermore, the influence of the retail sector is having a big impact on food safety systems. Food safety concerns, quality assurance systems and GAP protocols are being put in place all around the region.

Integrated pest management (IPM) is the standard crop protection policy throughout much of Asia these days. Pesticide-regulated frameworks have been strengthened and

[29] The following paper is an edited transcript of a presentation delivered to the International Symposium on Fresh Produce Supply Chain Management

residue analysis facilities are being developed. National IPM farmer education programmes are in place to support quality assurance. At the same time, new options for pest management are becoming increasingly available and utilized. This includes biocontrol options, biopesticides, better use of introduced parasitoids and natural enemies and, increasingly, improved seed technology. Yet the majority of small-scale farmers continue to rely exclusively on the use of toxic pesticides. In Bangladesh, for example, farmers can spray up to 80 times a season to control fruit and shoot borer.

Farmer pesticide poisoning in Asia is widespread and generally under-reported. Farmers don't go to hospitals when they fall sick from pesticide poisoning. Widespread environmental pollution and the adverse impact of chemicals on the natural resources are raising concerns about food safety in Asia. This is an issue for domestic consumers, but it also poses serious trade impediments for those who want to export. In Asia, the consumption of pesticides is huge and rising. On an annual basis, 790 000 tonnes of pesticides are applied worth an estimated US$8.3 billion.

Cambodia is a country that has absolutely no capacity and capability to control imports. It's a place for dumping. Instructions on pesticides are often in foreign languages: products are dumped on the market with Vietnamese and Thai labels. Neither merchants nor farmers can read the labels, if they can read at all. There is limited training and certification of pesticide merchants and small traders, and farmers have little knowledge on pest management, which brings us to the obvious conclusion that throughout much of Asia, particularly in countries like the Lao People's Democratic Republic and Cambodia, you cannot speak of safe use of pesticides.

That provides the rationale for why FAO is implementing programmes to train farmers to reduce the on-farm use of pesticides in this part of Asia. The programme seeks to address the rampant misuse and overuse of pesticides. The programme is focused on the Greater Mekong Sub-Region that includes Viet Nam, the Lao People's Democratic Republic, Cambodia, Thailand and the southern part of the People's Republic of China. The task of the programme is to provide technical support to governments and associated public and private sector partners in order to develop strong vegetable training programmes for farmers. These programmes carry out applied research extension and farmer education. They focus on the development and application of integrated pest management practices for fresh vegetable crops. The standard education approach we use in our work is based on the farmer field school approach.

The primary learning approach that we use in our work in educating farmers is schools without walls. All training happens directly in the field. Farmers learn about ecology and pest management from seed to harvest. We generally use a group approach aimed at community development, finding better ways to organize farmers around issues of plant protection and production. New schools aim to help farmers produce safer vegetables and reduce the inputs of pesticides. Typically there are no yield reductions and farmers achieve higher profits.

The governing principle of the farmer field school is to grow a healthy crop. If a farmer knows how to grow a healthy crop, he can do away with most of his pesticides. Regular

field monitoring is the key: a farmer needs to go into the field and observe what the threats are. Optimal use of conservation and natural biocontrol is encouraged.

As farmers need to make daily decisions on their farm, the farmer needs to be an expert, and that means education. All training uses adult education approaches: learning by discovery, learning through experimentation and active fieldwork. For example, throughout much of Asia, diamond-backed moth is a major trigger for pesticide applications. Conventionally, farmers spray about 10 to 15 times per season. If you apply IPM, or if you use classical biocontrol, there is no need at all for toxic pesticides and, at times, maybe one or two applications of biopesticides.

In relation to GAP, and particularly GLOBALGAP, these programmes are very biased towards pesticide applications. In its introduction section one can read that "GLOBALGAP is a means of incorporating IPM and integrated crop management (ICM) practices within the framework of commercial agricultural production. Adoption of IPM and ICM, is regarded by GLOBALGAP members as essential for the long-term improvement and sustainability of agricultural production". So GAP is basically about avoiding pesticide residues. Farmers need to know, therefore, what to do and how to do it. This requires training and access to inputs such as pest-resistant varieties and biopesticides. Yet, if we look at GLOBALGAP in terms of the crop protection sections, of the 64 control points, only two refer to IPM. When we look at these two control points, they are highly vague and flexible, and they are not a major must. The basic point I am making here is that GLOBALGAP is, in our opinion, not looking closely enough at the alternatives that are available to farmers to avoid the use of pesticides.

ASEAN GAP is a newer initiative. Its purpose is to develop standards and harmonize GAP programmes across the ASEAN region. It is not a certification system, but it does impose standards and it does seek to harmonize the many GAP standards that now exist within the region. The scope covers production, harvesting, farm purchasing and post-harvest handling for fresh fruit and vegetables. If we look at the IPM quality control points, there are basically four sections in the ASEAN GAP. It deals with food safety, environmental management, workers' welfare, occupational health and safety, and product quality. Within ASEAN GAP there is a lot more attention to the alternatives for crop protection.

Finally, I want to explore some functional linkages between national GAP and IPM farmer education programmes. Of course, this distinction is a bit dubious, because basically IPM programmes are GAP programmes. It is important to realize that GAP is taking over as a major mainstream investment by governments setting standards and forgetting that they actually have IPM programmes in place that they need to connect to and make use of. Some examples of where these connections are being used: in the southern part of the People's Republic of China, vegetable farmers are actively connected to green food marketing chains. Viet Nam is investing heavily in safe vegetable programmes and actually using IPM farmer field school models as training models in their programmes. In Thailand, the experience is also very interesting in terms of how IPM farmers were connected to GAP schemes and to the organic Royal Project marketing chain.

There are a lot of opportunities for GAP and IPM programmes to be integrated in Asia. There are opportunities for organized communities of IPM farmers who know how to reduce on-farm use of pesticides to apply for GAP certification. For these farming communities, there is improved market access, but the risk nevertheless remains of most small-scale farmers becoming increasingly marginalized.

The challenges: do farmers implement GAP for export or for domestic markets? What are you really aiming at: an export or domestic market? Should your GAP standards be different and your programmes different in terms of how to address these issues?

Quality control of farmer education is a huge problem. We are seeing that in Thailand. We are seeing that in Viet Nam. Training often resorts back to filling out forms instead of going into the field to learn actively how to reduce pesticides.

There is also a paradox. In these difficult times of very rapid change in the vegetable industry, farmers need to be innovative and creative, yet, at the same time, GAP seems to be pushing farmers to follow instructions and protocols. The challenge is for curriculum development. Food safety, post-harvest techniques, record keeping: these are modules that still have to be developed and clearly linked with IPM programmes.

Setting realistic targets. I want to close with that. You cannot train millions and millions of farmers in GAP or IPM overnight. In Thailand, the government is learning the lesson and trying to make sure that there is a better training approach to GAP.

DELEGATE: I am thinking about your last point. Talking to business people, farmer field schools are considered to be a very expensive way of educating farmers. Can you speculate how supply chains may offer an organizational approach in which you can encourage learning and an exchange of information for which the actors in the supply chain are prepared to pay?

MR KETELAAR: It is important to realize that most GAP protocols are very much focused on withdrawal periods. You stop spraying for say two weeks before harvest. Never mind what happens before that! It is important to ensure that in GAP protocols you pay attention to what happens throughout the season and to make sure that there are incentives for farmers to take the reduction of pesticides seriously.

DELEGATE: What I wish to say is not a question, but an observation. At the beginning of the week, Peter Batt described that we are moving from a supply push to changes which are reflected by demand pull. This project is trying to encourage the small farmers to improve their production practices. Is this not a supply push? Hence I was wondering why there is not more focus on training the consumers, because if we tell them what poisons they are eating, that will change their perception and we will get the demand pull. Then these small farmers will have a much stronger incentive to produce cleaner and safer produce.

MR KETELAAR: Good point. As a future part of our programme, public awareness campaigns will definitely play a major role. However, I don’t think it should be the role of FAO; it should be done in partnership with others. For example, the Pesticide Action

Network is extremely efficient and with a huge outreach here in Asia and at a global level.

DELEGATE: I would like to clarify a point. We have just heard some of the problems that arise from following GLOBALGAP and a prescription approach and the problems that arise from that; perhaps even a greater reliance on pesticides. Yet, we heard from Tesco Lotus that the pesticide residues in their suppliers' base have gone down in terms of their detection from 11 percent to 2 percent to 0 percent over the last three years. Is there not some message in there between the sort of retail pull and what is happening with those contracted suppliers, and what is happening in the rest of the market?

MR KETELAAR: Most definitely. I personally encourage collaboration with the private sector. We have initiatives going on in various parts of the world to look at more effective and efficient ways of engaging with the private sector. It is always a tricky sector to work with though, given that it is so dominated by the pesticide industry. There are a lot of lessons to be learned in Thailand, for example, where very successful initiatives have worked under contract farming conditions to reduce the on-farm use of pesticides.

Strengthening the capacity of farmers' groups to enhance quality through organic certification: a case study of cashew nut producers in Flores, East Nusa Tenggara, Indonesia

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Abstract

*Cashew is a major source of income for most farmers in Flores, an island of East Nusa Tenggara Province of Indonesia. Most of the cashew are grown organically and sold in shell (*gelondongan*) to traders who frequent the farmers' villages. The price of cashew in shell is considerably lower than the price for nuts in either a fresh or processed form. With the aim of enhancing the competitiveness of selected farmers' groups and local producers through value adding, two international non-government organizations (NGOs), in collaboration with two local NGOs embarked on a project to certify selected farmers' groups in Flores for organics. The project focused on the organic certification process, as managed by the farmer group themselves, and capacity building in terms of collective marketing and cashew processing. The paper describes how VECO Indonesia, a Belgium NGO and Swisscontact, a private sector-funded Swiss development agency, collaborated with two Indonesian NGOs – Bangwita and YMTM – to enhance the capacity of selected farmers' groups to add value to their produce. While not without its share of problems, the project led to an enhanced understanding by the farmers and the NGOs of the certification process and the required documentation. More importantly all four participating farmers' groups received organic certification in accordance with standards from the American National Organic Programme (NOP), the European Union and Bio Suisse (Switzerland). An added outcome of the project was that farmers' groups became more aware of sustainable land management practices. The market-linking process is still a challenge that the project collaborators have to deal with. Lessons learned, both technical and institutional, now serve as a basis for planning future activities.*

Introduction

Organic farming is growing worldwide. The total land area under certified production has reached 25 million hectares (Gier, 2004). In 2003, worldwide sales of organic products reached US$23 billion. The world's biggest markets for organic products are the United States of America (US$11–13 billion) and Europe (US$10–11 billion). Britain's largest trader in organic products estimates that the market will grow to US$100 billion within the next ten years, with most of this growth taking place in the United States of America, Europe and Japan.

For export, organic certification adds a great deal of value (Scialabba and Hattam, 2002). Organic certification not only provides consumers with a guarantee of quality, but it also gives farmers the opportunity to obtain premium prices. However, most consumers will pay a premium only to a certain point. As the premium increases, the

number of consumers willing to pay decreases, mainly because the conventional commodity is always available as a substitute.

In Indonesia, the market for organic products is growing too, especially in major cities. Indonesia's main organic products are rice, fruit and vegetables, coffee, cashew nuts, spices, coconut oil and shrimp. According to Prawoto (2005), organic coffee, cashew nuts and shrimp from Indonesia are exported to Europe, the United States of America and Japan.

The majority of Indonesia's cashew is produced on the island of Flores in East Nusa Tenggara province. Based on the area, the province of East Nusa Tenggara is the largest area for cashew nut production, with 23 percent of the country's area under cashew (Dipokusumo, 2004). In the districts of East Flores, Sikka, Ngada, Ende and Manggarai, the total land under cashew nut production has reached around 90 570 hectares. The cashew nuts produced are typically sold unprocessed and ungraded to processors from India and local traders. The farmers usually just dry the nuts on the ground for a short period (about one day) and do not segregate the nuts by size.

This paper will discuss the experience of developing organic cashew nut production in four villages in Flores based on the joint project between VECO Indonesia and Swisscontact. Flores is a natural area for organic production as the farmers do not use chemical fertilizers or pesticides. Much of the discussion in this paper is drawn from the results of the project over the years 2005 and 2006.

Objectives

The project aimed to help farmers optimize the potential for cashew nuts in Flores through organic certification while maintaining a low input system of production. The specific objective was to create a learning process for farmers, VECO Indonesia and Swisscontact through: (i) arranging organic certification of cashew nuts through farmers' groups; (ii) introducing internal control systems (ICS); (iii) building the capacity of farmers' groups to market organic cashew nuts; and (iv) building the capacity of farmers in processing cashew nuts to increase the added value. Organic certification was viewed not only as a means of securing better markets, but also as a means to improve product quality in the long term.

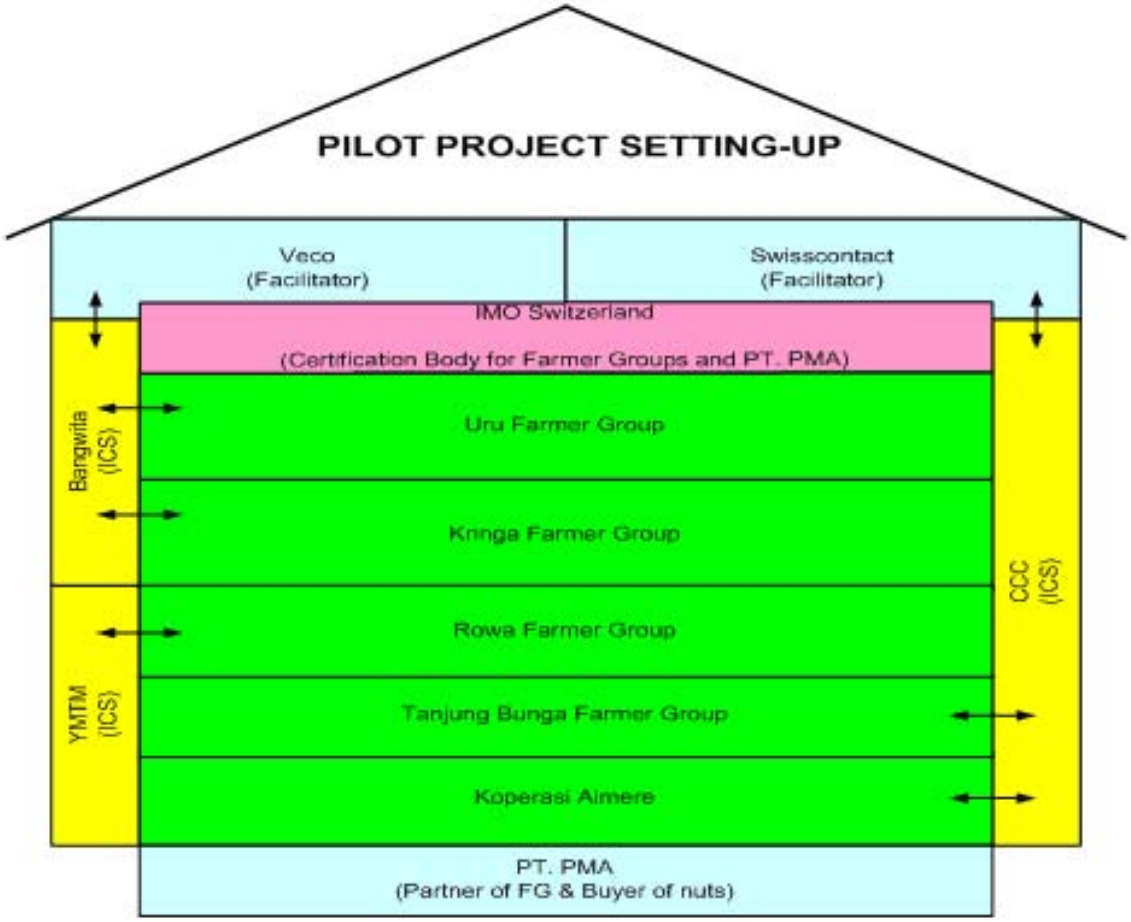
Project methodology

Project design

The multistakeholder organic cashew nut certification project officially began in 2005. It involved farmers' groups, local NGOs, private sector traders, Swisscontact and VECO Indonesia. The local NGOs involved were YMTM and Bangwita, VECO Indonesia partners with much experience on farmer empowerment.

The organic certification process was undertaken in cooperation with the Swiss-based International Marketecology (IMO). The set up of the pilot project between VECO Indonesia, Swisscontact and IMO, and various other institutions such as PT PMA, NGOs and farmers' groups in Flores is shown in Figure 1.

Figure 1: Setup of the pilot project for organic certification of cashew nuts



The roles of each of the stakeholders in this project were as follows:

- the farmers' groups involved were from four locations (Rowa, Ilin Medo, Kringa and Ilepadung);
- IMO is an international institution that provided international certification according to Regulation (EEC) No 2092/91 for organic production;
- the Consulting Cashew Centre (CCC) assisted in implementing internal control systems (ICS), especially in Ilepadung, where no local NGO was involved;
- PT PMA, a private company, purchased the farmers' organic cashew nuts;
- local NGOs (YMTM and Bangwita) provided support to the farmers' groups in the form of technical assistance in sustainable agriculture and capacity building. In the organic certification process, YMTM and Bangwita served as the ICS provider (local ICS coordinator), facilitating coordination of the local inspectors in documenting and monitoring processes in the field;
- VECO Indonesia and Swisscontact facilitated and supported project implementation as well as forged links or networks with all stakeholders, including traders and the IMO.

Selection of the project location
The project covered four villages in three districts of Flores, namely: Rowa (Ngada district), Kringa and Ilin Medo (Sikka district) and Ilepadung (Flores Timur district). These locations were selected on the basis of the potential for organic cashew nut production as a result of; (i) a preassessment study which determined the potential for the development of organic cashew nuts in Flores; and (ii) the PT PMA study in 2004 which explored the potential and challenges of the cashew nut and vanilla business in five districts in Flores.

Project stages
In keeping with its objectives, the project involved several stages of activity:

Selection and verification of farmers' groups: Based on the results of the preassessment of the risk of contamination (fertilizer, pesticide and surrounding lands), four villages were selected as suitable for involvement in the pilot project. From these four villages, a total of 561 farmers were involved.

Assessment: A joint team from IMO, YMTM, Bangwita, Swisscontact and VECO Indonesia conducted a field assessment of the selected locations. Results indicated that the land in Flores was in reasonable condition for the cultivation of organic cashew. The farming systems developed by the farmers typically feature low external inputs. Chemical fertilizers and pesticides were not used. However, the assessment also indicated that there were no existing farmers' groups capable of providing continuous internal control for the development of organic farming enterprises. For this reason, the need arose to strengthen farmers' capacity to undertake internal control as required by an internal control system (ICS).

Selection of local inspectors (local ICS): In the organic certification process, at the farmer group level, there was a need for an internal system to be set up that functions as a documented control system. The ICS is more than just a "control system", because ICS is an overall quality management system for the farmers' groups. ICS is a must if organic products are to meet the standards required for organic certification.

Local inspectors were recommended by the groups and they were selected jointly by YMTM, Bangwita, Swisscontact and VECO Indonesia. Most of those selected as local inspectors were farmer cadres with field experience and knowledge of organic farming.

ICS training: To introduce ICS and its role in the organic certification process, ICS training was given for the first time in October 2004, facilitated directly by IMO. Representatives of the farmers' groups, ICS providers (YMTM and Bangwita) and local government participated in the training. The level of participation and motivation of the training participants were found sufficient enough to begin developing internal organic standards for cashew nuts produced in Flores based on the IFOAM (International Federation of Organic Agriculture Movements) standards used by IMO.
Preinspection by local inspectors: A preliminary inspection was carried out by local inspectors together with the ICS provider to initiate implementation of the ICS. This stage included awareness-raising for farmers on the benefits of organic farming and organic certification. Farmer members of organic groups were involved as they needed

to give their approval of the contract made by the group members, internal inspectors and the coordinator (ICS provider).

The local inspectors inspected the lands of all group members. The resultant data was then cross-checked by the external inspector. During the inspection process, the local inspector also offered advice on the technical aspects of organic soil management and raised farmers' awareness of the benefits of organic soil management.

International inspection by IMO: The internal inspections by the local inspectors were followed up by international inspections by IMO in May and June 2005. The aim was to verify the data and evaluate the performance of the ICS providers and local inspectors. On the basis of having met the standards, the cashew nut farmers were awarded international organic certification. These certificates are owned by the farmers' groups.

Building a marketing network: From the outset, Swisscontact and VECO Indonesia had agreed that the organic cashew nuts produced by the project would be purchased by PT PMA. However, these two organizations were also actively networking with several other Indonesian and foreign traders and buyers via e-mail and direct contact. The aim was to build a network of potential buyers for the long-term marketing of organic cashew nuts.

Monitoring and evaluation: To determine progress towards the project outcomes, regular monitoring and evaluation was carried out by VECO Indonesia and Swisscontact programme officers. This involved undertaking field visits to the farmers, the ICS providers and local inspectors, as well as intensive meetings between VECO Indonesia and Swisscontact. The aim was to identify and discuss progress and problems arising in the field to improve the project further.

As organic cashew certification was a first for VECO Indonesia, Swisscontact, the local NGOs and farmers in Flores, an in-depth evaluation was made at the end of the first year to reflect on the challenges faced. This self-reflection involved all project stakeholders. The results of the self-reflection were used as inputs for the project's planning for the second year.

Results

The role of the ICS in the organic certification process

The organic certification process requires a quality control mechanism to ensure that farming practices, products and processes are organic. In the case of this project, a control system known as the Internal Control System (ICS) was introduced and this was implemented by IMO. Control processes were implemented on a regular basis to assess whether the organic cashew nut production processes in the field met the standards and were properly documented.

From the four farmers' groups, 31 local inspectors were selected to perform the internal control, broken down as follows: ten from Rowa, eight from Ilin Medo, six from Kringa and seven from Ilepadung. In terms of documenting the local inspection activity,

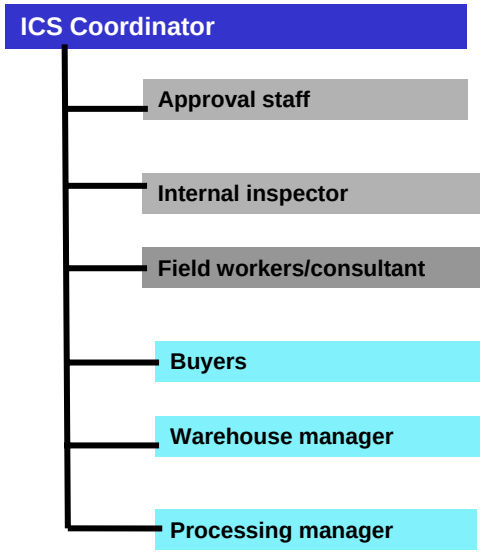
YMTM and Bangwita helped the local inspectors, as ICS providers, to remind the farmers to make detailed records.

In keeping with the principles of ICS, the roles and responsibilities undertaken by the internal inspectors in the process of organic certification for cashew nuts are defined as follows:

- plan inspection visits to each location;
- prepare or inform farmers of inspection dates;
- ensure that all relevant ICS documents on the farmers (from the ICS manager) are available for inspection;
- ensure that all relevant forms are available for inspection;
- arrange transport, for example for field visits (or the ICS coordinator does this);
- perform inspections of the group members' land;
- report inspection findings to the ICS provider for documentation.

The ICS work structure is illustrated in Figure 2.

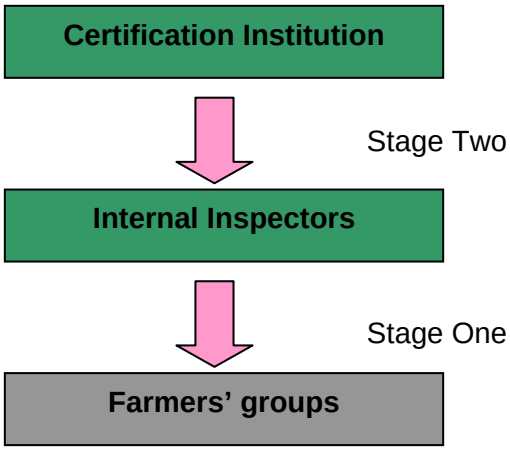
Figure 2: ICS work structure



The ICS control mechanism for this project involved two stages. Stage One is the internal inspection by local inspectors coordinated by the ICS provider. This stage involves the registration of organic cashew nut farmers, gathering data on land area, number of trees, estimated total production and how organic the land is in accordance with the standard set by IMO. The results of this internal inspection were then sent to IMO for verification. Stage Two involved a field inspection by IMO to verify the information and data gathered by the local inspectors. If they qualify, based on the results of this inspection, IMO will issue organic certification to the farmer group, along with a list of the names of the members of the group that has been registered. If they do

not qualify, they do not get the certificate. However, reinspection is still an opportunity. The ICS control mechanism is illustrated in Figure 3 below.

Figure 3: ICS control mechanism



The role of farmers' groups in the development of organic cashew nuts

The project partners worked through farmers' groups to attain the objectives of enabling farmers to produce cashew nuts with an organic certification, to implement the ICS, to minimize inspection and certification costs by sharing the costs, and to develop collective trading to improve the farmers' bargaining power. Farmers' groups play a key role in the organic certification process. Moreover, certificates are held by the smallholders' groups, not by individual farmers.

Each of the four farmers' groups have their own respective administrative structures and rules. Each of the groups was further divided into three or four subgroups based on geographic location or administrative boundaries. From each of these subgroups, one or two members were chosen to be local inspectors (local ICS), whose role was to undertake the documentation and to control organic farmers in line with the ICS work system.

To build the capacity of the farmers' groups in the institutional and technical aspects of production, training and peer visits were conducted. The training provided included institutional strengthening of groups (including group dynamics, farming analysis, etc.), management and processing of organic cashew nuts (including grading, sorting, drying and storage), and processing cashew into shelled cashew nuts.

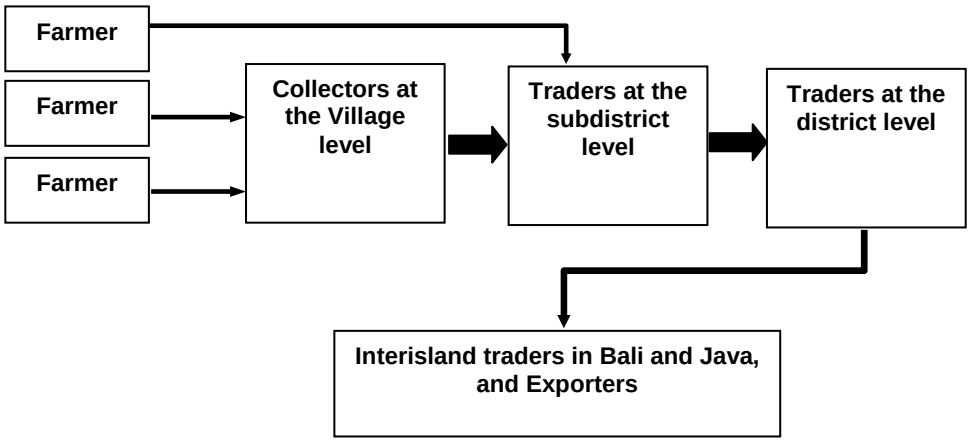
The Flores cashew nut marketing chains: conventional versus organic chain

The marketing chain for unprocessed cashew nuts in Flores generally involves four actors: farmers (producers), collectors, traders at the district level, and buyers from India who provide the links to the international market. Specifically, the actors of this conventional chain are:

- Collectors at the village level (individuals);

- Traders at the subdistrict level;
- Traders at the district level;
- Interisland and interdistrict traders in Flores;
- Exporters in Flores and Surabaya (Figure 4).

Figure 4: The marketing flow of cashew nuts in Flores



Source: Gamper (2005)

The organic cashew nut marketing chain developed by this project consists of the farmers, PT PMA/CCC and Flores Farm. According to Wheatley *et al.* (2006), this chain is separate and different from the conventional marketing chain. In 2005, the first year's sales of organic cashew nuts amounted to 60 tonnes. However, exports of conventional cashew nuts from Flores were estimated at 70 000 tonnes.

The organic marketing chain was developed for two main reasons. Organic certification will add value and provide a higher price compared to the unprocessed cashew nut. Furthermore, collective marketing was considered to provide greater returns to farmers. However, the organic chain requires certification, and without it, little or no price premiums will be achieved. The price premiums achieved support the capacity building of farmers.

Price of cashew nuts

The price of unprocessed cashew nuts fluctuates, depending upon market trends. The price per kilogram of unprocessed cashew nuts purchased from farmers ranges between Rp5 000 and Rp6 000. There is a downward year-on-year trend in the price of unprocessed cashew nuts. Collectors in the villages pay cash for unprocessed cashew nuts. Some employ a system known as *ijon*, where the farmer receives the money before the harvest. The long cashew nut marketing chain means that farmers receive a low price.

According to Scialabba and Hattam (2002), price premiums compensate farmers for the additional handling expenses and administrative, inspection and certification fees. The premium price was calculated to cover the cost of certification as well as the local ICS fee. A price premium was also given to maintain the sustainability of organic marketing.

The premium prices per kilogram received for the organic cashew nuts from the project in the first two years of the project are described as follows:

The first year (2005). For the first year, PT PMA was the buyer agreed for the project. The price at the farmer level was Rp7 500 per kg but PT PMA agreed to buy at Rp8 200 per kg. The additional benefit of Rp700 per kg was to be used to pay for the cost of certification in the subsequent year, ICS and sacks.

The second year (2006). After PT PMA resigned from the project, PT Big Tree Farm was commissioned to be the buyer. For the Ilepadung group, the first year premium price of Rp8 200 applied, but for the Uru, Kringa and Rowa groups, the price premium was calculated in a different way.

In Uru, Kringa and Rowa, as the price at the farm level was Rp6 800 per kg, PT Big Tree Farm decided to pay Rp7 500 per kg. These three groups received a lower price than the group in Ilepadung because the quality of the cashew nuts they produced was inferior.

Discussion

Based on these two years of experience, there are a number of points that merit discussion. This discussion is important for monitoring project progress and for the basis of improvements to the project or similar projects in the future.

ICS and certification

In terms of capacity, the local inspectors (local ICS) are fairly well equipped to perform their roles in accordance with the standards set by IMO. Organic certification was issued to farmers' groups. This project is the first one in Indonesia to have introduced international organic certification for farmers' groups. Furthermore, all four farmers' groups obtained certification within one year (Gamper, 2005).

However, as far as coordination is concerned, the local inspectors cannot perform their roles effectively if the ICS providers are not properly coordinating the implementation of internal inspections by the local inspectors, as required. This happened during the first year of project implementation to the farmer group in Kringa. The ICS provider Bangwita failed to coordinate local inspections properly and as a result, the internal inspection was not executed to IMO standards. As a consequence, the Kringa farmers' group did not receive a recommendation for organic certification at the same time as the other groups and had to undergo a second round of inspection. It was only when IMO performed a reinspection that this group met the standards and eventually received organic certification.

The role of the farmers' groups

The achievements of the farmers' groups in this project are quite significant. They were able to participate in an organic certification project, which included implementation of internal control. Gamper (2005) cited as one of the project's achievements, that the four farmers' groups in Flores that had been trained in setting up ICS had passed inspection by the international certification institution, IMO.

The value being increasingly placed on environmentally and socially beneficial production and consumption supports the entry of small farmers in developing countries into the global market (Crucefix, 1998). However, much depends on the capacities and responsiveness of the farmer groups (Manalili, 2003). Unfortunately, not all the farmers' groups participating in this project were strong. This meant that each farmer group had to strengthen its members' capacities in cashew nut marketing. As an example, not all farmers documented their activities as a matter of routine. In fact, this is one of the key lessons learned from the development of organic farming in developing countries. In Uganda, organic cotton exporters found that they had to pay a member of staff to ensure proper documentation was kept (Crucefix, 1998). In this project, although the role of the local NGOs included assisting the farmers with documentation, eventually, the farmers' groups must be able to do this for themselves.

In the first year of the project, the farmers received no training on sorting, grading and processing. As a consequence, the farmers did not pay enough attention to product quality. At the end of the first year and in the second year, the farmers started receiving training in processing (shelling unprocessed cashew nuts). The training was done mainly with the groups in Ngada and Sikka districts, as the farmer group in Ilepadung were already well skilled even before the project began. The three groups are currently receiving training in processing. One particular processing aspect where they still need to build their skills is shelling. Normally, shelling around 1–2 kg of cashew nuts takes a whole day. As a comparison, the Ilepadung group can normally shell 5 kg of nuts a day. A higher rate of splitting nuts shortens the storage time, as well as the time it needs before the nuts reach the market.

Marketing chain and its actors

All the stakeholders in this project are new to the marketing of organic cashew nuts. In the first year, a marketing problem was encountered when PT PMA (the sole buyer) failed to honour its commitment to purchase the organic cashew nuts produced by the farmers. As a result of PT PMA pulling out of the project, the plan to make the CCC the cashew nut processing centre failed to get off the ground. This had a devastating effect on the marketing of the farmers' products.

The unprocessed organic cashew nut market was unable to absorb the entire production. Furthermore, the process market could not be targeted due to the limitations of the buyer to process the unprocessed nuts into grade A shelled nuts. Of the four farmers' groups, only the group in Ilepadung had the skills to produce shelled nuts.

This first year's experience was an important lesson for all involved in this project. The project is now exploring possibilities with other reliable buyers for organic cashew nuts. The project explored market opportunities such as Australia, ACHAL (India), Flores Farm (Germany) and Bali (Big Tree Farm). All showed some interest, however, none of them entered into a contract, except the Big Tree Farm.

Price

In the first year, because the partnership with PT PMA and CCC did not function as planned, the farmers did not receive the anticipated profits from the sale of premium organic cashew nuts. The farmers' group in Ilepadung sold their organic cashew nuts to

CCC. Unfortunately, CCC got into difficulties as a result of which the farmers in Ilepadung suffered some financial loss. The non-functioning of CCC also resulted in problems for the Rowa group when the farmers' cooperative purchased 15 tonnes of organic cashew nuts from the farmers (at Rp7 500/kg) and sold them to the CCC for Rp7 800/kg. As it turned out, the CCC could not buy all 15 tonnes and the cooperative had to dump three tonnes of product on the conventional market at a time when prices had slumped to Rp5 500/kg.

This first year's experience left the farmers disillusioned with the project. In addition, the plan to pay the fee for local inspectors out of the premium price received could not be realized. As a result, the project paid the local inspectors' fees.

Although premium prices were worked out in more detail for the second year, there has been a drastic decrease in yield, especially in Kringa and Uru, where the yield declined by almost 50 percent. The reason for this was the long dry season, which was then accentuated by pests and diseases.

Recommendations

According to Crucefix (1998), benefits from organic farming are seldom immediate. Small farmers will require considerable support or incentives over the initial years if the system is to be initiated and maintained. The project results confirmed this observation. Below are some of the recommendations arising from the project team's own reflection complemented with some insights arising from a livelihood study by Gamper (2005) in the four project locations and a marketing study by Wheatley and Associates (2006).

Collective marketing

Collective marketing, one of the goals of this project, has not been completely realized. Collective marketing is a possibility owing to the poor relationship between traders and collectors that will give farmers' groups an opportunity to deal directly with the traders. Another supporting factor is the competition for supply, which demands that the traders collect the product as quickly as possible. Direct contact between traders and the farmers' groups is more profitable for both parties. For the farmers' groups, this will provide a price incentive for the farmer of around Rp100–150 per kg (Wheatley *et al.*, 2006). Of course this will only be realized when the volume of product is aggregated.

Market Segmentation

The project should explore the possibilities of non-export markets in the context of enhancing the efficiency of conventional marketing channels. Factors in this equation are an improvement of the institutions involved in the marketing chain and of the market players. It also has to do with the farmers' capacity, especially in processing cashew nuts and guaranteeing product quality.

Price information

The project has not managed to achieve the prices as planned. Several compelling reasons are put forward by Wheatley *et al*. (2006) as to the importance of price information in the marketing of cashew nuts. Both farmers and traders confirm that fluctuating prices are a problem for them when it comes to marketing cashew nuts. The

constant fluctuation in the price of cashew nuts necessitates a price information system that is accessible to farmers and traders every day. This system could be used as a tool for analysing seasonal price trends, allowing farmers to store and sell their produce at the right time.

Processing of cashew nuts by the farmers' groups
The farmers in Flores need skills in processing cashew nuts. As well as providing added value, shelled nuts can be stored more easily and for longer than unprocessed nuts. Training the farmers to do this will not be difficult because the farmers' group in Ilepadung is already quite skilled at processing the nuts.

There are two important points regarding the processing of cashew nuts that should be borne in mind. First, as well as processing skills, the farmers also need access to the necessary tools (*kacip* or clippers). This would be of great assistance to the farmers. Second, an area that has not been explicitly explored by the project and should be is the role of women in the processing of cashew nuts, because most women have proven to be quite skilled at shelling nuts.

Better communication mechanism between all stakeholders
The number of stakeholders involved in this project, coupled with the complexity of the certification process, has delayed the implementation of the project. A communication mechanism between stakeholders and with external parties (such as traders and government) should be developed to ensure the free flow of information related to cashew nut marketing. Support for communication equipment is sorely needed, bearing in mind the mountainous topography of Flores and the poor road access.

Conclusions

Several conclusions can be drawn from the first two years of this project. Strengthening farmers, while still in the initial stages, has been achieved by the project.

Organic certification given to cashew nut farmers' groups in Flores
In its first year, the project succeeded in securing international organic certification for the four farmers' groups involved in this project. This certification from IMO is in line with NOP standards and EU standards. This will promote the competitiveness of the organic cashew nuts produced by the Flores farmers at the international level.

The motivation and awareness of the farmers participating in the project to enhance the quality of cashew nuts through organic certification is growing, although in economic terms, the farmers have yet to enjoy the premium prices that were initially expected by the project.

ICS functions to support the organic certification process
The farmers have a growing understanding of the organic certification process and the ICS work system used for internal control by the organic certification institution (IMO). Thirty one farmers are involved as local inspectors. This is a significant achievement in the capacity building of the farmers, which should be continued.

Marketing
Collective marketing must be supported in the future because the farmers' groups have not had much training and are not skilled in this area. The failure to obtain premium prices and the problems with the marketing process are key points to note from the two years of experience of this project.

There has been quite sharp criticism of this project for targeting the export market, which, its critics say, does not guarantee a large- and safe-enough market. Opportunities for improving the conventional marketing chain should also be explored.

Cashew nut processing
The farmers need training in processing cashew nuts. The farmers' groups need the time and opportunity to perfect these new skills.

Multistakeholder collaboration
The benefits of multistakeholder collaboration should be clear for everybody. The first year's experience showed that poor communication and unclear task division among the participants created problems in the project implementation. This was revealed during the self-reflection process. For example, VECO Indonesia focused on strengthening the farmers' groups in organic certification, while Swisscontact focused on market access and orientation.

After the self-reflection process, improvements were made in the second year. Improvements included a clear division of roles, clear operational plans, a contract between local NGOs, farmers' groups, VECO Indonesia and SwissContact. Furthemore, each project stakeholder has searched for new market opportunities. After the improvement, the project has run smoothly.

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Supply chain improvement for mangoes in the Philippines

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Abstract

Optimizing post-harvest and agribusiness systems to maintain fruit quality and improve marketing efficiency is one of the key strategies of the PCARRD/UPLB/ACIAR project on "Integrated Pest Management and Supply Chain Improvement for Mangoes in the Philippines and Australia". The main objective of the supply chain improvement component is to identify and try out improvements to current practices and conditions for managing mango supply chains. An examination of a supply chain in Luzon and two supply chains in Mindanao demonstrated that fruit quality was lost before harvest as a high percentage of fruit failed to meet the quality requirements of the domestic and Hong Kong markets. Typically, more than 50 percent of the harvested fruit were of poor physical appearance with scab, insect damage, wind scars and latex burn emerging as the major problems. Fruit quality further deteriorated along the chain from the farm to major distribution centres in Manila due to poor handling. In many cases, anthracnose and stem-end rot become major concerns when the fruit ripened. The exporters and large traders are the key players in the mango trading business. Mango exporters either have their own buying stations in the supply areas or engage certain traders on a commission basis to procure mangoes for them. Procurement of mangoes is highly competitive with exporters and traders trying to beat each others' price to secure the required volume. Nevertheless, inefficiencies are still evident and there are players and activities that appear unnecessary and prevail as a result of information asymmetry. There are important logistics constraints also, especially the limited capacity of air freight carriers servicing the Davao–Manila route. Effective preharvest pest management, careful post-harvest handling, application of hot water treatment for disease control, extensive dissemination of technical and market information, as well as improving the logistics situation in supply areas are among the potential measures to improve the supply chain for mangoes in the Philippines.

Introduction

Optimizing the post-harvest and agribusiness systems to maintain fruit quality and improve marketing efficiency is one of the key strategies of the PCARRD/UPLB/ACIAR project, "Integrated Pest Management and Supply Chain

Improvement for Mangoes in the Philippines and Australia." This project requires a thorough assessment of the existing supply chain for mangoes with a view to identifying key improvement areas and carrying out actual improvements through a participatory approach. The paper highlights the preliminary results of the project. The next section outlines the methodology of the study. Significant findings are given in the third section, while the last section provides some measures to improve the performance of the supply chain.

In agribusiness, supply chain management (SCM) implies managing the relationships between the businesses responsible for the efficient production and supply of products from the farm level to the consumers to meet consumers' requirements reliably in terms of quantity, quality and price. In practice, this often includes the management of both horizontal and vertical alliances and the relationships and processes between firms (Woods, 2004).

Methodology

The study employed a supply chain management framework. Supply chain management simply refers to the management of the entire set of production, distribution and marketing processes by which a consumer is supplied with a desired product. Folkers and Koehorst (1998) (as cited by Woods, 2004) define a supply chain as a set of interdependent companies or entities that work closely together to manage the flow of goods and services along the chain in order to realize superior customer value.

Identification of two supply chain groups and mapping supply chains

Two agribusiness companies exporting fresh mangoes to Hong Kong cooperated in the study. Each firm is the principal player in its respective supply chain. Both procure fresh mangoes from the major production areas in Luzon (from January to June) and from Davao (in Mindanao) for the off-season (July to December). As Mindanao is the priority area for the project, this makes them as ideal cooperators. The strategy to work with major players or decision makers is crucial to ensure that measures to improve the supply chain will be coowned by the supply chain members. The firms are covered by confidentiality agreements which prevent disclosure of their identities. This, however, has little adverse impact on the project.

Supply chain maps were developed using the exporters as reference points. The map identifies the members of each supply chain, the flow of products, information and payment, activities and services conducted by supply chain members, critical logistical issues, key decision makers and external influences. A survey using a pretested set of questionnaires as well as key informant interviews was undertaken to answer the following key questions:

- Who are the key customers and what are their product requirements (especially quality standards)?
- How does product, information and money flow through the supply chain?
- What are the activities and services provided at each step in the supply chains?
- What are the critical logistic issues?
- Who are the major decision makers or drivers in the supply chain?

- What external influences affect the performance of the supply chain?

Identification of areas for improvement
Areas for supply chain improvement were identified after the chain had been mapped and analysed. The study gave special emphasis to post-harvest practices along the chain including: (1) harvest; (2) field sorting and packing; (3) transport; (4) re-sorting and repacking; (5) storing; and (6) post-harvest disease control.

Other areas for improvement were also identified, guided by the six principles of successful SCM. These are: (1) a focus on customers and consumers; (2) a chain creating and sharing value among all its members; (3) making sure the product fits the customer's specification; (4) effective logistics and distribution; (5) an information and communication strategy that includes all chain members; and (6) effective relationship that give leverage and shared ownership (AFFA *et al.*, 2002 as cited by Woods, 2004).

Significant findings

Key customers, product requirements and fruit quality at harvest
The supply chains investigated in the study cater to both the domestic and export markets. The domestic markets include supermarket chains and wet markets in major urban centres as well as processors located in the provinces of Bulacan in Luzon and Cebu in the Visayas. The product requirements of these markets are summarized in Table 1. The supermarkets require good quality mangoes: mature, green, clean and with smooth appearance. They only purchase "medium-sized" (250–300 g) mangoes classified into regular and premium grades. Normally, wet markets do not require specifications on product quality. The processor absorbs "reject" mangoes such as fruits with latex stain, latex burn, irregularly shaped, undersized, mechanically and insect-damaged fruits.

The Hong Kong market has no phytosanitary requirements. The grade standards and quality requirements for this market are fresh mangoes, mature, green, regular-shaped, smooth, and free from diseases, insect infestation and mechanical damage.

Table 1: Quality and size characteristics of mangoes for different markets.

Market	Destination	Characteristics	
		Quality	Size
Export	Hong Kong	Fresh green mangoes, mature, regular-shaped, smooth, free from diseases or insect infestation and mechanical damage	XL: ≥ 350 g L: 300–349 g M: 250–299 g S: 200–249 g SS: 160–199 g
Domestic	Supermarket	Fresh green mangoes, mature, regular-shaped, smooth, free from diseases or insect infestation and mechanical damage	Medium size only Regular: < 300 g Premium: ≥ 300 g
	Processor	Fruits with latex stain, latex burn, irregularly shaped, undersize, slight mechanical damage, and disease or infestation like capsid bug	Regular: ≥ 160 g Undersize: < 160 g

However, only a small percentage of the total volume of fruit harvested meets the quality requirements of the export markets. Some 68 percent of the fruit harvested from a major mango producing province (Abra) in Luzon and 50 percent of the fruit harvested in Davao were rejected. Poor quality fruit fetches much lower prices since they are sold only to processors.

Post-harvest operations, product flows and fruit quality along the chain

Harvesting usually starts before 09.00 hours. In areas that are too far from the buying station, harvesting is done much earlier in order to deliver the fruit to the buying station on the same day. This practice leads to heavy latex flow and eventually latex stains since the turgidity of the fruit is still high. Farmers are aware of this problem, but are constrained by the need to deliver the fruit on time. Harvesting is manual and laborious, thus farmers have to start early. Sometimes, harvesting is extended beyond the ideal time of 15.00 hours, thus the flow of latex is again excessive. Furthermore, farmers seldom provide for a 2–3 cm stem clearance from the pedicel when harvesting mangoes, which would minimize latex flow. There are farmers who place the freshly harvested fruit on newspapers spread on the ground before sorting and packing to remove the latex. This, however, is of little help once the latex has spread over the fruit.

Exporters normally send their collector agents to the farms so that fruit can be sorted and classified before being brought to the buying station. This is especially true for larger volumes. After field sorting, good quality fruit is packed into 12-kg cartons while poor quality fruit are packed into 25-kg used cartons (originally intended for bananas). In cases where fruit cannot be sorted in the field, they are brought into the buying station in bulk, usually packed in used 25-kg cartons or large rattan baskets. They are then sorted in the buying station and are repacked. Afterwards, the better quality fruit is airfreighted to the exporter's warehouse in Manila (in the case of Davao), or transported by truck in the case of mangoes harvested from northern Luzon. Fruit is normally re-sorted at the warehouse in Manila before final packing and loading in a 20-foot container for shipment to Hong Kong (Figure 1).

In Hong Kong, the container is unloaded in a container yard adjacent to the fresh fruit market in Yau Ma Tei. The cartons of fruit are then hauled by push carts to the market and stored in warehouses or stalls inside the market for eventual distribution to wholesalers, retailers and institutional markets. In cases where the fruit are intended for the Chinese market, the fruit is directly transferred from the container to a truck which takes the fruit to the People's Republic of China. It normally takes five days from harvest for fruits to reach the Hong Kong market.

Rough handling generally characterizes the movement of mangoes from the farm to the buying stations. In a particular shipment involving mangoes harvested in northern Luzon, poor handling was observed even at the exporter's warehouse in Manila. As shown in Figure 2, about 14 percent of the fruit considered to be of good quality at the buying station in the supply area were rejected at the Manila warehouse, primarily due to overstacking in the truck, rough loading and unloading, and poor handling during final sorting at the warehouse. Poor quality control at the buying station may also be an important reason. In another supply chain involving mangoes from Davao brought to a Manila warehouse, latex stains and damage due to poor handling are evident (Table 2).

Figure 1: Mango supply chain in Davao del Sur and Davao del Norte, Philippines – product flow (2006)

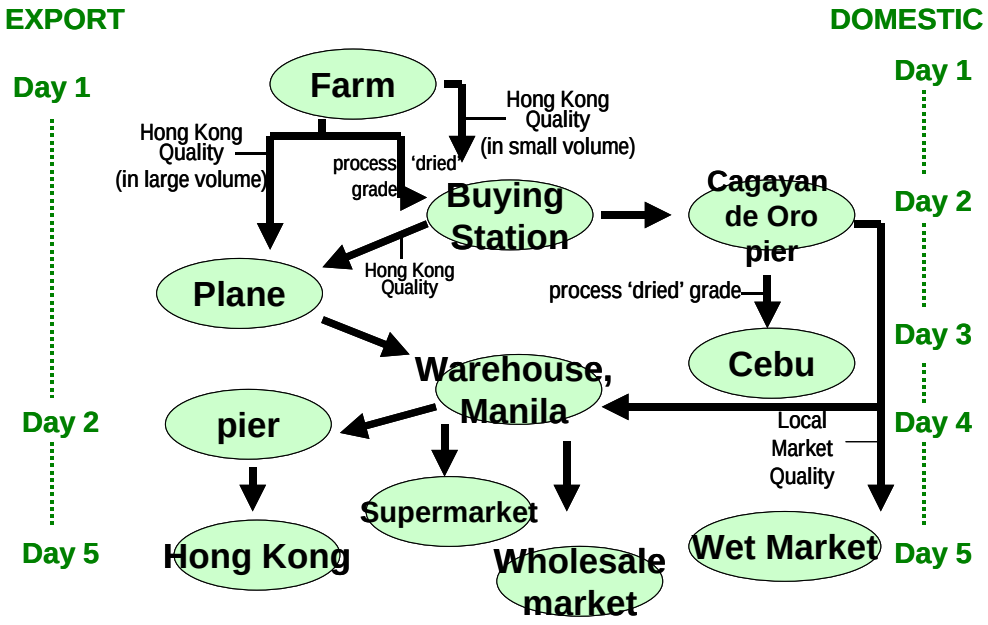
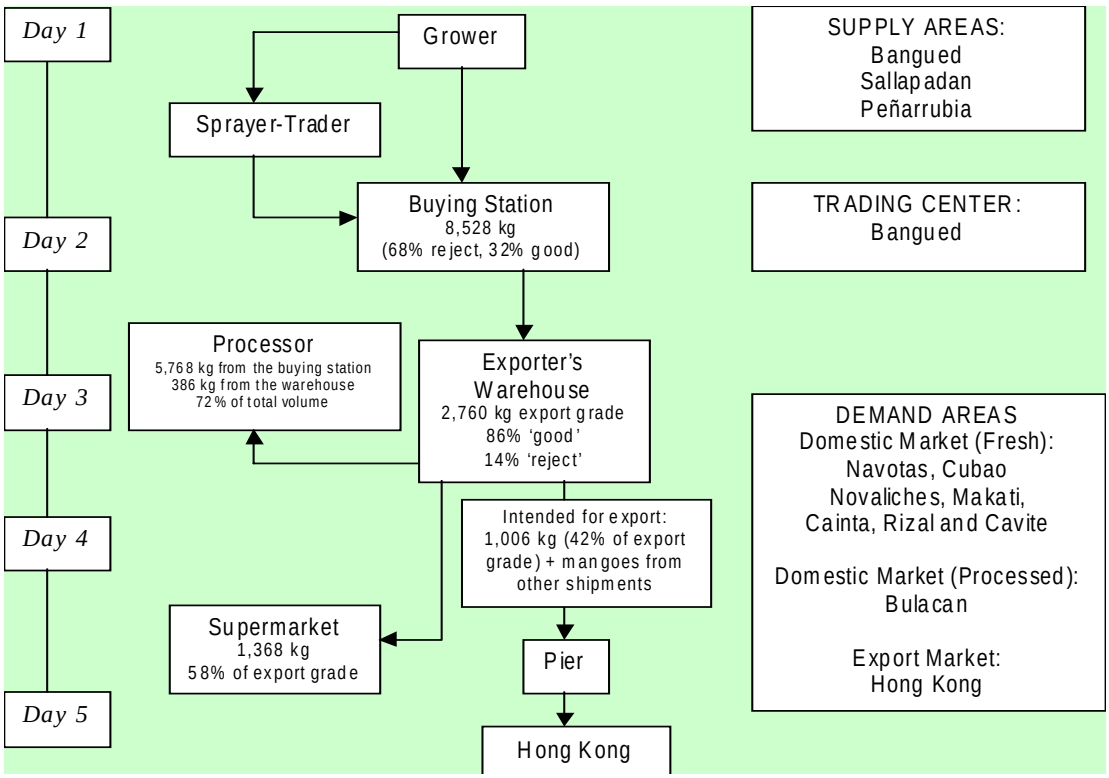


Figure 2: Mango product flow – one shipment from Bangued, Abra, 2006



Anthracnose and stem-end rot are important post-harvest diseases of mango, especially for fruit harvested during the rainy months of July to November (off-season). The fruit deteriorates very rapidly along the supply chain, especially when they begin to ripen. For fruit exported to Hong Kong, about 5 percent of each lot exhibits disease as early as upon arrival at the Yau Ma Tei market. Advanced deterioration is observed when the fruit is placed on display in the various retail outlets. The retail price in Hong Kong drops considerably as the disease becomes more prevalent. On average, medium-sized good quality fruit is sold for HK$8–12 per piece in retail stalls. This drops to as low as HK$1–3 per piece when the disease is at an advanced stage. One of the supply chains examined in the study employs hot water treatment to control these diseases. The incidence of disease was reduced and the severity was markedly less in hot water-treated fruit even at the table-ripe stage.

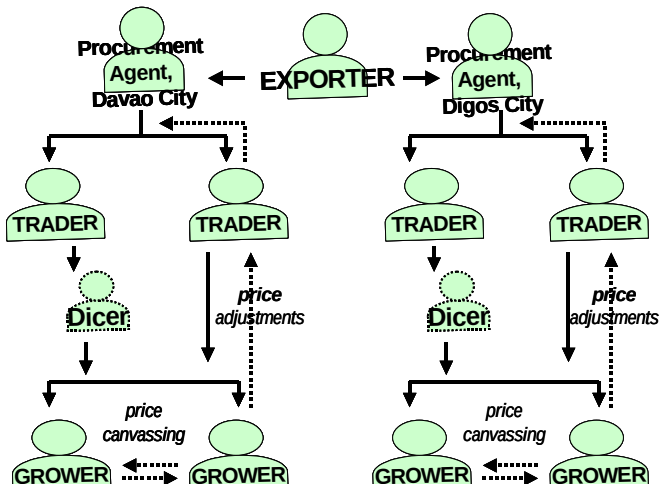
Table 2: Quality profile of rejected mangoes from exporter's warehouse in Manila.

Sample	Preharvest defect	Post-harvest defect
1		Latex stain
2		Colour break, latex burn or stain
3		Colour break, latex stain
4		Compression damage, latex burn or stain, colour break
5	Small, misshaped	Latex stain, lenticel spots
6	Misshaped	Latex burn or stain, compression damage, bruise, colour break
7		Abrasion, latex stain
8		Latex stain, abrasion
9		Latex stain, compression damage, colour break
10		Latex stain
11		Colour break, compression damage, abrasion, latex stain
12		Latex burn or stain, colour break
13	Vein, wind scar	Lenticel spots, abrasion, latex burn or stain
14	Scab	Colour break, latex stain
15		Abrasion, latex stain, compression damage
16		Latex burn or stain, colour break
17	Scab, small, insect damage	Lenticel spots, latex stain
18		Latex stain, abrasion, colour break, compression damage
19	Insect damage	Latex stain, lenticel spots
20	Ant damage	Abrasion, bruise, latex burn or stain, compression damage, colour break

The flow of price information is asymmetric between the traders and farmers. This is evident from the fact that the traders are the farmers' only source of price information (Figure 3). In addition, agents working on a commission basis proliferate in the major production areas. They locate farms with mature mango fruit and inform the traders for an agreed commission. In addition to the commission they obtain, it is common for

procurement agents to offer farmers a much lower price than the one quoted by traders. However, the problem on information asymmetry is lessened when there are several traders competing for the fruit. Nevertheless, in the more remote areas, there is often only just one trader operating in the area.

Figure 3: Mango supply chain in Davao del Sur and Davao del Norte, Philippines – flow of price information(2006)



Critical logistic issues

Farm-to-market road: Rough farm-to-market roads contribute to losses, due to the mechanical damage sustained through compression and abrasion. Most farms are far from the buying station and fruit has to be transported by trucks or jeepneys. Compression damage is especially high when fruits are not properly packed and overstacking is practised. The cost of transportation may also increase, especially when the roads become muddy. In such cases, mangoes have to be hauled by sleds for long distances before they can finally be loaded into the truck.

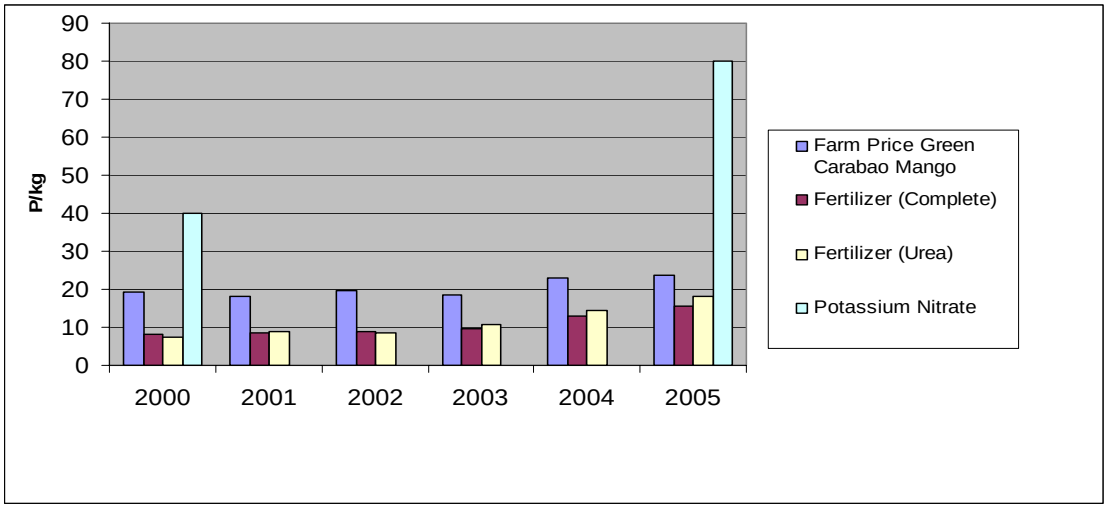
Limited air freight capacity in Davao: Air freight capacity servicing the Davao–Manila route is very limited. In cases when priority cargo such as tuna, cut flowers and other fruits such as rambutan and *lanzones* are available in large volumes, mangoes are often off-loaded by the major airlines. Thus, even if large volume of fresh mangoes is available in Davao, the volume that can be brought to Manila and eventually to Hong Kong and other export markets is limited. Fresh mango is often considered a filler in air cargo. As such, the freight cost is much lower compared with other types of cargo. The disadvantge however, is that fresh mangoes have a lower loading priority.

Increasing cost of inputs: The price of inputs particularly KNO_3 and other fertilizers have doubled over the last five years (Figure 4). However, the farm price of mangoes remains practically the same. Net income from mango production is only about Ps4–5 per kg on average. Given an average yield of about 5.5 million tonne per ha, net income is relatively small.

External influences

Mango production is covered by the Comprehensive Agrarian Reform Programme (CARP) which limits land ownership to a maximum of seven hectares. While some of the large plantations have already been subdivided into smaller parcels, others contend that this prevents farmers from achieving the economies of scale which are important for commercial export crops such as mango.

Figure 4: Comparative price of mango and commonly used production inputs (2000-2005)



Source: BAS

Measures to improve the performance of supply chains

Many preharvest and post-harvest interventions have been identified to improve the performance of mango supply chains in the Philippines. Among others, this includes the application of integrated pest management to reduce insect damage and minimize the cost of pesticides; proper harvesting practices; improved practices to minimize handling-related damages, as well as application of hot water treatment to reduce fruit deterioration along the chain due to anthracnose and stem-end rot.

Farmers' access to price information should also be improved to enable them to exercise greater bargaining power with traders. The government should continue improving farm-to-market roads and other transport infrastructure to lessen the costs of transportation and physical damage not only to mangoes but to other agricultural products as well.

The cost of inputs must be reduced by addressing the inefficiencies in the input system and low-cost alternative inputs (e.g. organic) must be explored. Finally, the implications of CARP on the productivity or profitability of mango production must be examined in depth with the view to formulating and implementing measures to minimize any adverse impact.

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Emerging possibilities and constraints to Papua New Guinean smallholder coffee producers entering the speciality coffee market

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Abstract

Papua New Guinea produces around 1 percent of the world's coffee, most of it Arabica. The average price it achieves for its coffee is below the price of many comparable Arabica-producing countries. Most of Papua New Guinea's coffee comes from smallholders producing parchment using a village-level, wet processing method. One of the major obstacles to the improvement of coffee quality in Papua New Guinea is the failure of the current marketing system to give the right price signals to growers, in terms of different prices for different qualities of parchment. The marketing system is highly competitive, with large numbers of traders and roadside buyers purchasing small quantities of parchment from smallholder coffee producers. Since many of the taste faults in coffee cannot be detected at the parchment stage it is not possible to reward smallholders who produce superior tasting coffee. Historically, two coffee chains have coexisted in the Papua New Guinea industry, with the plantation chains, a remnant of colonial occupation, producing higher quality coffee for the speciality market. In contrast, the smallholder chains produce coffee for the soluble market. While the market determines quality and hence price essentially by consistency of taste, the government regulated grading system for green bean determines quality by bean size and the level of defects. The two are not necessarily correlated. Furthermore, cultural differences between plantation farmers, exporters and smallholder farmers, contribute to the perception by smallholders that lower prices are due to excessive profits in the processing–export sector rather than to any inherent problems with coffee quality. A number of solutions have begun to emerge which will be explored.

Background to the Papua New Guinea coffee industry

Production and prices

Papua New Guinea is a relatively small player in the world coffee market, producing around 1 percent of world coffee exports or 1 million (60 kg) bags. In 2005, the major importers of Papua New Guinean coffee were Germany (48 percent), the United States or America (14 percent), Australia (14 percent) and Japan (9 percent) (Dambui *et al.*, 2006b). Much of the coffee exported to Germany, Australia and Japan goes to the soluble coffee market and hence attracts lower prices than those achieved in the speciality market.

Almost all of the coffee exported from Papua New Guinea is Arabica, which is produced in the Highlands at altitudes above 1 000 metres. Under the International Coffee Organization classification system, Papua New Guinean coffee is grouped in the Other Mild Arabicas category. While this is potentially good quality coffee, historically

Papua New Guinean coffee has received lower prices than the average, as most Papua New Guinean coffee sells at a discount to the Other Mild Arabicas Grade on the New York Board of Trade (or NY 'C'). In 2004 and 2005, around 60 percent of Papua New Guinean exports sold at a discount averaging 13 to 14 USc per pound (Dambui *et al.*, 2006a). In 2005, around 80 percent of Papua New Guinean coffee was sold as smallholder Y grade coffee (PSC, Y_1 & Y_3) while only 20 percent was sold into the speciality market (A, X, Organic and Fair Trade). While Y grade coffees were sold at a discount to the NY 'C', the speciality coffees received price premiums (Table 1).

Table 1: Green bean prices & differentials to NY 'C' for Papua New Guinea coffee (2005)

Grade	***Price Lae (t/kg)***	***Differentials (USc/lb)***
A, AA	804	25
X	793	7
Organic	801	19
Fair Trade	920	
PSC	648	-7
Y1	606	-13
Y3	265	-66

Source: Dambui *et al.*, 2006: p. 22.

A dualistic coffee production system

Coffee production in Papua New Guinea comes from three main types of farms: smallholders, blockholders and plantations. Between 80 and 90 percent of production comes from around 250 000 smallholders involved in subsistence agriculture on customary land (Stapleton, 2000). Smallholders generally cultivate a few trees or a few hectares among their subsistence food crops. Coffee is the main source of cash income, which is used to pay school fees, purchase trade goods and meet traditional social obligations. Most of the coffee is sold as parchment, often to local roadside traders or has to be flown out in the case of the more remote locations. The parchment is produced using highly variable wet processing techniques. Suitable pulpers are in short supply, fermentation often occurs in bags and washing is incomplete or uses muddy water. Consequently, the quality of the parchment is highly variable as is the taste of the coffee made from this parchment.

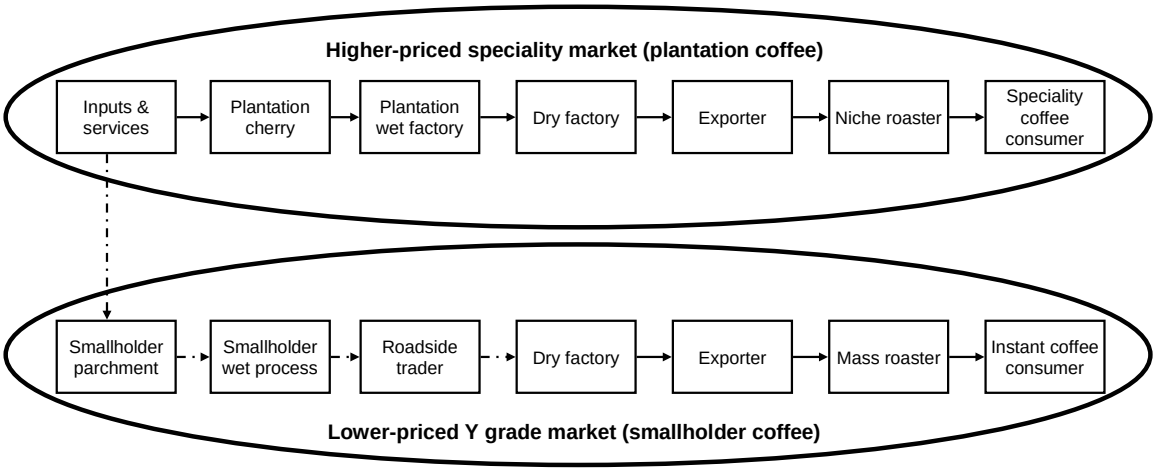
The blockholder sector is the smallest and is derived from a 1980s scheme that provided 20–hectare lots to around 250 business groups (Stapleton, 2000). Research indicates that many of these have since been subdivided between family members, so there is now a wide range of sizes. These farms tend to be run along more commercial lines with the use of wage labour and cash inputs, while processing is usually carried out using a pulper and a small wet mill. However, in many respects, the quality of their coffee is similar to that produced by the smallholder sector, for the quality of the parchment produced is highly variable and reflected in the taste of the coffee.

The few remaining plantations now produce less than 10 percent of total production. They are larger in size (hundreds of hectares) and often occupy leased land. Almost all

are majority or totally owned by nationals (Stapleton, 2000). These plantations achieve higher production per tree and per hectare. They use commercial operating principles and rely on wage labour and cash inputs to achieve this. The quality of their coffee tends to be better, mainly because of the better quality control systems employed in their wet processing mills. Some also have their own dry mills, but many use the same dry mills that are used to process the smallholder and blockholder coffee.

The traditional Papua New Guinean industry can be characterized as a dualistic supply chain model (Figure 1), composed of smallholder subsistence farmers and large plantations. The plantation sector sells most of its coffee into the speciality market, while the smallholder sector sells much of its coffee into the soluble or instant coffee market. Consequently, the decline in size of the plantation sector has contributed to a decline in the average quality and price of Papua New Guinean coffee.

Figure 2: Traditional dualistic Papua New Guinean coffee systems



Problem perceptions

Some blockholder and smallholder coffee is sold as A or X grade coffee and hence finds its way into the speciality chain. However, the perceived wealth of processors and exporters, cultural differences between smallholders, plantation managers and exporters, and the higher prices paid for plantation coffee, lead to the perception by many smallholders and politicians that low prices for smallholder coffee are due to high margins in the processing and trading sectors and a failure to pass on prices for better quality coffee to smallholders. In response, government programmes have been formulated (Papua New Guinea Coffee Industry Corporation, 2002) to support grower groups to process and market their own coffee. Some of these programmes have focused on processing and marketing to traders (e.g. farmer cooperatives formed under the Smallholder Agricultural Credit Scheme and the EU-funded Stabex project). Other smallholders have tried to form cooperatives with direct links to overseas buyers (e.g. Papua New Guinea Coffee Federation).

With these issues in mind, this project was initially set up to address the problem that "one of the major obstacles to the improvement of coffee quality in Papua New Guinea is the failure of the current marketing system to give the right price signals to growers in terms of different prices for different qualities of parchment". This paper sets out to explore the validity of this statement and to redefine the problem in a more positive light to show how "the operations of the coffee chains can be improved so that relative prices for Papua New Guinean coffee will improve and farmers will be appropriately rewarded for their role". The results presented are based on interviews and focus group meetings with farmers, farmer groups, processors, exporters and staff from the Coffee Industry Corporation.

The key issue is one of establishing systems whereby it will be possible for buyers along the chain to have confidence that they are buying higher quality coffee and therefore to pay an appropriate price for the improved quality. A number of solutions, which have emerged to resolve this problem will be discussed.

Quality determination in world coffee and in the Papua New Guinean coffee industry

Coffee is prepared for the consumers in two main ways: in a soluble or instant form or in a roasted and ground form. Around three quarters of all coffee consumed in the world is roast and ground, with the rest being consumed in soluble forms, although the proportion going to each varies widely from country to country (International Trade Centre UNCTAD/WTO, 2002). Soluble coffee can be further divided into spray-dried and freeze-dried forms with spray-dried being at the cheaper end of the market. Almost all of these coffees are derived from blends of beans from a range of sources. Cheaper coffees are produced from lower-priced Robusta coffee and the lower-priced Arabica coffees. This market is highly price-competitive and dominated by a few large roasters.

Roast coffee comes in many forms, but the mainstream market is for blended coffee with the coffees coming from many sources, which are often interchangeable (International Trade Centre UNCTAD/WTO, 2002). Essentially roasters in this market blend to a taste and price and the market is very competitive. Many coffees that do not have particular characteristics to set them apart end up in this market where they face stiff competition. Concentration has been less pronounced in this sector because of the recent expansion in what can be called the speciality sector.

The speciality sector is a broad term to cover coffees "which either command a premium price over other coffees or are perceived by consumers as being different from widely available mainstream brands of coffee" (International Trade Centre UNCTAD/WTO, 2002: p. 65). This sector includes coffees that have niche market characteristics or have other certifications that attract premiums (e.g. Café Practices, Organic and Fair Trade).

A coffee's suitability for a niche market depends on whether it meets certain quality and availability characteristics. The price will tend to increase with increasing quality and decreasing availability. Examples of price being determined by exclusivity include Café *Chon* from Vietnam and *Civit* coffee from the Philippines. Both are extremely rare

because the beans are manually extracted from the faeces of, respectively, foxes and native cats that have consumed the beans.

Quality of coffee is essentially a subjective characteristic determined by the tastes of the particular country and the segments within the market. Quality coffee can be categorized into three groups (International Trade Centre UNCTAD/WTO, 2002: p. 65): exemplary (limited availability and fine or unique cup); high quality or premium (either single origin or blends but of good cupping quality, may not be visually perfect); and mainstream (average quality). Good quality coffees can attract considerable premiums at retail level, which can also result in worthwhile although still lower premiums to farmers. Nevertheless, it is important to recognize that speciality coffees account for less than 15 percent of the world market.

As indicated in Table 1, Papua New Guinean coffee going into the speciality market does attract a premium but most are not attracting high quality premiums. This implies that Papua New Guinean coffee is competing in the larger segment of the speciality market for high and mainstream quality coffees. Nevertheless, it signifies that there is scope to sell more coffee into this market if it is properly processed.

The other segments of the speciality market which have been largely untapped by Papua New Guinea are the organic and various forms of environmental, sustainable and ethical markets. In 2004–2005, only 7 545 bags (0.7 percent) of Papua New Guinean coffee were sold as organic (Dambui *et al.,* 2006b), despite the fact that a large proportion of the coffee is grown under organic conditions. Similarly only 5 250 bags (0.5 percent) were sold as Fair Trade. While the trend has been increasing, this is a small proportion compared with some other countries (e.g. 13 percent in Mexico [Kilian *et al.,* 2004]).

For historical reasons related to the colonial past and different wet processing systems, there has essentially been a dualistic grading system for Papua New Guinean coffee that corresponds to the dualistic coffee chains: the plantation grades (A & X) and the smallholder grades (known as Y grade). However, this is not immediately apparent as the parchment grading system highlights moisture, defects and colour, while the green bean grading system highlights bean size, defects and colour, with cup quality as an additional largely intangible factor. While coffee can be graded for bean size and levels of defects, it is not possible to grade for taste until it is roasted and cupped. Even if most of the coffee has a suitable taste, only a very small number of off-flavoured beans can ruin the taste of a batch of coffee and hence reduce the price.

Consequently, while the market determines quality and hence price ultimately by subjective taste or flavour characteristics and the consistency of these tastes, the Papua New Guinean grading system does not emphasize this. This puts Papua New Guinean coffee producers at a disadvantage since taste characteristics are becoming more important as coffee is produced to meet the higher priced speciality markets. Most parchment is graded for moisture and defects while green bean is graded largely by bean size and levels of defects. Particularly in the Y grade market, traders grade and blend to meet maximum defect specifications and cupping is mainly practiced to ensure that off-flavours are not present. Some parchment buyers further degrade the system by offering "*wan prais*" (one price) for all parchment.

Notwithstanding these problems, there is still a ready market for Y-grade smallholder coffee because of its fruity and wild taste (Wheeler and Kufinale, 2005). However, the problem is with consistency of taste. This lack of consistency is derived from the variation in processing (particularly smallholder wet processing) and deficiencies in the grading and payment systems. Lack of consistency is the major reason for the discounting of Y grade coffee compared with the NY 'C' and other washed Arabicas.

Constraints to the improvement of quality in the Papua New Guinean coffee industry

There are many constraints to improving the quality and hence price paid for Papua New Guinean coffee. Some of these are external constraints to the industry, which can only be solved by government action. These include poor roads and communications, law and order, uncertain land tenure and lack of bank finance to the coffee industry. Although each of these may have an impact on possible solutions, they are not discussed in this paper. Other constraints, which will be discussed include: confusion about quality; inconsistent quality due to processing methods; confusion about causes of low and fluctuating prices; social and cultural distance between sectors of the industry; and the small amounts of coffee available for sale. There are often overlapping elements between these constraints.

Confusion about quality

Many smallholder coffee producers have the perception that quality is determined by bean size and defect levels. They are aware that A grade beans, which are larger and have lower levels of defects, receive higher prices and that dry processors are able to grade green bean to take out larger beans and remove defects. Some of this coffee is sold as A grade. What they do not realize is that the average quality A grade coffee receives only a small premium to New York 'C' compared with plantation A grade that has a recognized brand backed up by consistent performance over time.

Smallholders have almost no understanding of the operations of the coffee market beyond their relationship with the roadside trader or factory buyer. They do not drink coffee and have not been exposed to differences in taste between the various qualities of coffee. They have little understanding of the operations of a dry processing mill or of the functions of an exporter and no understanding of the various markets for their coffee. Consequently, they do not make the link between their own processing procedures and the prices they receive for quality. This confusion about quality leads to calls from smallholders and politicians for them to be able to process and market their own coffee without going through the established processors and marketers so that they can obtain better prices for their coffee.

Inconsistent quality due to processing methods

Coffee in Papua New Guinea is produced using the wet processing method. However, there is considerable difference between the quality of parchment produced from a large wet mill with proper quality control procedures and parchment produced by most smallholders. Handling of coffee from harvesting to parchment is the major determinant of the differences between Y grade coffee and some of the plantation A coffees sold as speciality coffees. Average quality Y grade coffee has a range of winey and fruity

flavours and is often thin. As previously indicated this has a market, but it is not a speciality market. The same cherry processed in a properly managed wet mill will lack these flavours and in most respects cannot be differentiated in taste from a cherry picked from a well run plantation. As one major coffee company manager says: “There is no such thing as bad coffee on the tree”.

The problems of inconsistent quality in smallholder coffee begin with the failure to harvest and process only red cherry and end with poor drying. Other factors leading to inconsistencies include:

- not pulping all cherry on the same day as harvest;
- poorly adjusted pulpers or use of other pulping methods;
- failure to separate rubbish, floaters, chipped or broken beans from properly pulped beans;
- overfermentation often in unclean bags;
- poor washing of beans or washing in unclean or muddy water;
- drying on the ground or in situations leading to contamination or extended drying periods;
- incomplete drying.

The key problem is that most smallholders process their own coffee and there is very little consistency in this process from one farmer to the next. Accordingly, each farmer’s parchment will have different characteristics. The causes of this problem are a lack of knowledge of proper processing methods and the link between processing and price and the difficulty of getting a large number of farmers to process exactly the same way.

Confusion about causes of low and fluctuating prices

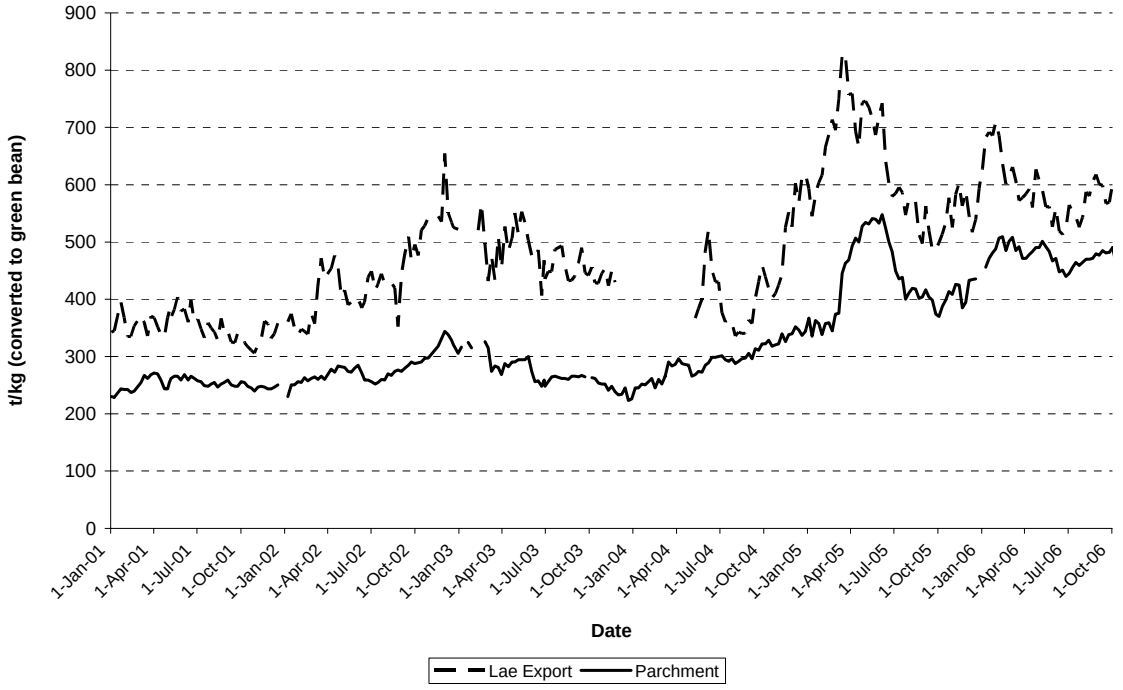
There is also a widespread belief that low prices are the result of high margins and fraud in the processing and exporting sector. Smallholders have almost no understanding about the causes of fluctuations in world coffee prices and the size and quality of Papua New Guinean coffee relative to other countries in the world. Consequently, they blame low prices and fluctuations in prices on unscrupulous buyers and traders.

While there will always be some unscrupulous buyers and traders in any market, Papua New Guinea has a highly competitive free market when it comes to buying parchment. There are many thousands of roadside buyers, 57 registered dry factories and 17 registered exporters (Dambui *et al.*, 2006a). Most smallholders have a range of choices when it comes to selling their coffee.

Evidence from Papua New Guinea Coffee Industry Corporation (CIC) weekly statistics suggests that smallholders receive a very competitive proportion of the FOB price for green bean. As shown in Figure 2, which is based on weekly No. 1 grade parchment prices at the factory door converted to green bean price and the export price at Lae for Y grade, parchment prices are highly correlated with export prices. The Pearson correlation coefficient between the two prices from 2001 to October 2006 is 0.90. For the main months from April to September for the years 2001 to 2006, the price for No. 1 grade parchment at the factory door averaged 72 percent of the export green bean price

at Lae based on an assumed recovery rate of 73 percent. The FOB Lae prices are also highly correlated with the NY 'C' price with a correlation coefficient of 0.96 between 2001 and 2006.

Figure 3: Y grade export prices (FOB Lae) & No. 1 grade factory door parchment prices 2001–2006 (t/kg Green Bean equivalent)



Source: Derived from Papua New Guinea Coffee Industry Corporation. 2001–October 2006 Weekly Market Prices for Broadcast

Social and cultural distance between smallholders and the plantations, processors and exporters

The hangovers of a colonial past with its race-based social hierarchy and the dualistic nature of the industry still resonate in the Papua New Guinean coffee industry. Most of the large plantations, processing factories and export operations are managed by people whose cultural backgrounds distinguish them from smallholders. While they are not necessarily wealthy in comparison with managers of similar operations in developed countries, they are still much wealthier than smallholder farmers. In addition, most do not belong to any of the clans of the Highlands, although many have been born or spent most of their life in Papua New Guinea and have a good understanding of the culture. In combination, these factors exacerbate the belief by smallholders that they are not receiving a fair deal.

Small quantities of coffee for sale

Because of the small numbers of coffee trees owned, picked and processed by each smallholder farmer, the quantity of parchment they have for sale at any one time is small. Parchment is also a liquid item and farmers store parchment for sale when they

need cash for family and social obligations. Here roadside traders serve a useful function since they buy small quantities of coffee for cash and aggregate these small lots of coffee into larger numbers of bags. They then sell the parchment to a dry mill that in turn processes it and sells it to an exporter. However, the quality of this coffee is highly variable.

The problem for processors and exporters is that they sell and ship coffee in 300-bag containers or 18-tonne lots. The buyer of this container expects all the bags to be of the same consistent quality, which will include size of bean, level of defects and taste. Some characteristics are obvious in the parchment, but taste is generally not, so there are information problems in the purchasing transaction. In almost all cases, whether the processor is buying from a farmer or a roadside trader, neither party will have any real knowledge about the taste characteristics of the coffee. It only becomes economic to taste coffee when buying around 30-bag lots. Consequently, parchment buyers face risks when buying and discount the price to allow for this.

A similar problem also exists for a farmer. If the farmer is producing high quality parchment, but only has a small amount, they are unlikely to be rewarded as the trader cannot source enough to fill a container. The roadside traders have no way of determining superior quality or of being rewarded for purchasing superior quality coffee because they face a similar problem when selling to a processor. Similarly, a processing factory can only reward a farmer for the visual quality of their coffee, not the taste, because it is not feasible or economic to taste small lots of coffee.

Implications of these constraints to the problem of improving quality and price

While the mainstream Y grade coffee chain in Papua New Guinea is highly competitive and is efficient in that it quickly adjusts to world prices and provides smallholders with a fair proportion of export prices, it is not able to reward smallholders for producing better quality coffee. In fact, the system tends to have the opposite effect because smallholders who produce poor quality coffee can often receive the same price as smallholders producing superior quality coffee.

Although it is possible to make improvements in this system through education, its inherent problems will remain. This does not mean that government should ban roadside traders because, as already indicated, they provide a valuable service for village farmers and industry. For smallholders they act as a source of cash by buying coffee at the village level and for industry, they take the risk of buying and transporting coffee from remote villages over very poor quality roads and the risk of theft by rascals. Systems to overcome these constraints are emerging.

Emerging coffee chains aimed at achieving higher prices

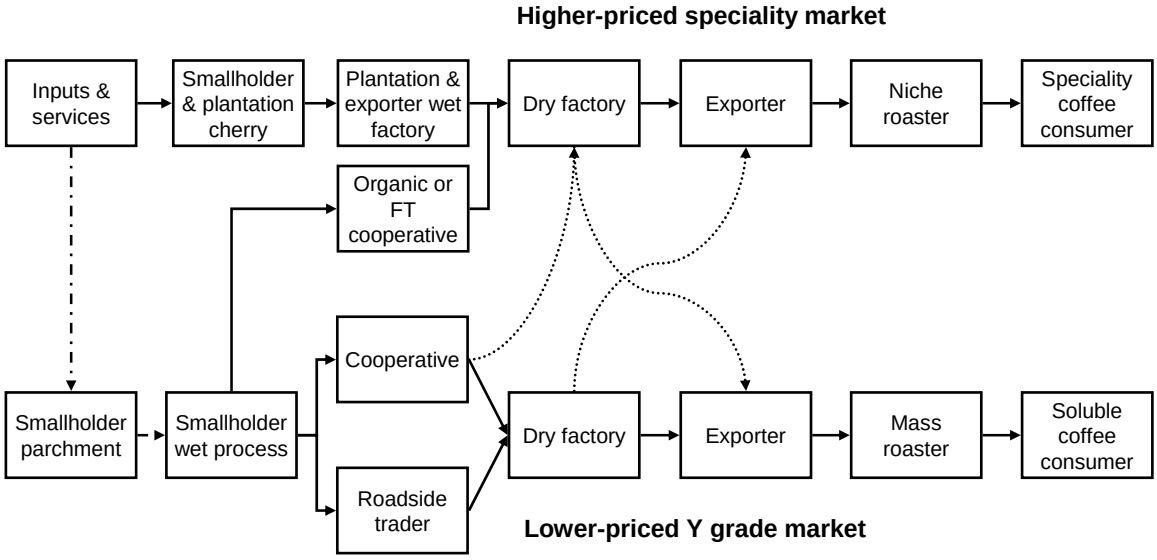
As is obvious from Table 1, Papua New Guinean coffee that achieves A grade, Organic or Fair Trade grades is sold at a considerable premium to NY ‘C’. Unfortunately, only around 10 percent achieves this status. The key reason for this difference in price, which is around USc30–40 per pound, is the poor processing at the village level, leading to inconsistent product quality.

A number of chains have overcome this problem by improving quality or delivering to accredited organic or Fair Trade markets through:

- purchase of smallholder and blockholder cherry by centralized wet mills owned by plantations and exporters, to produce speciality coffee;
- exporters who have established relationships with smallholder cooperative groups to improve the quality of their coffee and receive accreditation to deliver to the organic and Fair Trade markets;
- smallholder cooperative groups trained to deliver higher-quality coffee to exporters.

The first two of these options directly target the speciality market to achieve higher prices, while the third attempts to improve price by overcoming the inconsistent quality and small quantity constraints. These chains are illustrated in Figure 3.

Figure 4: Emerging Papua New Guinean coffee chains



Chains in which centralized wet mills purchase cherry

In the key coffee producing provinces of the Papua New Guinea highlands, many smallholders have access by road to large wet processing mills. These mills can be on existing plantations who buy cherry from surrounding farmers, forming a type of nucleus estate model. The other model is a specially built wet mill that buys cherry from surrounding farmers. The catchment zones are generally a 20- to 30-kilometre radius from the factory, depending on the quality of the roads and the location of the factories. In some cases, farmers deliver directly to the mill and in others, the factory sends out trucks to procure the cherry from the farmers.

While there are a number of variations in the operations of the nucleus estate model, the key is to process the smallholder's cherry using the same processes used for their own coffee and to sell it to the speciality coffee market as plantation grade coffees. In some cases, the coffee is kept separate from the plantation coffee for traceability and other

reasons, although this is not universal. In some cases, the plantations have their own dry mill and exporting arm, while in others they use other companies as dry processors and exporters. In the latter cases, they tend to establish close relationships with the exporter. Similarly, there are a number of variations with the stand-alone wet mill model. In some cases, the wet mills are co-located with a dry mill or the company has its own dry mill. It may also be a subsidiary of an exporter or have an established relationship with an exporter.

To achieve higher prices for their coffee, these chains are following two strategies. The first is to attain volumes of coffee processed to the standards that exist in the Papua New Guinean plantation sector. This coffee can sell at plantation prices because it has consistent standards and hence taste. To this end, they emphasize buying only ripe red cherry, as this is a critical factor in achieving consistent wet processing. The second strategy is to achieve accreditation to a speciality coffee market. An example of this is Starbucks and their Café Practices programme. Some of these cherry chains have already obtained preferred supplier status and are aiming at strategic supplier status.

These strategies have been successful in obtaining higher prices for Papua New Guinean coffee and in passing on a considerable proportion of these prices to farmers. As is indicated in Figure 4 farmers who sold cherry rather than parchment received an average of around 100 Papua New Guinean toea (USc35) per kilogram parchment equivalent (or one-third) more during the 2004, 2005 and 2006 coffee seasons. The difference varies from season to season depending on the world price and domestic seasonal factors. In 2006, with high world prices and a local shortage of coffee, fierce competition increased the premium to around 130 Papua New Guinean toea (USc45) per kilogram parchment equivalent or around 38 percent. It also appears that the level of competition for cherry has been increasing over the years and that farmers are receiving a higher relative price for cherry.

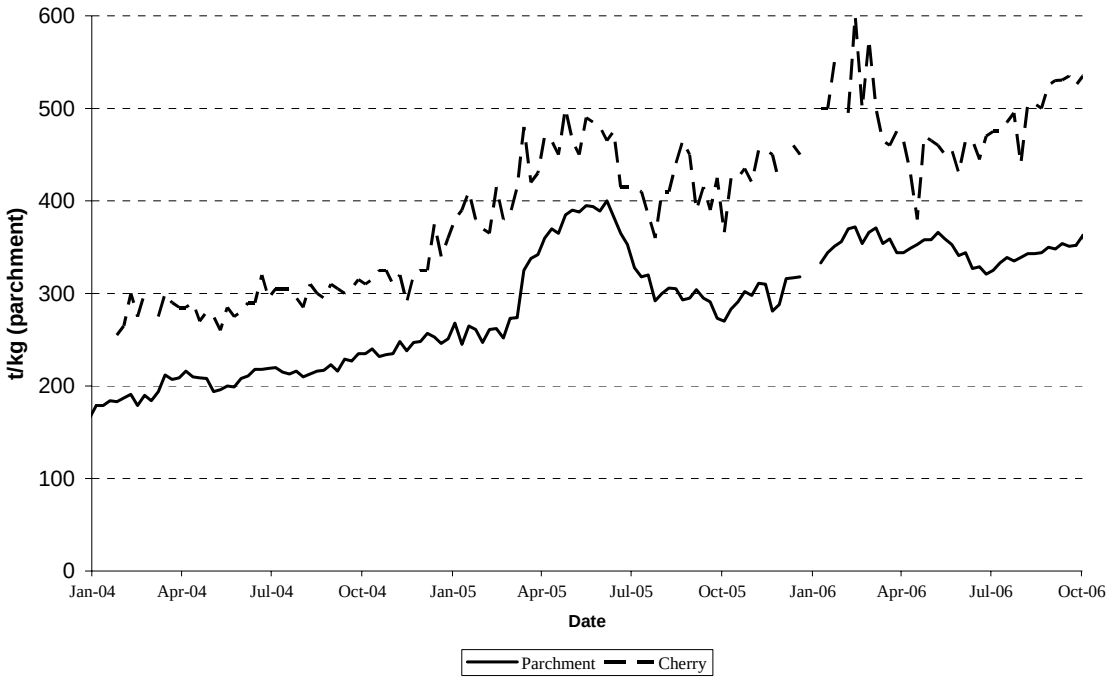
The model of centralized processing of cherry is expanding in Papua New Guinea and has the potential to expand further. There is still considerable room for improvement through adopting quality assurance schemes and achieving accreditation to speciality markets such as Starbucks. However, there are some constraints to some of these as the Café-Practices model has been developed for the Central and South American system and this creates problems for Papua New Guinea with its large numbers of very small coffee farmers. However, some of the chains have or are developing systems to overcome these problems.

A major constraint to the expansion of the schemes is the poor condition of the roads and to a lesser extent, problems of law and order. Cherry must be delivered to the mill for processing on the same day it is harvested. Because the Papua New Guinean coffee industry is widely dispersed, often in remote areas, the system is only suitable for limited parts of the industry until roads are improved.

Another emerging problem is the increase in cherry theft. This is occurring because of the higher prices for coffee over the last two years as well as the increase in cherry buying. The expansion in mills buying cherry is occurring at two levels: the buyers of ripe red cherry who are aiming at the speciality market; and buyers of poorer quality

cherry who have problems achieving premiums for their green bean. Cherry theft has led to calls for a ban on cherry buying similar to a ban that existed previously. Much of the cherry theft occurs at night. Because the coffee trees are strip picked, the quality of the cherry is poor and can only be sold to the less discerning buyers. Some of the speciality buyers have schemes that demand traceability under quality assurance programmes to limit this problem. Most cherry buyers do not. It remains to be seen whether the buyers of the poorer quality cherry will be able to compete as they are currently paying similar prices to the speciality buyers for their cherry but will not be able to achieve the same quality and thus be unable to access the speciality market.

Figure 5: Papua New Guinean factory door cherry and No. 1 grade parchment prices 2004–2006 (converted to parchment at 5kg cherry = 1 kg parchment)



Source: Derived from Papua New Guinea Coffee Industry Corporation. 2004–October 2006 Weekly Market Prices for Broadcast.

Chains aimed at the organic and Fair Trade markets

A couple of chains are emerging that are targeting speciality markets by achieving certification for organic and Fair Trade, although at this stage they produce less than 2 percent of exports. These chains involve a relationship between exporters and farmer cooperatives. As shown by Table 1, considerable premiums are available for coffee that is certified under these schemes, with dual certification providing additional advantages. Others are also possible, such as Rainforest Alliance and Utz Kapeh, but these are not significant at this stage. While organic certification is possible for both plantation and smallholder coffee, the latter is the focus of this discussion.

The systems that are needed for organic and Fair Trade certification with smallholders are similar and require the establishment of cooperatives and traceability systems.

Providing these requirements are met, much of Papua New Guinean coffee would be eligible for certification under these systems. Because of their remoteness, most smallholders use very little if any chemicals and produce their coffee in sustainable multi-cropping systems. It would seem therefore that this system provides an opportunity for considerable expansion, because of the relatively small size of the Papua New Guinean industry. However, some key constraints are limiting this.

One of the key constraints is establishing and maintaining cooperatives and traceability systems. Cooperatives have a poor record in Papua New Guinea. Relatively low levels of education of village farmers and cultural issues generally lead to the failure of cooperatives due to a combination of conflict, poor management and corruption. Furthermore, in order to achieve certification, especially for organic, the process may take up to three years. Although no price premiums will be realized, the costs for inspection and auditing must still be met. As most smallholder farmers do not have the financial resources, the schemes that are overcoming these problems in Papua New Guinea generally involve a close relationship between an exporter and the farmer cooperatives. Considerable support, effort and costs are required from the exporter to facilitate the establishment and continued operation of the cooperative to ensure good governance and management. This is a slow process and is very much dependent upon the quality of local leadership. Certification is also complex and expensive, and arranging this would appear to be beyond the capabilities of most farmer cooperatives without the assistance of an exporter. Consequently, rapid expansion of these systems is unlikely and farmers and exporters who move too fast will probably fail. It requires committed exporters with an appropriate cultural understanding and patience.

Another constraint is that much of the organic and Fair Trade coffee is produced using similar processing systems to that used by producers of the mainstream Y grade coffee. This means it is still susceptible to problems of variation in quality and taste. If this issue is not addressed, customers are likely to complain about quality and markets could be lost. However, because of higher prices, more effort can be put into overcoming these issues. Existing chains focus on training in the village, with local inspections of parchment quality and hand sorting of the green bean.

Smallholder cooperatives delivering higher quality parchment or green bean to exporters

A third approach, which has two schemes; one supported by the Coffee Industry Corporation and the other by an EU-funded project, is to support smallholder cooperatives in bulking up parchment, which a dry mill then processes under contract before it is sold to an exporter.

The Coffee Credit Guarantee Scheme (CCGS) was established in 1997 by the CIC under the Smallholder Agricultural Credit Scheme. The scheme was initiated by the CIC as a means of providing capital to smallholder coffee producers, who without sufficient collateral, security and equity, are unable to borrow from the banks. To facilitate the repayment of loans, those coffee producers who borrowed from the CCGS were placed into clusters at either the village level or on the basis of clans. Under Phase Two of the Smallholder Agricultural Credit Scheme, CIC established a farmers' marketing cooperative to process the smallholders' coffee into green bean. The green

bean is then sold on consignment to the exporter who offers the highest price. Considerable support is provided by the CIC to run this scheme, particularly when it comes to arranging collection, processing and sale of the green bean. Because of the central role of the CIC in the formation and support of these groups, there is no formal chain, because the CIC organizes the farmer group's parchment to be processed in a commercial dry mill and then facilitates the sale to an exporter.

Other farmer cooperatives are supported by the EU-funded Stabex project which is assisting grower groups to improve the quality of parchment delivered to processors and exporters. The project provides training, audits the books and helps groups to look for buyers, but does not make the decision for the group on whom to sell to. The Stabex project provides subsidies for dry processing to participants. The subsidy declines over time and disappears after three years. Once again there is no formal chain, because the relationships with processors and exporters are fluid.

Like the organic and Fair Trade schemes, both these schemes produce coffee using village-level wet processing methods and hence potentially have problems with consistency of quality and taste. Problems arise with variation in cherry quality, wet processing methods and moisture levels of parchment. There are no existing quality assurance programmes except for the focus on quality by group members and any systems implemented by the dry factory and exporter. Some smallholders are hand-sorting cherry prior to pulping to remove green cherry, but not overripe cherry, while others sort parchment. Consequently, it is difficult for these schemes to produce coffee suitable for the speciality market and their green bean is often just better quality Y grade or PSC coffee. They may achieve some price advantages through being able to sell larger volumes of coffee and avoiding the roadside traders.

Once again a key constraint to the long-term success of these schemes is the sustainability of the cooperatives. At present, they rely on support from the CIC and the Stabex project. It is possible that some of the groups will achieve the necessary cohesion and skills to become self supporting, but many may not for the reasons already discussed.

Another constraint is that these schemes cannot be easily expanded because of staff constraints in the CIC and the Stabex project. Possible solutions to these issues depend upon the location and characteristics of the group. Where groups are close to existing centralized wet processing mills, they may be able to establish a relationship to deliver cherry either as individuals or as a group. Another solution for more remote groups is to establish a relationship with an exporter who is willing to help them achieve organic and Fair Trade certification. The exporter may also be able to facilitate the maintenance of the cooperative. A third solution is for the cooperative to build and operate a wet mill that produces consistent quality parchment. While this is theoretically possible, it requires considerable cohesion and management skills by the leaders of the cooperative and probably support by a third party such as the CIC and will be unlikely to have a high success rate.

Conclusion

Papua New Guinea sells the majority of its coffee at a discount to NY 'C' due to inherent problems with consistency of quality and taste. While the industry is highly competitive, the systems in place make it difficult to reward smallholder farmers for producing superior quality coffee. Only around 10 percent of Papua New Guinean coffee achieves significant premiums to NY 'C' and hence qualifies as speciality coffee. Most of this comes from the small numbers of remaining plantations. The challenge is to encourage systems that overcome the inherent constraints in the mainstream coffee industry so that more smallholder farmers can receive higher prices when they deliver superior quality coffee. The approaches to achieve this include:

1. Assist the expansion of commercial wet factories buying cherry and implement quality assurance schemes that enable them to sell to speciality coffee buyers. These schemes are providing price incentives of around one-third for farmers. Key constraints to the expansion of this approach are problems with achieving certification in the Papua New Guinean context, poor roads, law and order, and cherry theft.

2. Form organic and Fair Trade certified chains. These chains are also producing premiums for growers, although they entail higher costs because of the certification requirements. The key constraint to the expansion of these schemes is the need to have a functioning cooperative and product traceability. This is difficult in Papua New Guinea and the current successful schemes rely on a strong relationship between exporter and cooperative. Because they produce coffee with village wet processing methods, achieving consistent quality is an ongoing issue.

3. Form cooperative groups that produce larger quantities of consistent parchment that is dry-processed under contract and the green bean sold to an exporter. The successful schemes here currently receive support from the CIC and an EU-funded Stabex project. There is a question mark over the sustainability of these schemes when this support is withdrawn. Most of the coffee produced under these schemes is superior Y grade or PSC coffee rather than speciality coffee because of the variation in quality and hence it does not attract the same premiums as the other two approaches.

Acknowledgements

This research was funded by the Australian Centre for International Agricultural Research.

We would like to acknowledge the assistance of the Papua New Guinea Coffee Industry Corporation and its staff, in particular Kessy Kufinale, Charles Dambui and Brian Kuglame. Members of farmers' groups associated with the project and a number of key exporters and processors have also provided considerable assistance.

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The fair-trade market for fruit[30]

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Abstract

This article presents an overview of the international market for fair-trade fruits. It also details the history and values of the fair-trade movement. The activities of the Fairtrade organization are also developed. Fair-trade marketing enables smallholder farmers in developing countries to access niche markets in industrialized countries while receiving an assured fair remuneration for their labour, which is invested in the development of their community.

For the next few minutes, I will give you a short introduction to Fairtrade[31]. I will introduce you to the organizational structure, some of the different products and standards, and provide you with an overview of fair-trade market development and trends.

Fair-trade is not something that is applied to apples grown in Europe. It started really from the South–North trade. The idea is that rich consumers in the North buy products from people in the developing countries in the South. It started as a kind of development tool. At the heart of the matter is the need to address unfair market conditions between Southern producers and the Northern consumers. It started towards the end of the 1980s in many different countries in Europe with very small initiatives based mainly on the political aspirations of development organizations, NGOs and church groups trying to find ways of purchasing product more directly from producer groups in the poor countries and, through this, creating a better income for them.

These things stayed quite small. Some people may have this picture of people in sandals, long hair and big beards buying solidarity coffee from Nicaragua. Others may have a picture of third-world shops. Some worked well, but some didn't work at all well. Mostly, these were special trade outlets for handicrafts and a few food products, but no fresh food. The fair-trade movement went on and has since entered the mainstream market, which is quite interesting, because in the early days, there was a clear idea of who were the good guys and who the bad guys were. The good guys were the small producers and the bad guys were the traders and the multinationals. Today, we work with Starbucks, Nestlé and Marks & Spencer.

Fair-trade is most active in the rich countries. In Europe, where the system was developed, fair-trade is strongest, but the United States of America and Canada are both

[30] The following paper is an edited transcript of a presentation delivered to the International Symposium on Fresh Produce Supply Chain Management
[31] In this article, "fair-trade" refers to the socially conscious consumer movement described here whereas "Fairtrade" refers to the organizations under the umbrella of FLO.

picking up a lot and Australia is doing well. Normally in each country there is one organization promoting the fair-trade concept, advertising it, finding partners, and working with what we call licensees. However, if you want to trade across borders, you cannot do that so easily, as everybody has developed their own standards and their own concepts. In 1997, these organizations came together to form an umbrella organization: the Fairtrade Labelling Organization (FLO).

The fair-trade movement is different from the organic movement. The organic movement went into hundreds of standards until governments had to take over and say: "We cannot work with that anymore; we have to protect the consumer." Fairtrade came together and said: "We will give up our own institutional programmes and join together to make one standard and establish one umbrella organization to look after the standards, develop the standards and do the certification."

Thus, another organization, FLO-CERT, was established. However, this created another problem, because when you go into formal certification, you have to separate that. This is an ISO requirement, so in 2003, the organization was divided again: we now have the FLO Association – FLO eV – and a certification body – FLO-CERT. The two organizations are physically separated: different buildings, different management, but we still talk to each other. While the Association develops the standards, FLO-CERT controls them. As well as that, there is a producers' support unit. They call it a business unit, which tries to develop new products and supports producer groups in achieving the requirements of the market. In FLO-CERT, we stay out of development and extension. We look only at producer certification and trade certification. The whole value chain has to be controlled. We have to ensure that the products that end up on the market as Fairtrade products are actually those which have been produced by our Fairtrade producers.

Fairtrade has developed very quickly, especially in the last ten years. This is largely because Fairtrade got out of the niche market, into the international market, and decided to work with major retailers. In 2004, the turnover was around US$1 billion. In 2005, we had a growth rate of 37 percent, which is increasing every year. The market is not only growing quickly, but so also is the range of products.

In the beginning there was coffee. Coffee, coffee, coffee, and then came tea, and then more and more products. Fresh fruit is a very new product in the Fairtrade system. Looking at the demand side, different countries have different levels of penetration. Some countries, like Switzerland and the United Kingdom, are doing very well, and in other countries there is no Fairtrade at all, so there is still a lot of growth potential. In Switzerland, 50 percent of the bananas sold in the market are Fairtrade bananas, but in Germany, none. There is also some potential in the producer countries themselves: in Brazil and South Africa, interested and concerned consumers are now emerging.

At the moment, there are 574 producer groups certified, a number that is also growing very fast. We have a lot of applicants to deal with: last year about 300, which come partly with new products, but coffee is still growing.

We don't work with all products. At FLO-CERT, we work only with those products for which we have developed standards. We have product-specific standards: one is for small farmers' organizations and one is for those organizations that employ labour (plantations or factories). For coffee, we work only with smallholders.

Bananas are a huge product now in the Fairtrade system. Standards have been developed for fresh fruit and vegetables grown by small farmers. However, for plantations with hired labour, Fairtrade standards have only been developed for fresh fruit.

Fresh fruit started on a trial basis in 2002. It was a big task, not only for the small producers but also for the Fairtrade traders, because of the unprecedented demands on the value chain. While this area of our business is increasing in Africa, it is not growing in Asia. Although there is potential, most consumers are comfortable with their well-established conventional chains.

A few years ago, working with hired labour (plantations) was a no-no, but today, we are developing Fairtrade contract farming standards. In developing these standards, we have to look at the social development requirements. When a producer group applies for Fairtrade, we have to look at their development potential. Does it make sense for the consumer to pay a substantially higher price for a product to support its development? When we talk about small producers, how small are they? We have to define that and sometimes this is not easy. We do not work directly with individual producers but, rather, we work with producer organizations, normally cooperatives. They are not always called cooperatives; in some countries, cooperative is not such a good word. However, they are organized in a similar way to what we understand as cooperatives. They must be democratically organized, there has to be producer participation and they must be transparent.

Then we have a standard of non-discrimination and economic development requirements. We have two economic tools. One is minimum prices. Under Fairtrade, the farmer should always get a higher price or at least a sufficient return to recover the costs of production. Furthermore, there is a premium, but this premium is not for the individual farmer. This premium is for development activities. This is often a substantial amount of money: sometimes small producer organizations get US$400,000 in the first year, so they must learn to do something with it.

The producer groups must be able to export. This is definitely a requirement, either by themselves or through a trader. We do not say any more that trade has to be directly from the producer to the consumer, especially for fresh fruit. You need professional people in between, but the farmer group has to show that they are able to export either by themselves or through a partner. We want to see the farmer organization developing and ideally becoming an exporter themselves or taking more responsibility for the commercialization of their product; for example, quality control or consolidation of the product, but they don't have to go to the last step of export.

Then we have environmental requirements. These are not organic. Sometimes people think Fairtrade is also organic. I have to say that a lot of Fairtrade products are organic

and these are also certified organic. Consumers who are socially concerned and who are willing to pay a higher price for Fairtrade products are often the same consumers who pay a higher price for organic product. If the producer group is not certified organic, we also have environmental standards. A lot of pesticides are forbidden. The producer groups must have an internal control system to show what pesticides have been applied, how they were applied and what impact, if any, that this had on the environment. It is a little bit like GLOBALGAP.

In cases where there is hired labour, like a tea plantation, we have to look into labour conditions. We work with the International Labour Organization (ILO). One big thing is child labour. We promise that a Fairtrade product is not produced with child labour and not with forced labour: labour rights and conditions must meet the standards.

Of course, we also have product-specific standards for fresh food. We need product-specific standards because we are looking into prices and we are looking into premiums. The fresh fruit standard is an example of how difficult this can become because every country has different prices, different production costs, different products and varieties. So what we have to do in every country and for every kind of product is to develop minimum prices and premium prices. There is a guaranteed farmgate price per kilogram, and there is a minimum free-on-board price. These differ depending upon how the producer groups are organized and according to the product. Then there is the premium, but this is not for the trader, or the individual farmer, but for the organization and their development activities.

DELEGATE: About ten days ago I was in Kabul and I met a person who was busy trying to develop fair-trade for some products there. I asked: "How are you going to meet the European sanitary standards, because Afghanistan isn't very clean?" This person tried to tell me that because they were going to get fair-trade certification, they didn't have to worry about these other standards. So first, I would like you to confirm that this is not true and, second, please tell me how you are going to get these people to understand that they have to be very serious about the sanitary issues to get product from Kabul to Germany?

MR ROSENKRANZ: There are a lot of NGOs working on the supply side and a lot of individuals and producers that do not necessarily reflect the official position of FLO. Often you meet someone who speaks about fair-trade that is not in line with us. Of course, fair-trade products must meet all the sanitary requirements to gain market entry. I think you can work with producers in Afghanistan, but you must work with your suppliers.

DELEGATE: Fairtrade is about establishing an emotional link between the poor farmer in the South and the rich consumer in the North. Why is it that consumers in the less-developed countries have not engaged into Fairtrade?

MR ROSENKRANZ: Fair-trade was initially about colonial products: product from the poor to the rich. However, it doesn't have to stop there. In many of the southern countries, consumers are becoming more concerned about social issues. But these markets are very small niche markets, not unlike what we experienced in Europe in the

1980s. There is also a problem of economies of scale. If you want to promote fair-trade in a country, if you want to have a national initiative, you must first sell a certain volume. Even in Thailand, there is a potential market for fair-trade products, right here in Chiang Mai. If you so wish, you can buy Fairtrade coffee.

DELEGATE: Should we have Fairtrade for farmers in the developed nations?

MR ROSENKRANZ: This is not what we stand for. This is not the image of Fairtrade. People buy Fairtrade product as a development tool.

DELEGATE: Is FLO the only fair-trade organization?

MR ROSENKRANZ: There may be other fair-trade initiatives, but FLO is the only one which is internationally recognized and provides higher returns to the producers. Some organizations have their own labelling and they label their own products. Some traders say, "Our product is Fairtrade" and they create their own fair-trade brand, but they don't have any external verification. Some organic certification bodies are trying something at a local level, but so far, the Fairtrade movement has stayed together. Most traders insist on the FLO label, because they say: "We don't want to split up like the organic movement."

CHAIR: Are there any controls on the use of the Fairtrade label by companies such as supermarkets, because it seems to me that Fairtrade is becoming primarily a marketing tool. I recently saw Fairtrade chocolate biscuits. My understanding was that the only Fairtrade component of that was the chocolate in the biscuits which was probably only about two percent of the value of the biscuit. What sorts of controls are there on the use of the Fairtrade label?

MR ROSENKRANZ: We have Fairtrade standards and there is a composite product standard. We have Fairtrade chocolates, but not all fair-trade chocolates are always Fairtrade. I don't actually know the figures, but the cocoa has to be from a Fairtrade source and also the sugar. I really don't know, but if it is a Fairtrade label product, I would think that at least 50 percent of the ingredients would have to be Fairtrade.

We do come from this idealistic niche path, very politically, ethically motivated, and we are working with the multinationals. There is a lot of discussion, especially within the Fairtrade system, and people are heavily divided on that. For example, Starbucks was for many people in the Fairtrade movement a target for anti-campaigning, but now we are working with Starbucks. Starbucks sells one or two percent of their coffee as Fairtrade coffee. They cannot sell more of that, because we will not allow them to make a statement that "All Starbucks coffee is Fairtrade". I have been inspecting several producers' groups which are delivering to them and they are very happy. They get the benefits. If we criticize them, we have to allow them to change. We have to allow them to become Fairtrade. We cannot say that we are exclusive, "We are the good guys; you are the bad guys. We won't allow you to become good." But, for sure, there is a danger of people using Fairtrade labelling to whitewash their reputation. At the end, it is the consumer's choice.

Fair trade as product differentiation strategy for market access: an exploratory study of honey producers in southern Brazil

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Abstract

Fair Trade (FT) can be defined as a network established between producers and consumers with a strong element of mutual trust that binds everyone together. Nevertheless, the requirements for international trade are often codified by standards which are also imposed on producers. FT operates in parallel to the existing trading system. FT is an example of a set of private voluntary standards adopted in the agrifood supply chain. Clear rules, inspection and trustworthy certification are key points for FT assurance. FT can be considered a generic international quality assurance scheme defined and managed by independent standards organizations including the FLO. The literature on food standards has focused on two analytical approaches. The first and more dominant approach focuses on mandatory standards and international standards ruled by the World Trade Organisation (WTO). Most studies consider standards as barriers, highlighting the technical and managerial difficulties that developing countries face in compliance. The second approach emphasizes the opportunities provided by standards and how developing countries can use those opportunities to their competitive advantage. This is provided especially by private standards such as industry codes of practice, quality assurance schemes, organic and FT systems. The aim of this paper is to discuss some preliminary results of a research project assessing three groups of small honey producers from Southern Brazil. These producers are selected as being able to comply with FT standards. FT certification not only helps them to access international markets and consequently to gain better margins, but also to help their local networks of cooperative producers. As a result of the collective organization of farmers, transfer of knowledge in the form of good practice is transmitted.

Introduction

Significant economic, political and cultural transformations occurring since the 1970s characterize the increased integration of the world economy. The globalization of food chains illustrates a division of stages in production which are located at different sites. Diverse countries provide resources such as labour and raw materials that end up contributing to a final product. This network of commodity exchange binds producers and consumers across the world under the dominance of large agrifood transnational companies (Dolan and Humphrey, 2000; Farina 2002; Reardon *et al.,* 2001).

In recent years, the new trading paradigm of Fair Trade (FT) has developed and provided an alternative route to markets for food products coming from smallholders located in developing countries (Lewin *et al.,* 2004). The food industry has played an important role in the development of FT networks recognizing the need to obtain

sustainability through realizing the economic benefits that this can bring to businesses. In fact, fair trade operates parallel to the existing trading system. According to Barrat-Brown (1993), fair trade is in essence a network established between producers and consumers with a strong element of mutual trust that binds everyone together.

Fair trade is an example of a set of private voluntary standards adopted in the agrifood supply chain (Jones *et al*., 2004). The role of clear rules, inspection and trustworthy certification are key points for FT assurance. It can be considered a generic international quality assurance scheme (Reardon *et al.*, 2001) defined and managed by independent standard organizations such as the FLO.

The literature on food standards has focused on two analytical approaches (Jaffee and Henson, 2004). The first and more dominant approach focuses on mandatory standards and international standards ruled by the World Trade Organisation (WTO) broadening the standards of developed countries. Most studies consider standards as barriers, highlighting the technical and managerial difficulties that developing countries face in compliance. The second approach emphasizes the opportunities brought by standards and how developing countries can use those opportunities to their competitive advantage. This is provided especially by private standards such as industry codes of practice, quality assurance schemes, organic and FT systems.

Although Brazil is an important international player, its food exports are derived mainly from large sized enterprises (Jank *et al*., 2001). Nevertheless, as FT is about engaging smallholder producers in international trade, the aim of this paper is to discuss some preliminary results of a research project assessing three groups of small honey producers in Southern Brazil. These producers are selected as being able to comply with FT standards. The FT certification may not only help them to access international markets and consequently gain better margins, but also help their inclusion in local networks of cooperative producers.

This research involves three steps. The first step is to characterize these groups of honey producers, their practices and vertical or horizontal relationships using semi-structured interviews (associations, academics and members of the FT chain). Secondly, the paper identifies and proposes changes to their production practices which would enable them to obtain FT certification. Finally, the study critically analyses whether such certification really provides access to international markets and a premium price and whether the costs associated with obtaining certification are worthwhile.

Market access

As a result of trade liberalization that culminated at the GATT Uruguay Conference and the emergence of the WTO, signatory countries have committed to reduce tariff protection, mainly in manufactured goods. This was possible due to the productivity of industrialized production growing steadily since the mid 1950s. Nevertheless, in that same period, the agricultural sector experienced a fall in comparative advantage, which is considered to be the root of the agriculture protection experienced today (Hayami, 1988).

More recently, in the Southern hemisphere, developing countries specializing in agricultural commodities have been forced to open their markets following the neoliberal wave of globalization that encompassed the world. However, in a period of liberalization, opposing forces to openness occur mainly from the developed countries that have either increased or maintained policies that continue to protect their agricultural sectors. This is the case of the Common Agricultural Policy in the European Union, the Farm Bill in the United States of America and farmer support measures in Japan, which ultimately distort commodity markets.

Distortion has many facets. The most common distortion is caused by production subsidies which result in overproduction. Such excesses end up in the international market causing agricultural commodity prices to collapse. Protection of agricultural markets can also take place in the form of restricted imports, thus limiting market access. Such a dichotomy in openness and protection creates tensions and imbalances and widens the gap between rich countries in the North and poor countries in the South.

With pressures mounting for the imminent liberalization of agriculture as a result of the long-awaited implementation of the WTO Doha round Article 13, tariff-based protection is under severe scrutiny. Nonetheless, industrialized nations are one step ahead and have introduced measures that will replace tariff protection with non-tariff protection. A series of food safety and product quality standards have been introduced into the European Union, the United States of America and Japan, to restrict market access for agricultural commodities from the less industrialized nations.

It is fair to say that industrialized nations have experienced many food safety scares such as Bovine Spongiform Encephalopathy (BSE) and outbreaks of *E. coli* 150, among many others. Thus, protection based on quality and safety standards that ultimately lead to credence by the consumers is something that is not constrained to governmental policy but is, in reality, of consumer sovereignty. A myriad of terms such as food safety, quality control, assurance, traceability and more recently origin, provide the consumers in industrialized countries with enough product attributes. However, it also raises the minimum requirement for producers in less industrialized countries that are dependent on agricultural commodities for their export earnings. Hence, market access is now controlled by private, national and supranational bodies (i.e. GLOBALGAP) that set the rules and provide certification that must be adhered to.

However, despite all the protection and market access difficulties, producers of agricultural products in the less industrialized nations find markets in developed countries attractive. Following Adam Smith’s classical theory of trade, an exchange of goods takes place when there is a price differential between two nations.

The Fair Trade movement as an alternative to market access restrictions

The Fair Trade (FT) movement has spread in the shadow of the tensions caused between the more industrialized and less industrialized countries with respect to market liberalization, openness, protection and limited market access for agricultural products. Fair Trade is understood as a new way of looking into a production and market system in an attempt to overcome market imbalances, especially for small farmers. It also tries to address issues of market access by creating specialist marketing channels and

networks that operate in parallel with the existing trading system. Nevertheless, in order for this to happen, the requirements for operating at the international trading level are often codified by standards which are also imposed upon producers. Thus, those engaged in Fair Trade have to follow basic principles, such as:

- direct purchasing from farmers;
- transparent and long-term trading relationships;
- agreed minimum prices;
- a focus on development and technical assistance through the payment of an agreed social premium.

For developing nations, the difficulties encountered in accessing high income markets can be solved in the short term by joining a Fair Trade network. In the case of small honey producers in Brazil, it works as an alternative strategy for producers organised in a cooperative-type structure. Hence, the extra hurdle in getting a product certified organic and under the Fair Trade banner is justified in the name of market opportunity, a differentiation strategy worth considering.

Since Fair Trade makes use of the conventional trading system, it uses "credence apparatus" to mimic the market practices closely. In the evolution of FT in agrifood products, the quest for product certification as a differentiation tool works, as opposed to the global undifferentiated homogeneous market.

Businesses such as the honey producer's cooperative in Brazil that can capture these ideas and then communicate them to their consumers have been found to be more sustainable, and more successful in overcoming barriers and accessing different markets (Aguiar, 2006). To engage in either a mainstream or niche market strategy is about positioning a business to supply superior quality product either across the market or to a chosen market segment (Porter, 1985).

The FT market is still restricted to consumers that are sensitized by ethically driven demand. Such businesses offer products that are perceived to be socially responsible (Crane, 2005, cited by Harrison *et al.,* 2005). Here the ethical dimension provides enough differentiation for consumers to choose between businesses and products. In this sense, credibility in the way a good is produced and traded provides an alternative to industrialized products with high in-built technology that sometimes threatens social relationships, the environment, animal welfare and human health (Harrison *et al.,* 2005).

The high-income consumer in developed countries is reaching a point of saturation regarding product choice, especially if the product in question is of high value. Thus, there is a move in the market towards goods that provides an emotional connection. The case of FT honey from Brazil that can communicate naturalness, organic production and stories of the people who manage the bees will embody a sense of community that can diminish the barriers to market access. Nevertheless, as regulatory frameworks become more entrenched as a means of further defending markets in the more industrialized markets, producers will need to meet even more demanding requirements. Thus, considering FT as a differentiation strategy to access markets is not enough. Simply achieving product differentiation may not be enough. Eventually the consumer will

move on and therefore product innovation should continue to identify new ways of fulfilling consumer demand.

Objectives

The aim of this paper is to discuss some preliminary results of a research project aimed at assessing groups of small honey producers in Southern Brazil. These producers were selected as being able to comply with FT standards.

Methodology

The focus of this study was the State of Rio Grande do Sul, roughly the size of the United Kingdom. For the purpose of this study three areas were initially considered for the analysis as shown in Table 1. Area One (Osório) is located along the state's Atlantic coast where the population is less dense and the number of industrial units is very low. Area Two (Porto Alegre) is located in the capital city metropolitan area. Area Three (Sao Jerônimo) is located some 100 km west of the capital city. Areas One and Two did not qualify. Area One's non-qualification was due to seasonal labour conditions as a result of the summer months when the farmers and their families work in bars, restaurants and hotels to supplement their annual income. Area Two, characterized by the green belt area of the capital city, did not qualify due to not complying with the Fair Trade + Organic certification requirements. Hence Area Three served as the base for this study.

Table 1: Areas of Study

Areas	Municipalities	Total honey production (kg, 2004)
One – Osório	22	171 484
Two – Porto Alegre	22	137 931
Three – Sao Jerônimo	9	160 000

Data was collected by the means of a survey using face-to-face interview technique. Further rounds of group discussions with honey producers were carried out to deepen the issues raised from the questionnaires.

Discussion

Brazil is the 15th largest honey producer in the world. In 2004, Brazil produced 32 290 tonnes (IBGE, 2004), and has since become the 5th largest honey exporter (FAO, 2005) and there is still scope to increase production. The Southern part of Brazil where this study was undertaken is responsible for 47 percent of the country's total production, with the State of Rio Grande do Sul alone being responsible for producing 7 317 tonnes of which 1 691 tonnes were exported (Table 2).

Table 2: Honey production, exports and domestic consumption in Brazil from 1999 to 2004

	2000	2001	2002	2003	2004	2005
Production (tonnes)	21 865	22 220	23 995	30 022	32 290	40 000
Domestic consumption (tonnes)	21 900	20 000	11 400	10 800	11 300	na
Exports (tonnes)	269	2 489	12 640	19 273	21 029	14 500
Average price of exports per kg (US$)	1.07	1.13	1.83	2.36	2.02	1.31

Source: Based on data provided by FAO (2005) and IBGE (2005)

Until 2001, the majority of honey production in Brazil was consumed internally. However, since then, Brazil has progressively increased its international market share by getting access to more added-value markets.

The FT certification may not only help them to access international markets and to gain better margins, but also help their inclusion in local networks of cooperative producers. Following Nicholls and Opal (2005), as a result of the collective organization among farmers, transfer of knowledge in the form of good practice is transmitted, which helps the process of upgrading.

This paper focuses on Rio Grande do Sul, the Southern-most state of Brazil. This state is responsible for producing some 25 percent of Brazil's honey. The honey production derived from this region is typically of small- and medium-scale enterprises that generally employ family labour in small farmsteads.

Although the export of honey from Rio Grande do Sul is undertaken primarily by three specialized companies which purchase honey from a network of small producers, this study attempts to unveil the means to engage smallholder producers in international trade by qualifying them to engage in Fair Trade marketing.

According to the Brazilian Secretariat for Family Agriculture (Ministry of Agrarian Development, 2006), most family honey producers own up to 50 beehives. For a honey producer the number of beehives and income are directly related: the greater the number of beehives the more likely honey production is to be the main source of income. In the past ten years, honey production has doubled. This has been achieved as new honey producers commence beekeeping activity with small numbers of beehives. This relationship is highlighted in Tables 3 and 4.

These numbers show that honey production is an activity where scale is a key point. Small producers need to add value to their products to be able to receive a better income and to sustain their livelihoods. Next we will argue how FT and organic certification may be considered as strategic options to honey producers.

Table 3: Honey production costs (100 Beehives)

Total Annual Cost (R$)	3 766.77
Sale Price (R$/kg)	1.40
Production (kg)	3 000.00
Total Revenue	4 200.00
Cost Price (R$/kg)	1.27
Profit (R$/kg)	0.13

Source: Embrapa (2003)

Table 4: Honey production costs (350 Beehives)

Total Annual Cost (R$)	9 786.70
Sale Price (R$/kg)	1.40
Honey Production (kg)	10 500.00
Total Revenue	14 700.00
Cost Price (R$/kg)	0.93
Profit (R$/kg)	0.47

Source: Embrapa (2003)

Certification

In order to participate in FT and to capture the consumer demand in the ethical market in developed countries, the product must not only comply with the FT principles, but also be of organic origin. Thus the formula Fair Trade + Organic (FT+O) puts an extra hurdle on producers.

The Soil Association in the UK (2005) states that in order to qualify for organic certification, apiaries must be sited on organically certified land, and must have ample access to natural nectar, honeydew and pollen sources. In addition, hives should be situated within four miles of:

- uncultivated areas of natural vegetation;
- organic crops;
- crops have been managed under low environmental impact under EC regulation 2078/92;
- bees must be kept away from sources of contamination such as urban centres, motorways, industrial areas, waste dumps and incinerators.

The standards for organic honey production restrict the producer to specific areas in regions that will qualify for certification. Nevertheless, beekeepers of Area Three have a multifunctional characteristic typical of their small holding structure. This has proven to be a challenge to organize farmers into associations in an attempt to spread the costs of certification as seen in Table 5.

Table 5: Fair Trade certification costs

Quality	Number of members	Fees (€)
A	< 100	2 000.00
B	101 – 500	2 200.00
C	501 – 1 000	3 000.00
D	> 1 000	3 400.00

If a group of producers have their own processing plant, the following additional fees will apply, as shown in Table 6.

Table 6: Additional fees for smallholder processing plants

Quality	Number of members	Fees (€)
A	< 10	200.00
B	10 – 100	400.00
C	> 100	600.00

Pricing

Honey prices also depend on the quality of the final product. According to the FLO, honey quality is calculated using two criteria: percent of water in the honey – humidity, and presence of Hydroxymethylfulfural, which generates a points system.

Fair Trade organizations are committed to offer producers a price that covers all production costs. In addition, prices should also provide comparatively good remuneration for labour, thus providing members and their families with adequate living conditions. Producer organizations should also receive a percentage of the prices to cover their supporting services to beekeepers, as well as other social development activities within the community.

Table 7 shows the prices and the premiums paid for honey at the time of this study. In cases where the market price in a producer country rises above the FLO minimum price, the premium prices disappear and the spot market price would then be exercised (Fairtrade, 2006).

Table 7: Prices for Fair Trade honey

All producing countries	US$ per kg				
	Fair trade minimum FOB price	Fair trade Premium	Total Fair trade price	Organic differential	Total Fair trade Organic price
A Quality	1.80	0.15	1.95	0.15	2.10
B Quality	1.65	0.15	1.80	0.15	1.95

Source: FLO (2006)

Results

The preliminary data from the group of honey producers selected suggests that there is a need to adapt some technical standards and implement some improved management of beehives so that quality can be improved to qualify for FT certification. The current average productivity is 18 kg of honey per year per beehive. There is significant scope to increase production to 60 kg of honey per year per hive. However, for the whole group of producers to meet the certification requirements, the social standards imposed by the FLO will have to be better understood and evaluated. Fortunately, our analysis shows that there are no technical restraints for these honey producers to comply with the standards imposed by the FT system. However, honey producers will have to bear the costs of certification which can be very high for such small scale production.

Another question that arises from our analysis is that although the FT system may empower these producers to access markets, the mechanisms that would allow these producers to grow are not clear. Some critics say that for the FT system to perpetuate, it requires the rich country–poor country relationship to be maintained. Following Aguiar (2006), this reinforces the notion that "breaking the colonial pact and dependency is the root behind fair trade initiatives. Nevertheless, as paradoxical as it may seem, such a pact is in earnest reinforced and perpetuated by Fair Trade certification bodies."

The analysis of the group discussions shows that being certified by FLO would bring larger margins. Nevertheless, it will not guarantee an improvement on managerial or technological practices, and in fact would maintain the producer's small size.

When asked about this issue, FLO officials argue that Fair Trade certification provides training and information for producers to access markets. They affirm that small producers will not be able to develop these skills without the technical assistance they provide. As a result, FLO is the agent governing the chain, establishing who will be included or excluded of the "fair trade system".

The preliminary results also suggest that there is a risk of becoming increasingly dependent on the export market, specifically the European Union ethical consumer eager to consume less developed world imageries. These findings support Leclair's (2002) concern that the fair trade system relies upon the goodwill of a small group of consumers. Within the developing countries, there is no domestic or alternative market that will pay more for social and ethical standards. These honey producers would incur high risks to become overspecialized and extremely dependent upon a niche market.

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Geographical indications: concepts and implementation in Thailand[32]

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Abstract

This article presents the principles of geographical indications as implemented in Thailand. A geographical indication (GI) is a quality sign protected under national intellectual property law, which enables producers to differentiate their produce by linking it to their geographically specific agro-ecological environment. Proof of a scientific relationship between the geographical characteristics of the production location and the produce must be delivered for a new geographical indication to be created. The careful definition of the geographical delimitation of the GI and of the terms of references for the production and processing practices are very important to allow an unequivocal use of the quality label by producers within the area protected under the GI.

Before I go to my slides, I would like you to think of an example. When you buy a bottle of wine, apart from the brand, you think about where the wine has come from. In Thailand, usually people think of wine from France, from Bordeaux, or from some other famous region in France, Italy, Spain, or even from Australia. The location, region or area has an influence on the perceived quality of the product. The GI, or geographical indication, is a mark or a sign which indicates this link. When you use the name of the region with your product, it indicates or sends a signal to the consumer, to the buyer, that the product originates from that geographical origin, and has some specific quality characteristics.

In Thailand, pomelos from the Nakhonchaisi region are quite famous. They are famous because the texture of the pomelo is very good. The fruit is very juicy and very sweet and people are willing to pay a higher price to buy this product than a pomelo from other regions. Similarly, in Chiang Mai, there are quite a few GI products: for example, coffee from Doi Tung. The coffee from this region is of excellent quality.

Geographical indication, in a sense, is a kind of intellectual property. Thai people usually think of copyright, British people think of patents and Indonesian people might think of trademarks. GI is a unique intellectual property, different from other kinds of intellectual property, because GI is a sign that belongs to the community rather than to individuals. Therefore, it is not assignable. You cannot sell this sign to someone else. The sign belongs to the community and to the producers in that area.

[32] The following paper is an edited transcript of a presentation delivered to the International Symposium on Fresh Produce Supply Chain Management

To get the GI registered, you have to meet certain criteria. You have to be able to show the Department of Intellectual Property (in Thailand), that your product has a specific link to the region in terms of quality, in terms of character and in terms of reputation.

In 2003, we enacted the law on Geographical Indication Protection to give proper protection to this sign. This law prevents any misleading use of the sign. That simply means that if your products do not come from the specific region which is indicated on the label, you are not allowed to use that sign.

The sign itself may not only be a symbol, it could be a name. It could be something else which can refer to that region, but most of the geographical indication signs that have been registered with the Department of Intellectual Property are names of the regions; for example, Nakhonchaisi pomelos or Doi Tung coffee. Some of those that are in the process of being registered include Hom Mali rice from Ubon Ratchathani, Phrae Wa (Thai silk) from Kalasin. So the geographical indication is usually the name of the region which is associated with the product.

However, these are some legal considerations. The geographical indication which can be registered must not be a generic name. For example; when we say Chinese tea, Chinese tea is not, or does not, necessarily mean that this tea is from China. Rather, it indicates the type of tea and the way people drink the tea. Furthermore, you cannot just simply register the word pomelo as your geographical indication, because it is the common name for that kind of product. You would have to link it with the geographical name. Then, the name which will be registered as a geographical indication must not contravene public order, morality or public policy.

Geographical indications can be used with agricultural goods, industrial goods, or even with handicrafts. Some examples are; Jasmine rice from Thoong Gula Rong Hai. Thoong Gula Rong Hai is an area in the northeast part of Thailand. This area covers five provinces; pomelos from Nakhonchaisi; and salted egg from Chaiya. However, salted egg from Chaiya is not a good example, because there are different groups of people in that area and each of them have their own method of producing salted eggs, so there is some doubt as to whether the product is generic.

Industrial products include, for example, wine from Phu Rua Chateau and Phrae Wa silk. This is very famous because of the texture, the pattern, which is very unique, and the way people make it. The local people have a specific way to make this kind of silk. For handicrafts, earthenware from Koh Kret is very famous. Koh Kret is on the outskirts of Bangkok and is a tourist attraction as well.

To register a GI, people cannot simply think of a name and then file an application. They must first undertake some research. This begins with a meeting among interested groups. The applicant must then demonstrate that the product has some link with the region. This means that if the same product is grown somewhere else it will not produce a product with the same characteristics. The applicant must then specify the process by which the product will be produced. You have to indicate how you will grow the product, how you make it and the process of maintaining the product. If you think about a pomelo, you have to specify the area. You have to specify the breed, the variety, and

the process of picking the produce and transferring it from one place to another place in order to be able to control the quality of your product.

Because geographical indications belong to the community, every producer and every interested party in the region has to come together. When you draft your application, you must have certain control mechanisms in place so that when the authority examines the application, they know that your product possesses certain standards that can be verified and traced back to the origin. The most important aspect is that your product is distinctly different from other products of the same type. Because it is a geographical indication, you must provide a map indicating the area in which the producers can grow the product and be qualified to use the geographical indication sign.

You must provide some scientific proof as well. For example, the aesthetic appearance of your product, how it looks when it is ready to be picked from the tree, and when the consumer buys it, what it should look like. This kind of thing conveys a message. The sign that you use with your product will convey the message to the consumer that your product is ready to be consumed and is in perfect condition, and it meets certain standards which you specify in your registration. To ensure that the consumer gets good quality product, you have to control things right from the beginning. The control system will consist of many registered producers, an internal control plan and an external control plan.

DELEGATE: In your outline of registration, you have a production process within that system. Who will certify the production process? A certification body, or your department?

MR EKKAYOKKAYA: It depends on the type of product. For an agricultural product, the Ministry of Agriculture helps to certify the link between the product and the land, or the area. If the applicant believes that there is some link between the quality of the product and the land, they must provide scientific proof. This will be checked and verified by the Ministry of Agriculture.

DELEGATE: In the case of Surin province, which is near Cambodia and produces a similar quality of rice to Hom Mali, what measures are in place to ensure that this product is Thai and not Cambodian?

MR EKKAYOKKAYA: As far as I understand, the area in which Hom Mali rice is grown in Surin province and Cambodia are not right next to each other, but at least 100 kilometres apart. The land between these areas – in both Cambodia and Thailand – is slightly different in terms of the soil condition and the character of the atmosphere which influences this particular type of rice. The technicians say they can trace the origin by DNA fingerprinting or something like that, which can give you a certain idea that the rice from this region is different to the rice from another region.

One of the important things about geographical indication is that it is not only the character or the specific type of the plant which is important for registration, but also the reputation attached to it. Certain products can come from a nearby region, but they have a totally different reputation. This is because of the quality control and the history

associated with the product itself. Certain products, for example, grilled pork from Trang province, the method of grilling the pork could be carried out anywhere in the world. It could be done in Bangkok; it could be done in Chiang Mai, but the reputation which is attached to the product is not the same, and the history associated with it is not the same. Its origins date back 80 or 100 years. I can't remember how this grilled pork came about, but it does have a history which is shown in the registration and in the application. So grilled pork, the same grilled pork, but from a different region, would not attract consumers at the same level. That means if you are a consumer and you are going to pay for the genuine grilled pork from Trang, or grilled pork from some other province, you have to think twice whether it is worth money paying for that or not. You are not sure whether the quality is the same, even although people will assert or allege that their pork has the same quality.

DELEGATE: Who specifically is certified? Is it the farmer himself who can put the sticker that his pomelo is from Nakhonchaisi, or is it the community who can put the sticker on it?

MR EKKAYOKKAYA: The producers, but the producer must be registered first. They have to become part of the association or must prove that they can verify that the process complies with the standards confirmed by that body. When they are able to show that, they are entitled to put the sticker on by themselves.

DELEGATE: In other words, if my pomelo is from the geographical area, but my soil is not brown and does not meet the acidity range or the pH, I will not be allowed to be a member of the association, and then I will not be able to get the sticker? Is that how it works?

MR EKKAYOKKAYA: Yes, but the applicant has to verify first and specify the area which can grow this pomelo. If you are in that area, this means your product will be qualified to have this sticker attached to it. However, if you are not in that area or your area of land has a different type of soil, this means the application is wrong. You have to amend the application.

DELEGATE: If for example, the variety of pomelo that a farmer grows is different, can they still attach a sticker?

MR EKKAYOKKAYA: Yes, if that variety was part of the registration or application. You have to specify the variety of the pomelo first that are permitted.

DELEGATE: Firstly, I would like to add that the geographical indication is not related only to the geography, the location or the reputation, but also to the traditional way in which the product has been produced. My question is that you should clarify who can be the applicant to register the GI product? Who has the right to use the GI sticker on the product? How long does it take you to certify or to prove that a product has a specific characteristic and that it should be a GI product? How much does it cost?

MR EKKAYOKKAYA: In law, there are three groups of people who can apply for geographical indication registration in Thailand. The first one is a government authority

responsible for, or related to, that product; for example, the governor of the province. He is entitled to file an application on behalf of the producers or farmers who produce the product in that area. Secondly, the producers or the manufacturers themselves may apply, and thirdly, it is the consumer. Consumers are not often the applicant, because the consumer usually does not know how the product is produced. I totally agree with you that in the application you have to provide some information regarding the tradition which is associated with the product.

DELEGATE: What about the person who has the right to use the GI? For example with Rattan products, when rattan is grown in a province but transformed in other communities, for example in the city, do the latter also have the right to use the GI?

MR EKKAYOKKAYA: Yes, they do have the right, not only producers from that area, but any business people in that business circle, like the person who received the product and transports it to sell in another area. You can use that sign, you can use the geographical indication for the product, but not producers from other regions.

DELEGATE: Normally, how long does it take you to prove that it is a GI product?

MR EKKAYOKKAYA: It depends on the type of product. If it is a plant which has, for example, a one-year cycle, you probably need one or two years to prove that, because you can prove the link only one time a year, so you have to wait until the next crop or the next cycle comes about. The next year you can double-check your produce to make sure that there is a link between your product and the region, but again it depends on the product. Some products are harvested every two or three months, so in this case, the certifying period is shorter.

Traceability systems applied to FFV export chains in Thailand[33]

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Abstract

Traceability systems operating in fresh fruit and vegetable (FFV) export chains emanating from small-scale farms in Thailand were analysed. Interviews with chain actors revealed that key export markets for Thai FFV are demanding product traceability. These demands are driven by issues such as food safety, and brand or market protection. In general, FFV traceability systems in Thailand are in their infancy with most of the small pack houses not able to trace produce reliably. However, about five larger pack houses can demonstrate effective use of a traceability system. Hurdles to adopting traceability solutions relate to the nature of the supply chain, lack of awareness and limited resources. Lessons learned from the firms operating successful traceability systems include the need to shorten the traditional supply chain, to employ contract farmers and to be prepared to commit considerable resources in developing the system. In many cases, data may not be reliably collected and stored; when it is, there are invariably differing data collection practices and proprietary information or identification systems. No single solution has the capability to provide an effective one-stop solution to traceability of FFV in Thailand. The key is judicious selection of a basket of approaches customized to meet the needs of a particular situation. A successful approach to traceability of FFV in Thailand is briefly summarized to illustrate solutions on how to deliver the required level of traceability and associated information at an acceptable cost.

From the outset, I must stress that this presentation is about the traceability of fresh fruit and vegetables. What I have to say does not apply to other sectors such as chicken, shrimp and seafood. Fresh fruit and vegetables are very, very different as we will soon see.

Traceability is about a series of mechanisms by which we identify and prepare data, collect and store data. As produce flows through the supply chain, records are added at every stage and we keep a history of where the produce has been and where it is going. Traceability is about a product knowledge framework and in many cases we see parallel traceability systems. At a very basic level we can see where the produce has come from, when was it harvested and where it is going. However, an increasing number of buyers and an increasing number of markets require. more detailed information. Here traceability refers to other information such as fair-trade, organic and other credence attributes. As a result, we often have two levels of traceability and thus two levels of documentation.

[33] The following paper is an edited transcript of a presentation delivered to the International Symposium on Fresh Produce Supply Chain Management

Many of the key markets for Thai fresh produce require traceability; principally Europe and Australia. Some of the Thai fresh fruit and vegetable exporters are responding to this need. I say "some", but not all. Probably only five or six companies in Thailand at the present time can provide comprehensive traceability systems. The other 60 or so packing houses cannot do this. So, essentially, traceability for fresh fruit and vegetables in Thailand remains in its infancy.

There are many reasons for this. The number one hurdle is the lack of awareness of the need for traceability by the firms, but there are also other barriers to the implementation of traceability imposed on the packing houses and the exporters.

When we talk about traceability, we talk about varying three parameters: the breadth (how much information we need to collect); the depth (how far back we need to go); and the degree of precision or accuracy. All of these vary in Thailand. Traceability on its own does not assure the safety of a product, but it is one of many tools in a bigger scheme. If we want traceability to contribute, if we want to have a safe product, we have to have a robust quality management system in place. We need to have robust good agricultural practices (GAPs) and we have had lots of discussion about GAP in Thailand and the rest of the region. Without these systems, tracking is not going to guarantee the safety of the product.

We also need commitment from the chain members. No one is going to commit time and effort if there are no benefits; the farmer needs to realize benefits; all the supply chain actors need to realize benefits, because without benefits, there is no commitment.

At the end of the day, traceability provides a perception of food safety, but without the underlying mechanisms in place, it does not guarantee food safety. If we look at the key markets in Thailand requiring traceability, we see that there are variable drivers. In Europe, the main driver is risk management and liability legislation, being able to demonstrate due diligence and to manage a recall efficiently. However, we also see the market becoming more differentiated and the increasing need for producers and food manufacturers to provide evidence of a substantive claim, a credence claim, and productivity gains. Knowing your supply chain allows you to improve your supply chain. So, for an exporter in Thailand, we may see some or all of these drivers being the reason why a buyer requires traceability. This obviously drives information needs and drives the type of traceability system at the end of the line.

Into the European Union (EU), we obviously have due diligence. We have the General Food Law Regulation Article 18 that came into effect in 2005/2006 and we have retailers wanting to protect themselves; and the retailers, in turn, are cranking up the requirements. A lot of the buyers are requiring complete chain traceability. In Australia, the main driver is productivity gains. There is legislation there, but I would say that it is not yet the main driver.

If we look at exports of Thai produce, most fresh fruit and vegetables from Thailand are going to other Asian countries. These do not require traceability. Most of the buyers within the region will accept the Thai Government food safety programme. Now let's look at the other markets: the EU or Australia – Australia is just a small importer, but it

does require traceability. Into the EU, many of the buyers are requiring third-party or private certification, principally GLOBALGAP, but we also have in-house schemes like Tesco's Nature's Choice and British Retail Consortium (BRC).

Talking to exporters, we see that even into Europe, when there is a supply crunch, a lot of the smaller importers waive the need for traceability. Even though we have strict regulations in Europe, when I talk to the small exporters, the need is often waived at times.

Price continues to be the principal factor in many cases. Putting it into perspective, the EU is not a main market for Thai fresh fruit and vegetables. Asparagus is probably five percent of total exports, baby corn about ten percent. Both are high-value markets, but not high-volume markets.

When we look at traceability, we need to understand the chain structure in Thailand. The Thai fresh fruit and vegetable sector is composed of many smallholder farmers. For example, baby corn farmers generally cultivate only 0.8 to 1.6 hectares; asparagus farms are 0.24 to 0.32 hectares, with asparagus grown on maybe 800–1 200 m². Some supply chains are deep and in nearly all cases – 99 percent of the cases – the farmers will be linked to the market through collector agents and other intermediaries. We all grumble about the intermediaries, but they do provide assistance. Some estimates tell me that on average, fresh produce in Thailand will be handled seven to nine times from the farmer to the packing house. In exceptional cases, this can go up to 14 times. Think about the implications of that in tracing the quality of the product.

Nevertheless, I am going to be positive. We have spoken with several exporters and we have tried to identify some of the factors which help them to implement traceability. One of the key factors is contract farmers. Of the five or six firms who have traceability systems, they all use contract farmers. They all have very, very short supply chains, maybe just a single collector agent or no collector agent at all: the firm will collect for themselves. They are very flexible in their approach and require a minimum of data entry. Each of these firms has a strong commitment to train the farmer and the collector agent. In many cases, the grumbles come from the collector agents who are much harder to train than the farmers. Furthermore, these firms tell me it may be five years before you can have a traceability system you are comfortable with. Obviously, there is a considerable investment in both time and money.

It is important that we set realistic targets. How many farmers will I have? What will be my degree of traceability this year, in two years, in three years? We must create a solid foundation from the outset. I have labelled this slide *Success of traceability ensuring food quality and safety*. It could also be *Failure of traceability*, but I thought this was a nicer title.

As I said before, tracing fresh fruit and vegetables by lot does not ensure food safety. It must be linked to an effective food control system. We need to get our food control systems and our GAP programmes in place. If a traceability system is going to be effective, it must be reversed and I would say, with the exception of the five or six top companies, this is seldom the case. Some packing houses do not have a traceability

system, others have, but not for all the produce. They claim that they can trace maybe 90 percent or 85 percent of their produce.

Across the industry, the adoption of food traceability is low. Many firms simply do not have a traceability system. There is a lack of farmers who are capable of entering into a traceability system. All farmers can, but first they must be trained. When we look at traceability for most of the small packing houses, we would only be able to trace back to the collector agent, not to the individual farm. This obviously has implications for product recall. Even for those firms which have reverse traceability, we are down to maybe the farm level or occasionally the plot level, but not to the input level as yet (seeds, fertilizers and chemicals, etc.).

Quality of information, record keeping, and the authentication of records are areas which need a lot of work. Records are invariably kept on pieces of paper. In many cases, there is no formal record keeping system. In a recall situation, this will obviously create significant delays. Again, in many cases, as farmers harvest their produce and send it through the collectors, we only see little pieces of paper attached to the product to identify the farmer. These pieces of paper get lost, they get destroyed through the system, and as the consignment moves through the system, we see a mixing of consignments. Again, this is the collector–intermediary syndrome. They don't understand what traceability is. They have one basket which is too full, one basket which is a little bit empty; "Let's put this product into this basket. It's easier to carry."

We come to a tricky one here: transparency and corruption. We have to have chains which are wholly transparent and not corrupt. We have to trust.

If we look at some of the reasons for the failures and if we look at some of the most significant barriers, number one is the lack of awareness. What is traceability and why do we need it? What is the purpose? What are the benefits for me? Once we get over the lack of awareness of what traceability is, we come to the next hurdle which is what is traceability? It is not something which is difficult, but the perception is that it is very, very difficult; "I can't do this. It's not for my farmers." Supply chain structure is going to be a huge hurdle in Thailand.

Another barrier is that some of the bigger pack houses are serving different markets, and different markets have different buyers with different requirements, and this reduces our resources somewhat. Many firms are dealing with multiple buyer schemes: Tesco's Nature's Choice, BRC and GLOBALGAP. This creates problems in creating a traceability system because it must accommodate all of these buyer schemes.

Information quality; getting people to give good-quality real information is an issue, just as data transmission and storage is problematic. With the exception of the main companies everything is on paper. What is more, language interpretation is always an issue in Thailand.

Most of the fresh fruit and vegetables going to Europe will be airfreighted. The produce goes to the airport in cartons. The packing houses cannot pack into Unit Load Devices

(ULDs) because produce is regularly thrown off planes. If the plane is full, your produce is thrown off.

A huge problem if we want to have a much broader traceability system is that we don't have a farmer identification scheme. Farmers do not have their own identification number. They have their ID number, but we don't have a farm identification number. Incidentally, we don't have a packing house identification number either.

From talking with packers and talking to farmers, two questions are raised repeatedly. "Will requirements for traceability exclude Thailand from some export markets?" The answer to that is yes. It's happening already. That leads onto the next question which I want to leave for you to think about, "How does this affect the smallholder farmer?"

If I look at the big firms who have reverse traceability systems, I see that in all cases they have adopted bar codes, certainly in their internal operations. They have all utilized a proprietary coding system to synchronize and to trace their buyers effectively. These systems were created partly because of a need to serve different markets and the need to adapt to the different buyers' certification needs. They do have effective recall, but the weak link is airfreight. All of these firms are sending out mixed consignments. So, in one carton you may have asparagus, baby corn, or whatever, and small quantities. There are no containers.

The KC Fresh case

To reinforce and illustrate the major points I have made, let me introduce the KC Fresh company. Their produce is mainly exported. Their key market is the United Kingdom. They employ contract farmers. Some of their contract farmers are GLOBALGAP-certified, some practice GLOBALGAP, but are not certified. There is a cost issue here.

The packing house has worked with the farmers to assign a farmer code and a plot code. They look at minimum production units. They have also created their own farmer coding system, a lot coding system, and carton despatch codes. Their IT system is developed to support the different third-party quality systems.

Looking very briefly at their supply chain, they have about 200 or 300 contract farmers. They use collector agents; each collector deals with about 30 farms. Then we have the packing house, loading at the airport, and loading at the destination, through an importer, and finally to a retailer who is operating a GS1 system of supply chain standards.

If we look at the Thai side of the operation, farmers are responsible for growing and harvesting the produce. They are also responsible for farm management records, completing a delivery note when they harvest the produce and for labelling the produce baskets. The packing house supplies the baskets. On the side of the baskets there is a little plastic strip on which the farmer can write the information, so no more little pieces of paper.

The purpose of the collector agent is to move the produce from the farmer to the packing house. The collector agent does nothing else, and the collector has been trained to do nothing else. He or she collects the produce from the farmer, collects the delivery note, and moves the produce and delivery note to the packing house. The collector's number one role is to maintain consignment integrity and not to lose the delivery note.

On receiving the produce, the packing house assigns a raw material number or a lot code. It then processes and packs into cartons. Each carton will be assigned a carton despatch code and, on the database, the contents of each carton will be described. So, we will have a number of raw material codes for each carton. All of this information is entered into a database which can be accessed by the buyer over the Internet. They are then despatched to the airport in containers, not in ULDs.

One of the key success points for this company is minimal data entry early in the chain. Farmers only mark the baskets and no data is entered by the collector agent. There is extensive training for the farmers and the collector agents and an online dating system is accessible by the buyer. They have a very strong packing house–supply base relationship. The packer supports the farmer through GLOBALGAP certification – they pay for this – they provide the training, they provide the preparation, helping the farmer and creating farmer records so the farmer can fill it in for themselves and assigning farmer plot codes.

To make this work there is a huge commitment. If we want to replicate this through the industry in Thailand, how do we get such a commitment from the smaller pack houses?

Current research, development and technology transfer efforts to improve quality after harvest of semi-temperate vegetables in the Philippines

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Abstract

The paper highlights the current research, development and technology efforts that are done by different agencies involved in improving the quality after harvest of semi-temperate vegetables in the Philippines. Quality assessment studies include selected vegetables stored and transported in a cold chain environment and contamination in selected vegetables after harvest. A study also found out the financial viability of establishing a cold chain system for semi-temperate vegetables in the major semi-temperate vegetable producing region in the Philippines. Economic analysis of transport by refrigerated trucks showed a higher internal rate of return and a lower payback period than the unrefrigerated transport. A market research on high value vegetables was also done to establish baseline information on vegetables being handled and to evaluate the existing post-harvest systems in the Cordilleras, the major production area of semi-temperate vegetables. Other related studies include the inflow and outflow of vegetables and the current post-harvest handling and the sources of losses. Efforts for technology transfer include the commitment of the government to establish cold chain systems on major vegetable routes and continuing capability building activities for various stakeholders in the vegetable industry.

Introduction

Semi-temperate vegetables are the types of vegetables that can be grown in relatively higher elevation areas. Production of high value crops like these vegetables in the Philippines has vast potential. The Philippines has large tracts of fertile lands for cultivation of semi-temperate vegetables with high market demand. These vegetables include lettuce, cabbage, broccoli, cauliflower, bell pepper, celery, carrots and potatoes. Despite the high returns in growing these vegetables, growth and development of the industry were hampered by post-harvest losses which can range from 40 to 60 percent. Quality deterioration of these perishable crops continues due to inefficient handling and lack of infrastructure to bring the fresh produce to distant markets.

Key production areas of semi-temperate vegetables include the Provinces of Benguet, Mountain Province, Nueva Vizcaya in Luzon and Bukidnon in Northern Mindanao. The bulk of the produce goes to commercial centers like Metro Manila and Baguio City.

A number of research and development efforts are being conducted to address the improvement of quality of semi-temperate vegetables after harvest. An intervention effort to improve the handling of semi-temperate vegetables is being established by the Department of Agriculture through the National Cold Chain Programme.

The paper highlights salient findings of research, development and technology transfer efforts done by various institutions on improving the quality after harvest of semi-temperate vegetables.

Research and Development efforts

Quality assessment studies

A series of shipment trials of vegetables e.g. lettuce, broccoli, cauliflower, was conducted to evaluate quality changes under existing cold chain conditions. Various packaging materials were likewise investigated to determine loss in weight and final quality. Results showed that a 2.5-hour delay in precooling caused significant change in visual quality of lettuce after a 36-hour journey from Cagayan de Oro to Manila. However, no significant weight loss is observed in precooled or delayed samples (Gibe *et al.*, 2005).

Another study conducted by the Bureau of Post-harvest Research and Extension (BPRE) assessed the contamination of semi-temperate vegetables like broccoli, cabbage, cauliflower, cucumber and carrots coming from Benguet, the primary producer of these vegetables. Results of pesticide residue analysis showed traces of organophosphate residue but very much below the approved maximum residue limits. Results also showed presence of carbamates in some samples but these were not alarming because they were very low (Gragasin *et al.*, 2006).

Potentials of cold chain systems

On the other hand, a study done to determine the institutional buyer preferences for semi-temperate vegetables focused on such attributes as freshness, size, colour, maturity, uniformity, variety, origin, labeling and form. Vegetables produced in the Cordilleras which have potential for the use of cold chain system include broccoli, carrot, bell pepper, lettuce, cauliflower, snap beans and sweet peas. Some requisites for the successful implementation of a cold chain system include clustering of farms, production organization, market linkages, information dissemination on the importance of cold chain system, proper production and postproduction practices on the part of growers and traders (Ramos *et al.*, 2005).

Results of the feasibility study showed that investment in the technology is financially viable. Benefits that are derived include maintenance of quality and increased proportions of marketable volumes due to loss reduction. Consequently, better quality and premium prices would accrue to producers as higher income, relatively stable price and fair price of vegetables in the market (Ramos *et al.*, 2005).

Another study was conducted by BPRE to evaluate the viability of a cold chain system for transporting lettuce from Bukidnon (Mindanao) to Metro Manila. The cold chain system is important for the Mindanao growers to market to Metro Manila. However, the profitability of transporting lettuce is threatened by increasing costs of handling and transport services. The existing setup, volume and handling practices are found to be viable but may not be in the long run, because of the volatile market in Metro Manila,

distance between the market and producers and the high cost of handling and transport services (Antolin *et al.*, 2005).

A study of the Post-harvest Horticulture Training and Research Center at the University of the Philippines-Los Baños simulated handling trials for refrigerated and non-refrigerated transport of bell pepper, broccoli, lettuce, sweet peas, Chinese peas, young corn and Baguio beans. Results of interviews with supermarket packers stated that post-harvest interventions for the said crops extended the shelf life and reduced losses. Economic analysis of transport by refrigerated trucks showed a higher rate of return and a lower payback period than the unrefrigerated transport (Yaptengco *et al.*, 2003).

Inflow and outflow of semi-temperate vegetables

A study conducted by the Cordillera Highlands Agriculture and Resources Management Project (CHARM) showed that major highland vegetables brought in to Baguio City and La Trinidad (major market destinations) were cabbage, potatoes, Chinese cabbage, carrots and chayote. Other major market destinations include Metro Manila and the nearby provinces of Pangasinan, Pampanga, Nueva Ecija and as far as the Bicol region. In this study, it was observed that high inflow volume results in low price. Likewise, average wholesale prices of perishable vegetable commodities fluctuated sharply while nonperishable vegetables like potatoes had relatively stable prices (Bektas, 2003).

In another report, Mindanao producers of semi-temperate vegetables were beset with the following marketing related problems namely: erratic supply and quality of produce; poor farm-to-market roads; inadequate storage facilities; limited access to reliable market information; lack of entrepreneurial skills among growers and cooperatives; and lack of promotion for increased vegetable consumption (Infante, 2004).

Post-harvest handling system assessment

A study conducted by the Benguet State University in 2004 assesses the actual post-harvest losses of selected vegetables at various handling points at the La Trinidad Trading Post. This study showed the specific causes of losses at various handling stages, as shown in Table 1 below.

A report of the status of the vegetable industry in Mindanao, the Philippines' second largest island and a major producer of semi-temperate vegetables, underscored the challenges in post-harvest treatment of semi-temperate vegetables, which include the following: lack of quality standards, poor handling, packaging and transport practices; lack of proper facilities for transport and storage; and high cost and non-availability of post-harvest supplies and equipment (Infante, 2004).

Table 1: Reasons for post-harvest losses at various handling points in the vegetable supply chain of La Trinidad, the Philippines

Harvesting	Incorrect timing, under- or overdeveloped produce, rough harvesting (harvesting not done carefully; harvesting containers not appropriate), exposure to unnecessary high temperature (harvesting during warmest time of the day; produce standing under the sun); rough field transport (careless driving, unsuitable vehicles, too high loading)
Grading or packing	Lack of quality standards or minimum requirements, rough handling, unsuitable containers (too large, not rigged, not smooth, not stackable); overfilling of containers
Assembling	Assembly points not adequately prepared and equipped
Loading and unloading	Rough handling, loading too high, bad stacking; for storing: inadequate ventilation of storage rooms, heaps for stacks, storage temperatures too high, rough handling, too high heaps or stacks
Transport	Rough roads, careless driving, unsuitable vehicles
Wholesaling	Insufficient protection against the sun and rain, rough handling, insufficient space, irresponsible labourers
Retailing	Insufficient protection and space at the retail markets; replenishment at too long intervals in retail shops, insufficient protection

Source: Salda *et al.*, 2004

Status of technology transfer initiative

Cold Chain System

The programme aims to establish pilot cold chain systems integrated in the marketing operations of small vegetable farmers. Its objectives are to identify traditional and alternative routes of high value crops and determine the technical, economic and marketing requirements. It is also aimed to provide assistance among high-value crops (HVC) growers and traders in the acquisition of cold chain infrastructure and facilities in selected pilot sites. It also provides information support, training and extension to promote the cold chain technology for the vegetable industry (Paz, 2004).

Pilot trade routes for vegetables in the Philippines

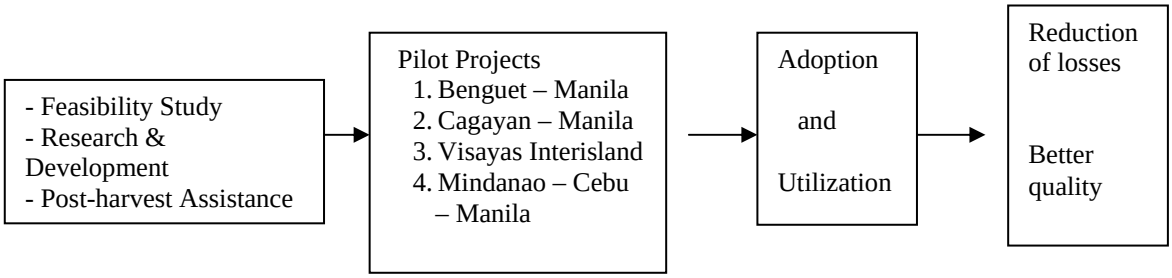
Benguet – Manila line
Cagayan – Manila line
Visayas – Interisland connection
Mindanao – Cebu – Manila line

Cold chain facilities have already been installed in the Benguet – Manila, Cebu – Manila and Mindanao – Manila lines. These cold chain facilities are being managed by private organizations who are groups of farmer producers.

National Cold Chain Programme

An interagency task force was organized to undertake the national cold chain programme composed of the Department of Agriculture's Agricultural Marketing Assistance Service, High Value Crops Programme, Post-harvest Horticulture Training and Research Center, National Agricultural and Fishery Council and the stakeholders from the private sector. The programme components include research and development, pilot projects, training and extension, information dissemination, and policy advocacy, as shown in Figure 1 below.

Figure 1: National Cold Chain Programme Framework



A forum was conducted on 30 October 2003, attended by different stakeholders of the cold chain industry. A training course was conducted in December 2003 to educate farmer producers on the benefits of the project.

The Benguet Cold Chain Project was inaugurated on 23 July 2004. Facilities like cold storage and refrigerated trucks were turned over to beneficiaries. Similarly, the Visayas Interisland Cold Chain Project was launched in Cebu and the Mindanao Cold Chain Project followed suit in April 2003 (Mallo, 2005).

Conclusion

The paper has documented the current efforts in terms of research, development and technology transfer in improving the quality after harvest of semi-temperate vegetables in the Philippines. Salient findings include the viability of establishing a cold chain system as a viable alternative in the transport and post-harvest handling of semi-temperate vegetables.

Better quality and premium prices would accrue to farmer producers as higher income, relatively steady supply and fair prices, if better technologies are introduced like the cold chain facilities.

Research and development results need to be disseminated to industry stakeholders so as to create awareness and stir interest for technology adoption. Also, these research findings need to be popularized through the use of instructional, educational and communication materials to form part of the continuing efforts of technology transfer to industry stakeholders.

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Post-harvest fruit sorting by optical graders: tests of efficiency on citrus fruits and table tomatoes

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Abstract

The cultivation of tomatoes and citrus is widespread in Southern Italy. For tomatoes, favourable weather conditions in Southern Italy make it possible to obtain multiple harvests which are highly appreciated by both the national and the international market. In order to satisfy consumers and remunerate the growers for the higher costs they must bear to extend the season, customers must be presented with a product that meets the market's requirements. Post-harvest processes provide a useful tool to pursue this objective. The present study focuses on the assessment of the efficiency of two optical graders with special focus on the levels of accuracy attained by the devices in question. Tests on the accuracy of grading were performed using manually precalibrated fruits (oranges, lemons and tomatoes) which had already been assigned a number to allow for their traceability during various repeats at different speeds. By processing the data obtained from the different tests, the optical graders under study fared very well in terms of accuracy, even at higher test speeds, thus guaranteeing elevated throughputs. The best results were registered with a grader that performed grading operations for 80 percent of the fruit with an absolute error of 2 mm, which proved to be below or equal to 1 mm for most of the calibration operations.

Introduction

The fruit and vegetable sector has always been of paramount importance to the Italian economy both in terms of production (around 53 million tonnes) and in terms of its impact on trade flows and business operations both upstream and downstream. Among the fruit destined for fresh consumption, citrus plays a crucial role. In 2004, some 3.3 million tonnes of citrus fruit were produced (ISTAT, 2006). The cultivation of citrus is particularly widespread in Southern Italy, where orange and lemon trees outnumber other citrus fruit.

The cultivation of tomatoes is particularly widespread in Southern Italy where favourable weather conditions allow for multiple harvests. Favourable climatic conditions result in high quality produce which is appreciated both in Italy and abroad. However, keeping consumers satisfied and producers fairly remunerated calls for producing fruits which respond to the requirements of the market. For this reason, post-harvest operations (sorting, gauging, control, grading, packing) have received as much attention as the cropping operations.

The manufacturers of the machines for post-harvest operations rely on different lines of technology. Mechanical grading systems based on fruit size or weight parameters were particularly widespread in the past. These mechanical systems essentially rely on slotted vibrating tables, on slotted rotating drums, or on properly sized screw sorters, which cause the fruit to fall out at specific drop locations according to their size. These systems are today losing ground to electronic graders which essentially rely on vision technology, whereby images are taken by one or more video cameras and analysed by a digital image processor, detecting those geometric parameters which make it possible to grade fruit (Guidetti and Oberti, 1999).

In addition to minimizing fruit damage, these optical graders are characterized by a high level of accuracy and the possibility of varying their sorting schemes. Today, different models of optical graders are available on the market, which are able to meet the different needs of highly diversified Italian packhouses. Therefore, it was decided to carry out an analysis of the operation of two optical graders in two modern packhouses. The results of some preliminary tests carried out on oranges, lemons and tomatoes are given as a part of a much broader research effort to be carried out on other types of fruit as a supplement to the present study.

Materials and methods

The two plants in question make use of conceptually similar systems for fruit and vegetable sorting operations (optical graders). However, the two systems are operated by different producers and are intended to meet different needs in terms of work capacity.

Plant A

The main element of the plant in question is a Maxsorter V2000 optical grader produced by Maxfrut. During the test period, the grader was still in one of the factories of the producer (Alzira, Valencia), before being delivered to the customer.

The grader was fed by manually overturning the fruit baskets (no mechanical feeder had been mounted) onto a roller conveyor which distributed the fruit in one layer. This part of the operation is used to control and discard fruit with defects manually.

This is followed by four devices used to singularize fruit onto four conveyors made up of a succession of double truncated-cone rollers with a pitch of about 0.1 m. Thanks to this mechanism each fruit finds its place between two successive rollers.

The roller conveyors then advance individual fruit and cause them to pass through a vision chamber where a video camera acquires images of the fruit in transit on two adjacent lanes. When the fruits enter the vision chamber, the double cones supporting the fruit start to rotate, thus causing the fruit to rotate, making their surface entirely visible. Four images are acquired for each fruit which are forwarded to a processor equipped with an analogical–digital converter for data to be entered into a calculator.

Once the gauge of the fruit in question has been defined, the calculator assigns the fruit to a given exit according to the grading programme established by the operator. An

impulse (ejector) at the exit in question causes the fruit to be conveyed into the processing beds where skilled workers perform the packing operation. The number of exits can vary as a function of needs and of the space available. In the plant under study, there were four exits in addition to another one destined for waste and for fruit that had escaped grading. The need for labour ranged from 13 to 16 workers for grader A, depending on the work.

The computer screen of the grader displays the data obtained: maximum chord of the normal section of the fruit polar axis (referred to as maximum equatorial diameter), the length of the polar axis and volume.

Plant B

In this plant, post-harvest processing is based on two sorting lines which use two optical graders, the Unical 600T-OC, produced by Unitec of Lugo-Ravenna. The two sorting lines are in operation in one of the Oranfrizer plants located at Scordia (Catania). Oranfrizer is a leading company in the production, processing and commercialization of citrus fruit and of other fruit and vegetables.

Each line is fed by mechanically overturning the fruit boxes onto a roller conveyor. A hand-made selection takes place in this area. Fruit is then advanced from this area to a slotted drum pregrader that discards “undersized” fruits.

Fruit is then washed in a basin to be cleaned by brushes and dried in a chamber with hot air. Should it be needed, fruit is then waxed before being conveyed to an area where additional manual sorting is carried out to discard rotten produce and fruit with evident imperfections. The rotary motion of the conveyors facilitates inspection and manual sorting.

In order to feed the graders, the fruit is first aligned. Each lane has its own aligner (six per machine). The two graders utilize a system for advancing fruit into the vision chamber (similar to that already described for plant A), as well as a video camera that acquires images of the fruit in transit on two adjacent lanes. The machines are also equipped with a series of labellers (produced by Sinclair) that make it possible to label each individual piece of fruit.

The system that conveys fruit towards the machine exits is particularly sensitive. The ejection system, which relies on an ejector, pushes the fruit towards a brushing roller placed at the exit. The roller takes fruit within its soft synthetic bristles and, by rotating it, gently discharges the fruit onto the conveyor underneath without damage. Such a system is also present on the grader of Plant A.

Each grader in Plant B has 29 exits for sized fruits and one exit for non sized fruit. The number of workers for each of the two lines may vary from 20 to 30 according to the throughput. In this plant, both machines and processing operations are monitored by a computer. Unitec is able to check both the operation and calibration of its machines through the Internet thus reducing most customers’ interventions.

Test methodologies

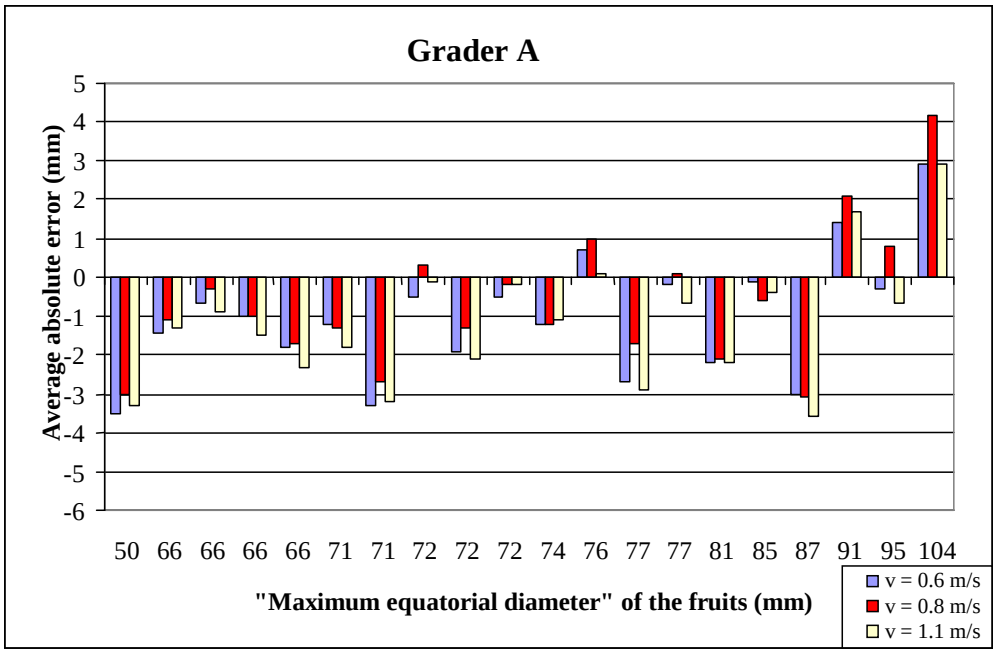
The determination of the work capacities of the two machines was made by verifying the filling percentage of the sectors destined to held fruits on the roller conveyors by applying the following formula:

$C = V \times 3600 \times R \times n$

where C = work capacity
V = velocity expressed in sectors per second
R = filling percentage of sectors
n = number of channels (Ragni, 1996).

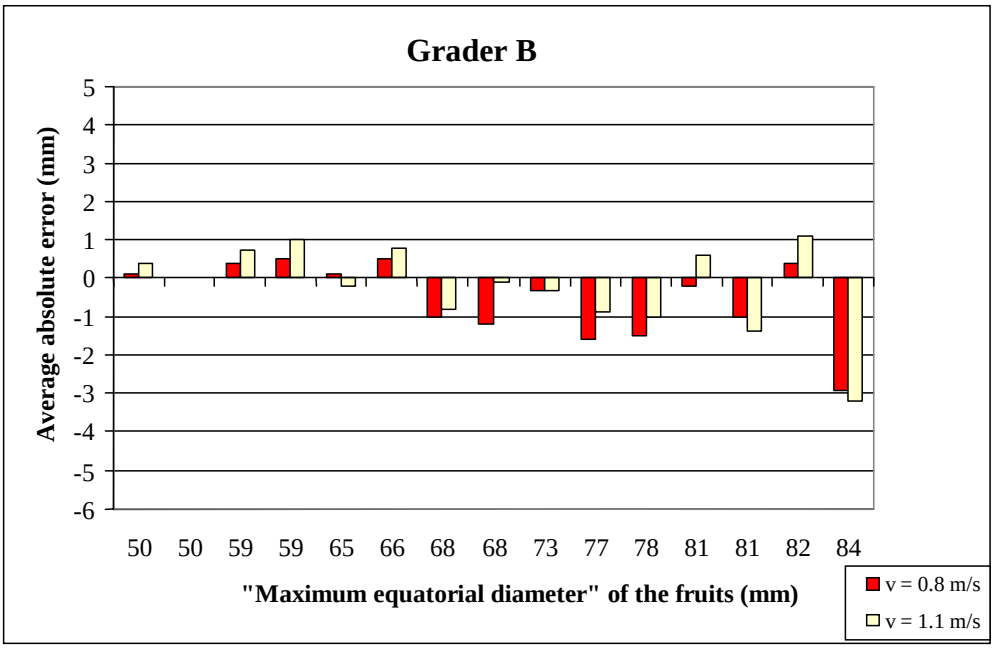
Tests were then performed with a view to determining the accuracy of the calibration. Twenty sample oranges were selected for Plant A which where characterized by differing sizes and shapes with the objective of assessing the operation of the graders in the different cases under study (Figure 1).

Figure 1: Machine A - Absolute error (average of 10 repeats) registered for sample fruits (oranges)



Similarly for Plant B fifteen lemons and fifteen tomatoes with different gauges and shapes were used as samples (Figure 2).

Figure 2: Machine B - Absolute error (average of 10 repeats) registered for sample fruits (lemons)



Some fruits had the same size but a different polar axis. A sample of each one of the different typologies of the fruit usually processed was obtained for the species in question. These fruits were all numbered and the maximum chord of the normal section of their polar axis was measured as required under EU Regulation EC2001 for calibration of most fruit and vegetables. This parameter is usually referred to as “maximum equatorial diameter” in spite of the fact that the fruit cross-section, which exhibits a longer diameter compared to the other regions, is seldom found in the median area. Fruit was then placed, one by one, on the conveyor belts of machine A and machine B to be advanced to the vision chamber. Ten repeats were made for each fruit.

Tests were repeated at three conveyor belt speeds for Grader A: 0.6 m/s; 0.8 m/s and 1.1 m/s (corresponding to 6 sectors/s, 8 sectors/s, and 11 sectors/s), and at two conveyor belt speeds for Grader B: 0.8 m/s and 1.1 m/s (8 sectors/s and 11 sectors/s).

The values of the diameter measured by the graders were stored in a PC during each passing of each fruit into the vision chamber. The data provided by the graders were compared to those obtained by manual calibration. The results were analysed taking into account the absolute error, i.e. the difference between the equatorial diameter of the fruit as assessed by the grader and that provided by the manual gauge. Both values and sign of the absolute error were assessed in one analysis to highlight the occurrence of any systematic errors.

For some graphic representations it was necessary to resort to the mean value of the absolute error calculated on the ten test repeats performed on each fruit. Even so the standard deviation value was also assessed, together with the index of data dispersion around their average and the coefficient of variability. What is more, in order to test the level of association between absolute error and fruit size, simple linear correlation was

used. The significance of the correlation coefficient (r) was assessed up to a probability level of 1 percent (Camussi *et al.*, 1995).

EU legislation for both citrus and tomatoes (EC Reg. N° 1799/2001, EC Reg. N° 790/2000) specifies that for all categories and for each form of presentation, only 10 percent of either total weight or the number of fruits having a size immediately larger than or smaller than that indicated on the label, are allowed. Therefore it was decided to take into account the absolute error in absolute value (|Ae|) of the measurements made on the fruit by the two graders compared to the actual size of fruit. In order to improve further the accuracy of the measurements performed by the graders, three error intervals were indicated ($0 \leq |Ae| < 2$; $2 \leq |Ae| < 5$; $5 \leq |Ae| \leq 7$) with the percentages of the cases of errors found to fall within said intervals at different speeds.

Results

The experiment carried out was not meant to compare the two graders produced by the two different companies. Quite the contrary, it was intended to supply data concerning the efficiency of fruit graders under real operating conditions.

The filling percentage in the conveyor sectors destined to fruit on both graders was found to be close to 70 percent and to remain constant at the different speeds. The work capacity of the machines was assessed and observed to be very high especially at maximum speed (Table 1).

Table 1: Work capacity of the graders under study

Gaugers	Lanes (no.)	Processed fruits	Speed (m/s)	Work capacity (fruits/h)	Work capacity (t/h)
A	4	Oranges	0.8	80 640	6.77
			1.1	110 880	9.31
B*	6	Lemons	0.8	120 960	9.67
			1.1	166 320	13.30
B*	4	Tomatoes	0.8	122 688	9.69
			1.1	168 696	13.32

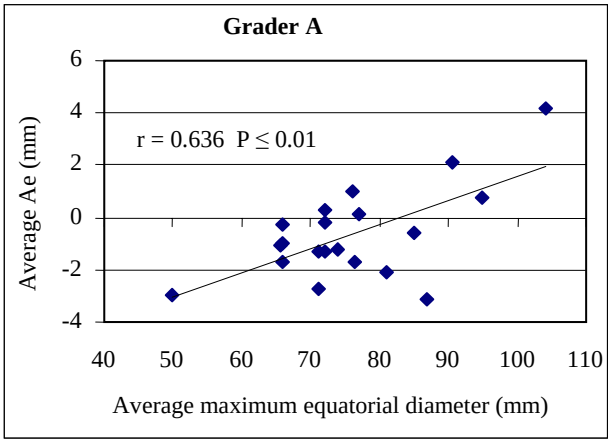
* Data of one of the two graders of plant B

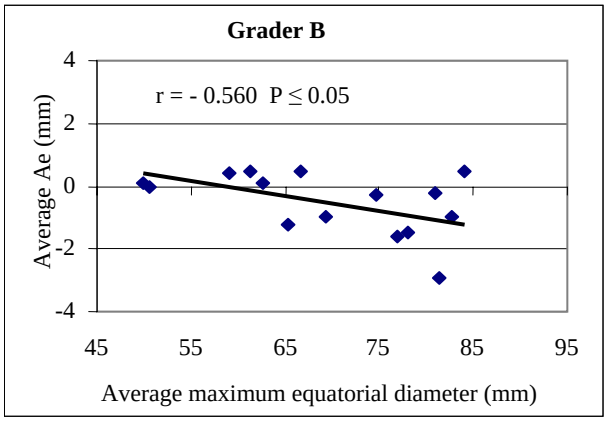
The increase in the work capacity of optical graders can be obtained by either increasing the number of processing lanes or by increasing the speed of conveyors. Thanks to the great advances in the field of sensors and the great progress made in terms of data acquisition and calculation of the processes used to assess the size of fruit, it is possible for machines with conveyors to operate at a speed of 1.1 m/s and more, with no negative effect on calibration operations and a remarkable increase in work capacity.

The results of the tests performed (Figures 1 and 2) confirm that the absolute error does not increase with increasing speed. Quite to the contrary, at a conveyor speed of 1.1 m/s the error was lower than that achieved at a conveyor speed of 0.6 m/s. For Grader A,

Figure 1 highlights a sizable underestimate error at least for smaller fruits. By applying the simple linear correlation method (Figure 3), it is possible to observe that the degree of association between absolute error and fruit size is highly significant.

Figure 3: Graders A and B. Correlation between fruit gauge and the absolute error (Ae) of the machine measurement (Grader A – oranges; Grader B – tomatoes)





In fact a correlation coefficient (r) of 0.636 was registered. A simple linear correlation with 18 degrees of freedom results in a probability level (P) of 1 percent thus indicating a highly significant correlation (Camussi *et al.*, 1995).

In this respect it is worthwhile mentioning that the regularity in the shape of the oranges under study diminished as the gauge of the fruit in question increased. During the tests, the larger fruit were observed not to rotate during their transit through the vision chamber thus making it impossible to assess exactly their maximum equatorial diameter as the four pictures acquired from the video camera all focused on the same portion of fruit surface.

For Grader B, with both lemons and tomatoes, a lower average absolute error was observed which was close to 0 mm for some sample fruits, and around ± 1 mm in most

cases. These results are of paramount importance especially in view of the fact that the irregularity of the surface exocarp of lemons makes it more difficult for optical vision systems to assess the exact gauge of these fruit and that of so-called “ribbed” tomatoes. Even so, for Grader B, the absolute error tended to increase with larger fruits. In fact the correlation turned out to be significant (r = –0.560), which, for 13 degrees of freedom, was tested up to a probability level of 5 percent (Camussi *et al.*, 1995).

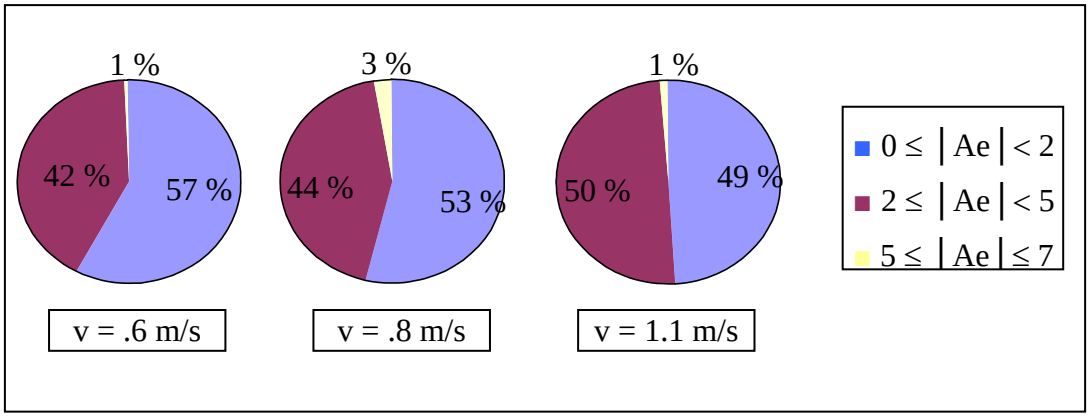
Moreover test repeats highlighted a good level of homogeneity across the different “readings” of the diameter on the same samples in different passings before the video camera. The standard deviation calculations, which were carried out to analyze the variability of the data obtained for each fruit compared to the mean of the ten repeats, was always lower than ± 2.5 mm for Grader A and even lower than ± 1.7 mm for Grader B (Table 2).

Table 2: Average standard deviation (SD) and variation coefficient (VC) for Graders A and B

Speed (m/s)	Grader A		Grader B		Grader B	
	SD	VC	SD	VC	SD	VC
0.6	0.86	1.14	Lemons		Tomatoes	
0.8	0.96	1.25	0.86	1.22	0.82	1.21
1.1	121	1.60	0.76	1.09	0.80	1.23

Optical grader producers usually declare a grading error within 1 mm. Grader A, which was used to grade oranges, registered a maximum error, in terms of absolute value, of 7 mm (Figure 4).

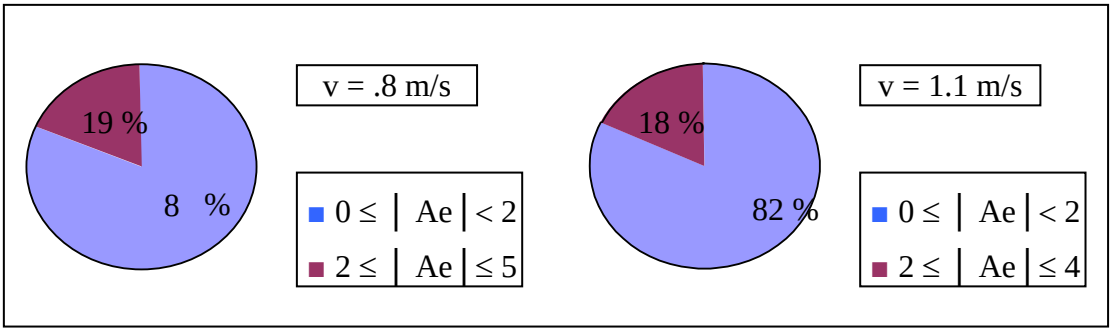
Figure 4: Grader A – oranges. Percent of cases observed on three intervals of absolute error in terms of absolute value (mm) |Ae|



Considering an interval of absolute error in the 5–7 mm range, 1 percent of the measurements carried out at speeds of 0.6 and 1.1 m/s were affected by such an error. At a speed of 0.8 m/s, the number of measurements affected by the error did not exceed 3 percent.

The results obtained from Grader B highlighted a more elevated accuracy as the maximum absolute error was of 5 mm at a speed of 0.8 m/s and only 4 mm at a speed of 1.1 m/s (Figure 5).

Figure 5: Grader B – lemons and tomatoes. Percent of cases observed on three intervals of absolute error in terms of absolute value (mm)



What is more, over 80 percent of fruits were read and graded with an absolute error in terms of absolute value lower than 2 mm, which turned out to be lower or equal to 1 mm in most cases. The errors recorded were higher than those generally declared by producers. However, this last phase of data processing highlighted that grading was made with a certain level of accuracy at all test speeds, more so by Grader B.

In both cases the data obtained confirms satisfactory levels of accuracy, especially in view of the fact that it was deliberately decided to perform difficult tests with the machines by choosing sample fruit of different sizes and shapes and selecting speeds higher than those usually used during processing operations and advised by the manufacturers. In addition, the fruit was handled very carefully at both lower and higher speeds.

As the tests were performed on different fruits, the operation of the two grading machines cannot be directly compared. While these grading machines are primarily used for citrus, in Plant B, the two grading machines were used to process different species of citrus fruit from October to June, and for the rest of the year, they were used to sort peaches, nectarines, pears and tomatoes. This implied a very intensive use of the grading machines and therefore a lower unit cost of sorting operations at the packhouse. The initial investment needed to purchase modern post-harvest graders may deter small farms from equipping themselves with these machines. Instead, the remarkable benefits in terms of quality of the sorted produce, labour saving, the possibility of varying the sorting processes to meet the different needs of consumers, as well as the possibility of using different sorting schemes for different fruits in order to respond to varying needs in terms of machine operation capacity should be taken into account.

Conclusions

The analysis of the operation of the optical graders under study has highlighted that, even at elevated speeds and throughputs, these machines provide greater accuracy in sorting citrus fruit by size. What is more, this accuracy has positive implications on the packaging processes as packhouse workers are only asked to transfer fruit into relevant

packages, thus avoiding the time and energy consuming control of the final processing phases required in traditional grading systems to eliminate possible errors. Such a benefit, together with the possibility of processing different types of fruit and therefore to increase the annual utilization of graders, results in important savings in terms of post-harvest processing costs.

In addition, the machines in question are characterized by the possibility of varying the sorting schemes by user-friendly adjustments of the control system. They also handle produce very kindly thus minimizing damage to the fruit.

Most modern optical grader manufacturers are able to supply models that meet the different needs (in terms of machine operation capacity and overall dimension) of fruit and vegetable post-harvest processing businesses. One–two lane graders are available, which are used either for produce sampling or in small businesses, but graders with 8–10 lanes are produced for larger businesses. Sometimes, in order to obtain greater packhouse flexibility, graders operating in parallel are preferred to machines with an elevated number of lanes (as was the case for plant B).

In the last few years, Italian fruit and vegetables have started to loose ground because of fierce competition from other countries (Spain, France, Belgium, and the Netherlands). Recovering competitiveness is only possible through strict compliance with regulations in terms of quality, as well as through standardization and excellent presentation of a wide range of products. The use of graders such as the ones under study can undoubtedly contribute to the above objectives through optimization of post-harvest operations.

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Deliberate contamination of modern food supply chains and the value of quality assurance systems

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Abstract

Modern food supply chains have become increasingly globalized and complex and have become the domain of the private sector with governments mainly providing a regulatory and hygienic oversight. Increasing globalization of food trade, however, also means a reduced ability to respond to food emergencies for several reasons including the emergence of private sector governance of food safety, the need to engage key government agencies in the countries of production, shipment and consumption and the requirement to inform consumers of possible problems. The modern food supply chain, by its size and scale, is also susceptible to deliberate contamination activities or food bioterrorism, and there are many reported cases involving the use of pathogenic agents to infect livestock or contaminate food. With the increased political unrest in many areas of the world today, targeting food supply chains provides the opportunity to cause maximum fear and disruption to consumers and food businesses in regions far away from the point of contamination, be it during production, processing, distribution or sale. Many of the private standards operating internationally today require organizations to test their systems of process management and product recall individually. The approach to this, however, is generally associated with food safety risks linked to accidental contamination (or "errorism"). What is unclear though is to what extent such systems could cope with deliberate contamination (or terrorism) and how they would link to regulatory controls and emergency response mechanisms. Combating deliberate contamination of our food supply chains will require a coordinated response from government agencies and those involved in food supply. This paper explores examples of deliberate contamination and clearly identifies the need for industry cooperation with regulatory bodies. The paper discusses ways in which the main private supply standards operating internationally could support regulatory efforts to combat food bioterrorism.

Deliberate contamination of the food supply chain

The World Health Organization has defined food terrorism as "an act or threat of deliberate contamination of food for human consumption with chemical, biological or radionuclear agents for the purpose of causing death to civilian populations or disrupting social, economic or political stability" (WHO, 2002).

Food contamination whether accidental or deliberate can have far reaching impacts on individuals and organizations, and can detrimentally impact on those food supply chains targeted. This paper builds on a review of deliberate contamination carried out by

Manning *et al*. (2005) and focuses on the use of agents such as foreign animal disease and other physical, chemical or biological contaminants of food. The paper reviews specific cases of contamination in order to determine the mechanisms currently in place to counteract contamination whether accidental or, as defined by Nestle (2003), as "the deliberate poisoning or contamination of the food supply to achieve some political goal".

Governments have a role in facilitating preventative food safety through both voluntary and regulatory mechanisms (WHO, 1996). However, increasing globalization of food trade means that national regulatory bodies may be unable to respond strategically to a food emergency unless they have established interagency strategies across national borders. Furthermore, the lack of such interagency cooperation could have significant consequences on health and trade in many countries (WHO, 2002).

From an industry perspective, it is the accepted practice along modern food supply chains that individual organizations should implement and routinely test management responses to food non-conformities along with the ability to initiate product recall systems. Indeed this is often a prerequisite for suppliers operating under all of the post farmgate standards operating internationally (e.g. SQF2000, BRC, IFS and the new ISO22000); it is not, however, a requirement for most prefarmgate standards.

The impact of deliberate food contamination was demonstrated by Manning *et al.* (2005) in their review of the personal and economic impacts of documented food safety incidents (Table 1).

Table 1: Personal and economic impact of food safety incidents (- indicates no data available)

Year	Place	Food	Agent	Cost	Human Impact	Ref
1981	Spain	Cooking Oil	Chemical	-	20 000 injured 800 fatal	(WHO, 1983)
1985	USA	Watermelon	Aldicarb	-	1 373 cases	(Green *et al.*, 1987)
1985	USA	Milk	*S. typhimurium*	-	170 000 cases	(Ryan *et al.*, 1987)
1989	Chile	Grapes	Alleged contamination with Cyanide	c. US$100 million	-	(Root-Bernstein, 1991)
c. 1999	UK	Beef	Prions	c. US$ 7 billion.	120 deaths of nvCJD by 2001	(Nestle, 2003)
1991	China	Clams	Hepatitis A	-	300 000 cases	(Halliday *et al.*, 1991)
1994	USA	Liquid ice cream	*S. enteritidis*	-	224 000 cases in 41 states	(Hennesy *et al.*, 1996)
1996	USA	Apple Juice	*E. coli* 0157:H7	c. US$14 million	70 hospitalized 1 fatal	(Nestle, 2003)
1996	USA	Guatemalan Raspberries	*Cyclospora cayentanensis*	-	1 465 cases	(Herwaldt *et al*., 1997)
1998	USA	Frankfurters/ luncheon meat	*Listeria*	US$ 50 – 70 million	35 cases	(Carus, 1999; FSIS, 2004)

Source: Manning *et al.* (2005)

There are a number of reported examples of deliberate food contamination (Manning *et al.*, 2005; Table 2).

Table 2: Reported incidents of deliberate food contamination (- indicates no data available)

Year	Country	Farm or Food	Agent	Economic Cost	Human Impact
1952 (Wilson *et al.*, 2000)	Kenya	Cattle	Plant toxin (African milk bush plant)	-	-
1978–1980 (Wilson *et al.*, 2000)	ex-Rhodesia (Zimbabwe)	Cattle	Anthrax	-	-
1984 (WHO 2002; Chalk, 2003; Nestle, 2003)	USA	Contamination in salad bars	*S. typhimurium*	9 out of 10 restaurants closed	751 cases
1985 (Green *et al*, 1987)	USA	Watermelon	Aldicarb	-	1 373 cases
1987 (WHO, 2002)	Israel	Citrus fruit	Mercury	-	-
1997 (Nestle, 2003)	USA	Doughnuts	Shigella	-	45 cases

Source: Manning *et al.* (2005)

The following examples are indicative of the motivations to cause contamination along with the human and economic consequences of such acts:

- During their uprising in Kenya 1952, the Mau Mau used African Bush Milk (a plant toxin) to poison steers of the Kikuyu tribe to cause political unrest.
- In 1974 a Palestinian group calling itself the "Revolutionary Command" claimed to have contaminated grapefruit exported from Israel to Italy. Four years later another Palestinian group, the "Arab Revolutionary Council", targeted Israeli citrus fruit using liquid mercury as an agent. Ten years later Israeli grapefruit exports were again threatened with contamination. In all these incidents, the primary goal appeared to be economic disruption (Cameron et al., 2001).
- In 1981 an ecoterrorist group called "Dark Harvest", threatened to place anthrax-contaminated soil in places throughout the United Kingdom to highlight the ecological dangers of chemical and germ warfare.
- In 1986 Tamil militants threatened to destroy Sri Lanka's national economy either by using potassium cyanide or by bringing in non-indigenous diseases to devastate rubber and tea plantations. Tea is Sri Lanka's main source of revenue.

Current operational risk management strategies

It is not possible to guarantee food safety as all foods, and the processes they are subject to involve elements of risk. Therefore, it is essential that the food industry and regulators ensure that effective risk management strategies are in place. The European Commission defines risk as "a function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard(s) in food" (EC, 1997). Risk analysis can be further broken down into three components, risk assessment, risk management and risk communication.

The Codex Alimentarius Commission (CAC) has adopted international definitions of risk relating to food safety (CAC, 2003). **Risk assessment** is the science of understanding hazards, the likelihood of their occurrence, and, the consequences if they do occur. On the other hand **risk management** is the mechanism of analysing policy (or

management) alternatives following risk assessment and identifying and implementing appropriate controls including regulation (and operational controls). The European Commission further defined **risk communication** as "the interactive exchange of information and opinions concerning risk among risk assessors, risk managers, consumers and other interested parties" (EC, 1997).

Manning and Baines (2004b) noted that risk management differs from inspection-based controls in that it is primarily science-based and developed from a set of food safety objectives. Such operational risk management plans may be implemented at the company, national or regional levels and generally focus on accidental contamination form physical, chemical or biological sources.

Deliberate food contamination

Deliberate contamination has generally been focused at national or regional levels as a political tool. This is aptly demonstrated in the United States of America under the Public Health, Security and Bioterrorism Preparedness and Response Act of 2002 (the Bioterrorism Act) where Part Three addresses protecting safety and security of food and drug supply. In contrast, deliberate contamination at the company level is generally associated with the actions of individuals who may have an "issue" with that company; this is often considered to be sabotage as opposed to terrorism.

In order to make the links between terrorism and sabotage, and the strategies to combat them, this paper argues that operational risk management should also address deliberate food contamination right down to the company and discrete food chain level. This would then place the potential threat of bioterrorism and the agents that could be used in the context of the more usual portfolio of risks to food safety considered at the business level.

The USDA (2001) has argued that food safety management programmes need to address the prevention, detection and control of food sabotage. The first step is to identify **potential perpetrators** of deliberate food contamination including personnel who:

- Work for the organization who wish to contaminate the food source;
- Wish to gain access to the food source within a facility either by deception, by forced entry or other means and;
- Intend to make exterior attacks from outside the facility.

The second step is to identify **potential agents** that could be used in an incident of bioterrorism. These need to be considered as part of the risk management approach. Agents capable of causing localized or widespread incidents include:

- Biological agents (communicably infectious or non-infectious pathogenic microorganisms, including bacteria, microbiological toxins, algae, viruses, fungi, parasites, protozoa, insect pest and worms), which could be delivered in the form of liquids, aerosols, or solids;

- Chemical agents (i.e. synthetic and natural toxins including pesticides, rodenticides, heavy metals, cleaning chemicals, toxic chemicals), which could be delivered in the form of airborne droplets, liquids, aerosols, or solids;
- Physical agents (including bone slivers, glass fragments, ceramic, metal, wood, plastic), which could cause contamination at any stage in the supply chain;
- Radiological agents (radioactive elements capable of causing harm) that can be delivered in liquid or solid form;
- Prions;
- Allergens including cereals containing gluten, crustaceans, eggs, milk and associated products, celery, mustard, sesame seeds, fish, soybeans, and nuts.

The third step is to identify and develop possible **methods of detection** of these agents through detection equipment (physical and radiological contamination), chemical analysis (chemical contamination) and microbiological analysis (biological contamination).

Public response mechanisms

In the event of a contamination incident, public risk controls should be implemented (Huxsoll, 2000; Royal Society, 2002). However, the effectiveness of these controls depends on the "preparedness plans" that have been developed, tested and implemented and on the assessment of vulnerability of the country or supply chain (WHO, 2002).

The main elements of such public risk controls and plans include:

- Preventative measures such as Hazard Analysis Critical Control Point (HACCP) management plans including the mechanisms for detection and identification of agents;
- Quantitative modelling to develop strategies in the event of food contamination, especially an outbreak of plant or animal disease. This requires the development of databases to aid the modelling process;
- Prompt identification of agents by a coordinated network of suitably resourced laboratories. This is key to an effective response mechanism;
- Health professionals being aware of the symptoms in humans caused by potential agents and reporting mechanisms to identify trends promptly;
- Introducing methods of diagnosis of disease;
- Effective vaccines, chemoprophylactics and therapeutics being readily available;
- The development of biosecurity measures including decontamination and disinfection;
- Effective communication of information both before and during an incident to minimize the potential for chaos and panic;
- Control of pests which might spread the agent of food contamination;
- Disposal of plant materials, carcases, food products and possibly human corpses;
- Securing the food and water supply chain.

The preventative measures above already include some fundamentals of industry-based risk management hence supporting our argument to link public and private strategies.

We would argue that public controls should also include training programmes at all stages of food supply chains and in public agencies so individuals understand the requirements of both routine and emergency biosecurity protocols and the mechanisms used by each party as well as recognizing the degree of vulnerability of supply chains under review.

Vulnerability should be assessed on the basis of "the scientific, economic, political and social circumstances of a country (supply chain or business) to measure the extent of the threat and to set priorities for resources" (WHO, 2002) and be assessed "as a multidisciplinary activity, with input from legal, intelligence, medical, scientific, economic and political sectors". From a national or international perspective, the WHO considers that vulnerability may be assessed on the basis of:

- The effectiveness of the countries' food safety management infrastructure and current surveillance mechanisms;
- Availability of potential food contamination agents;
- Motivation for perpetrators of food terrorism;
- Potential for the agent to contaminate mass-produced food and gain widespread distribution;
- Potential of human-to-human transmission of the agent;
- Capability for an effective emergency response and;
- Potential size of the threat to the food supply chain, animal health and welfare, export food trade, tourism and public health.

We would argue that the food industry should be included as part of the vulnerability assessment, especially those who know the logistics and quality assurance mechanisms of food supply, as they can make the links between existing industry risk management strategies and those of public agencies.

Food industry response mechanisms

Given this framework for public response to contamination incidents, several key elements focus on the food industry. Most importantly there is the adoption of HACCP as the preferred risk tool linked to appropriate management systems. However, there is the need to also include "unknown risks" as part of this assessment. This is where close links are needed between industry and those involved in vulnerability assessments.

The main drivers for the adoption of HACCP are government regulations (for high-risk foods) and market driven private standards. In terms of food globalization it could be argued that the main international private standards have the greatest impact on safety management. This leads us to consider, which ones of these standards are based on HACCP adoption? How are these standards linked along discrete supply chains? Do they attempt to address "unknown risks" and bioterrorism challenges?

As Table 3 below demonstrates, all international standards operating beyond the farmgate use HACCP as the risk identification, management and communication tool; however, only the SQF 2000 code is developing any form of specific standard to address food security and bioterrorism.

Table 3: Food safety risk assessment and management of the main international food and farm standards

Standard	Risk Assessment	Product Trace	Product Recall	Links to other Standards	Comment
GLOBALGAP Primary production	Pre-requisite GAP protocols	Yes	No	None	Does not require individual farm risk assessment of food safety. Would require HACCP further along chain. Not sensitive to bioterrorism issues.
BRC Food industry	HACCP	Yes	Yes	None	Risk assessment within individual business, capable of addressing bioterrorism but not sensitive to this at present.
IFS Food industry	HACCP	Yes	Yes	None	Risk assessment within individual business, capable of addressing bioterrorism but not sensitive to this at present.
ISO 22 000 Primary production and food industry	Prerequisite GAP protocols for primary production HACCP for food industry	Yes Yes	No Yes	Developed as a whole chain solution	Does not require individual farm risk assessment of food safety but link to rest of chain (if also doing same standard) ensures HACCP further along chain. Not sensitive to bioterrorism issues
SQF 1 000 Primary production	Food Safety Plan based on HACCP principles	Yes	No unless SQF customer requires it	Part of whole chain solution if linked to SQF 2 000	Risk assessment done at farm level that links to SQF 2 000 HACCP, especially under multisite certification programmes. Food security module being developed for 2007.
SQF 2 000 Whole chain including, retail and food service	HACCP	Yes	Yes	Whole chain solution including retail and food service	Risk assessment within individual business, capable of addressing bioterrorism Food security module being developed for 2007

Source: authors' research.

At the farm level the GLOBALGAP standard does not focus on individual farm risk assessment, it relies on prerequisite programmes like Good Agricultural Practices and Hygiene or cleaning guidance. In contrast, SQF 1 000 requires food safety risk assessment to be carried out annually. Furthermore, SQF members will soon have access to the same food security module and guidance as those operating to the SQF 2 000 code. It is uncertain to what extent the farm level adoption of ISO 22 000 will require safety assessments based on HACCP.

The international standards evaluated offer different levels of whole chain communication. Most standards only operate at their designated level and do not necessarily link to standards upstream or downstream; the same can be said of the many national schemes we have benchmarked. The exceptions to this general rule are the linked SQF 1 000 and 2 000 codes and ISO 22 000 standards.

It appears from this review that only the SQF Institute has recognized and put in place actions to help the food industry come to terms with the potential threats arising from bioterrorism and deliberate contamination. The ongoing development of the food

security module, backed up by guidance and training will add another dimension to SQF food and farming businesses. In addition they have the potential to align more easily with public control measures.

There is a need for greater awareness and training in this area so that individuals and organizations understand the requirements of both routine and emergency biosecurity protocols at the company and supply chain levels, plus an awareness of how private systems should link with public safety surveillance and action. The value of developing integrated systems can be aptly demonstrated by reference to the following three cases.

Case 1: Spinach recall in the United States of America
The recent national recall on spinach in the United States of America (September 2006) clearly shows the wide distribution of product emanating from a single farm business. Spinach packed by the Triple B Corporation was sourced from one Californian grower in the Salinas Valley (Natural Selection Foods) and was distributed across the States to retail stores and delicatessens. The *E. coli* contamination was believed to have originated from an alternative irrigation tank that had become contaminated. Whilst not suggesting terrorism here, the case shows how simple it could be to contaminate the salad supply chain and cause a national recall allied to public unrest.

What lessons can be learned? First, how should the grower have addressed and measured the risks? Was there a risk assessment of water supply and how frequently was this carried out? Secondly, did the packing and distribution of the spinach in plastic containers have a risk assessment within the packing HACCP plan? Finally, how would these risk assessments change in light of the threat of a terrorist attack? What did work well, however, was the traceability and product recall systems and the link to public procedures for food safety risks run by the Food and Drug Administration in this case.

Case 2: Potato supply to Walkers Crisps in the United Kingdom
A recent visit to a contract grower demonstrated the cooperation on food safety between growers and food processors. Walkers have recognized that most consumers of crisps are children and that we all generally consume crisps without looking at them. Walkers were concerned about physical contamination (glass, metal etc) and recognized that the most effective way of removing the threat was by hand sorting (especially for glass). As the crisp process is automated, the last opportunity to sort is on the farm prior to bulk delivery. All consignments are now hand sorted on-farm and boxes security-sealed. Any delivery without a security tag is rejected. This case highlights the need for security sealing during periods when food or raw materials are not being supervised (i.e. during distribution).

Case 3: United Kingdom retailers
This case refers to one retailer in the United Kingdom who supplied information in confidence (Gregson, 2006), so only an overview can be given.

The retailer
The complex structure of global sourcing, central delivery and distribution and operations in the store define the core role of modern retailers. The distribution system

is complex as it must deal with thousands of products from many different suppliers (there can be between 15 000 and 30 000 lines in an average warehouse). Products will then be shipped daily to stores requiring a significant logistical effort. However, by allocating delivery and collection times the retailer knows who to expect both at the warehouse and at the store. Moreover, as only the retailer's lorries go to stores, the focus of safety management is at the warehouse.

The suppliers

The retailer has more than 1 500 suppliers, from the biggest global food brands such as Nestlé, Coca-Cola and Kraft, to small operations with few staff who may supply a single branch with a local speciality. This retailer's willingness to work with the very smallest boutique suppliers makes it unique amongst supermarkets, but it also presents food safety challenges. All suppliers are required to work to very strict manufacturing specifications that exceed the BRC Global Standard and comply with all relevant legislation. All suppliers are risk-assessed for safety compliance and legality, and inspected either by food technologists or by approved third parties. Within the very strict specification are rules and regulations concerning tamper-evident packaging. In other words, wherever achievable, food must be supplied in tamper-proof packaging. Traceability is another key part offered to customers. In high risk products such as meat and milk this is achieved through working closely with producer groups and by limiting the numbers of suppliers. Being a bespoke supplier is viewed as a long-term partnership and the retailer prides itself on knowing the origin of all its fresh produce for example.

In the warehouse

A schedule of deliveries is developed with appropriate time slots. It is the suppliers' responsibility to deliver to this schedule, and performance is judged on the accuracy with which they do this. The delivery driver carries a detailed schedule of the content of the load and the warehouse manager will have a similar manifest detailing the expected load. The two documents are laid out of sight as the lorry is unloaded, and then after the delivery is checked, the physical quantities are reconciled with both the delivery drivers' schedule and the warehouse schedule – this is called a blind check. Any discrepancies are recorded and logged for investigation. The delivery is scanned into the warehouse management system, which tells the warehouse operator where it should be placed – the warehouses are floor-mapped to increase the efficiency of the operation (maximizing use of space and minimizing the time taken during the pick and cage fill). This also provides an internal trace and recall system if needed. To increase the efficiency of the operation, the warehouse manager has a site control system that is programmed with exact delivery schedules. It calculates when a trailer has to complete its loading cycle around the site, giving warehouse operators exact loading and delivery schedules.

The shop floor

Retail stores are very busy environments with 15 000 to 30 000 lines offered for sale to customers. Behind the scenes, branch operations are strictly controlled with members of staff signing in and out of the building through a monitored entrance next to the staff office. All visitors must sign in, whether they enter the branch through the front (sign in at the customer service desk) or the staff entrance (sign in at the staff office) and badges must be worn at all times. The shop floor and behind-the-scenes areas are CCTV-

managed. Access to all non-public areas, including branch warehouses, is controlled and monitored. In addition all staff members are trained to be vigilant for suspicious activity in the store and are skilled at spotting key telltale behaviours often associated with shoplifting or tampering. In addition, checkout staff are trained to check that goods passing through their tills are not damaged (the most obvious manifestation of this training is when they check eggs to make sure they are not broken). Although this is mainly aimed at providing good customer service, it is useful aid in spotting products that may have been tampered with. Modern tamper-proof packaging, required wherever possible under this retailer's terms of business, also makes the checkout operative's job easier. Indeed, the inspection of products that have been interfered with is easier for products packaged in this type of packaging.

This retail case shows how the various stages of the chain can be integrated and the types of checks that are made to ensure food safety. Though not designed to respond to a terrorist attack, the system outlined would be capable of developing a rapid and coordinated response as was demonstrated by their response to the recent Sudan 1 and other contamination incidents in Europe. We would argue that increasing the awareness of key staff to the risks and probability of deliberate contamination events allied to training in response procedures would further improve the system now in place.

Conclusions

Deliberate food contamination can have significant impacts locally, regionally, nationally and internationally. International impacts are especially important as the globalization and consolidation of food procurement increases against public controls that remain national or at best regional. Although the threat of deliberate contamination is largely theoretical, it is possible to contaminate food in a country where controls are limited in order to cause major human health consequences and economic disruption. As food supply chains increasingly work on short lead times, the impact on the general public of such an incident would be large-scale and immediate, especially if measures are not in place to switch to an alternative supply chain.

Plant and animal health issues, deliberate contamination of the water supply or the food supply chain on a regional or even national scale requires a coordinated approach. National strategies should be developed in association with industry specialists to enable harmonized public–private strategies to evolve.

At the same time, individual food businesses and discrete supply chains should review their risk assessments to include the possibility and potential threat of deliberate contamination and food terrorism. This may be articulated through their individual and linked HACCP plans and be further supported through prerequisites like security-locked distribution, tracking and the use of tamper-proof packaging. If a threat is considered likely, then key staff should be trained in this area and emergency strategies practised. Finally, effective communication strategies are needed between food businesses, public bodies and consumers.

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