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Assessing buyers' requirements for fresh produce in the formal market sector in Papua New Guinea

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Abstract

A market survey was conducted in five main city centres in Papua New Guinea to better understand buyers' requirements for fresh produce of major buyers in the formal market (wholesalers, the food services sector and supermarkets). The objectives of the survey were to provide farmers with this market information and to identify marketing opportunities which suit their circumstances. The principal considerations for the buyers at the formal market are consistency in supply, price and quality. Consistent supply is important for all these business buyers. The quality of fresh produce is very important to supermarkets, international airlines and international hotels, but it is less important for institutional buyers for whom price is more important than quality. For those buyers who consider quality to be important, their demand for quality is not satisfactorily met partly because they cannot communicate their quality requirements to suppliers. It seems communication problems occur because quality requirements are not well-defined and "quality" is perceived and interpreted differently by different participants along the supply chain. Currently there is no quality standard for fresh produce in Papua New Guinea at all marketing levels. The establishment of quality standards for key vegetables appears to be a reasonable starting point for improving communication on, and meeting, quality requirements from the formal market. Locally appropriate quality standards will help provide incentives to farmers to produce quality products and guidelines to improve postharvest handling.

Key words: fresh produce marketing, grades and standards, postharvest handling, hedonic pricing, Papua New Guinea

Introduction

Predicting and meeting changing consumer demand is a major challenge facing the agri-food industry worldwide, both in the developed and developing countries. Consumer requirements have become increasingly more stringent over time. For example, in the 1970s price was the main consideration for making purchasing decisions while in the 1980s, quality and product range also became important. By the 1990s, the term 'quality' not only referred to the appearance and physical characteristics of a product, but also to a range of consumer concerns, such as food safety, the environment, animal welfare, worker welfare, and ethical trade (Gilg and Battershill 1998). Increasing demands for organic, free range and fair trade products are good examples of demand trends towards healthier and more socially acceptable products. These demands have been supported by government regulations and various quality assurance programs.

In general, consumers are more demanding when they are more affluent and better informed. According to the United Nation's Human Development Index, Papua New Guinea (PNG) is one of the poorest countries in the world (UNDP 2010). It ranks 137 out of 169 countries, with life expectancy at birth being 61.6 years, mean years of schooling being 4.3 years and Gross National Income per capita being US$2,227. At the current stage of development, it is fair to say that most PNG consumers are more concerned about price than quality or variety when it comes to shopping for fresh produce due to their lack of purchasing power. However, the inability of consumers to pay for quality produce does not necessarily mean that they are not aware of quality issues or don't have a preference for quality products. That means demand for quality produce can become "effective" as soon as the opportunity presents itself (e.g., an increase in personal income). Producers must be ready to respond to such changes.

A case in point is the development of the PNG Liquefied Natural Gas (LNG) Project which is expected to generate substantial demand for quality fresh produce both directly from the LNG Project during 2010-2013 and from the general population due to income growth generated by the Project (The Alliance Group 2011; Chang 2011). The Project costs US$15 billion in the initial investment and will run for 30 years (Esso Highlands Ltd 2008). During the life of the Project, GDP, as well as private and public consumption, is expected to nearly double (ACIL Tasman 2009). This will provide the impetus for a substantial increase in the demand for quality fresh produce, especially through the formal sector.

This study focuses on the food services sector and supermarkets in the formal sector, because of their potential to become major buyers of fresh produce. It has also been suggested that the ability of the suppliers to meet the buyer requirements in the domestic formal sector can not only make it more competitive with imports[2] but also it is a pre-requisite for meeting often more stringent requirements of buyers overseas. The information obtained here can therefore be used to draw inference for the readiness of the fresh produce sector in taking up on export opportunities should they arise.

Purchasing criteria, including quality requirements, used by these buyers however are less familiar to smallholder farmers because they tend to sell their produce at the open-air market directly to household consumers and have little contact with the formal sector. Previous studies (e.g., Wilson 2008, Peter 2001) have shown that buyers in the formal sector were most concerned about quality and consistency in supply while farmers were most concerned about price, followed by transport and road conditions, costs of marketing and weather. Clearly, there is a significant gap in understanding the issues faced by the other side (i.e., demand versus supply) of the fresh produce market in PNG. Similar findings were obtained by Nawi and Batt (2011). They found that in the Western Australian apple industry what growers want from their downstream buyers and what they actually receive are vastly different. A better understanding of buyer's requirements by PNG farmers was thought to be a first step towards transforming the production-oriented subsistence farming to a more market-oriented commercial farming.

The objectives of this study are to generate information on the purchasing requirements of, and problems currently experienced by, major buyers of fresh produce in PNG and to provide policy recommendations for addressing some of the key issues. The research questions to be addressed are: To what extent is

there a demand for quality fresh produce in PNG? And, if this demand exists, to what extent is it being met? And what are the constraints?

Methodology

Personal interviews of participating firms in the food services sector and the food distribution sector (supermarkets and their suppliers) were conducted in Goroka, Port Moresby, Kokopo, Lae and Mt. Hagen in 2009. Twenty nine businesses were interviewed, including seven supermarkets, three catering companies, two restaurants, five international hotels, two institutional buyers (one school and one hospital) and ten wholesalers. The respondents were managers, purchasing officers, chefs or owners/operators of those business entities contacted.

The survey was conducted based on a semi-structured questionnaire with open-ended questions. Leading questions included in the interviews were: The nature of their businesses; the type of vegetables they buy regularly; sources of supply; purchasing criteria; customers; communications; and any problems they have encountered in sourcing fresh produce.

Because of space limitations, the discussion below will focus on quality requirements and how quality requirements are communicated. Note that the methodology employed is qualitative in nature, and the results presented here may not be representative of the view of all the fresh produce industry. Nevertheless, valuable information has been obtained from those experts who have had many years of experience in the fresh produce sector. Key findings are presented below.

In the following sections, we first provide a brief review of the fresh food market in Papua New Guinea and then the concepts related to quality.

The fresh food market in PNG

Benediktsson (2002) divided the PNG fresh produce market into three segments: the formal market, the informal market and direct bulk selling. At the formal market, producers sell to wholesalers, who, in turn, supply both retail establishments in the urban centres and the many mining and logging enclaves scattered throughout the country. The informal market refers to the open-air markets found in every city, town and village and along the major roads, with a mixture of farmer-marketers and resellers. For direct bulk selling, producers sell directly to supermarkets, restaurants, small institutions and resellers at the open-air market. The total volume of fresh produce production in PNG is not known, but the total value of local fruit and vegetable sales was estimated to be about K100 million a year (Embassy of PNG to the America n.d.). Assuming an average price of K2.5-3.5/kg (Chang 2011), estimated sales volume would be around 30,000 – 40,000 tonnes a year. This figure could account for only about one percent of total fresh produce production in PNG as 80 to 85% of the PNG population is still engaging in subsistence farming (Ministry of Agriculture and Livestock 2006).[3]

The market share of fresh produce in the formal sector is currently small country-wide, about 10-15%, compared with the informal sector of 85-90% (Chang 2009). Those figures are much higher in Lae and Port Moresby[4], the two largest cities in PNG. With the influx of expatriates into PNG because of the LNG project, much greater proportions of fresh produce are expected to be delivered through the formal sector, such as supermarkets, restaurants and institutional buyers and hence a much greater reliance on wholesalers. The rapid rise of supermarkets in developing countries is a potential threat to smallholder farmers and small operators at the open-air markets (Reardon and Gulati 2008). More research on the needs of the formal sector and their implications for smallholder farmers is therefore warranted.

The majority of fresh produce sold in the major city centres in PNG, especially Lae and Port Moresby, came from the Western and Eastern Highlands Provinces (Chang 2009). For the Port Moresby market, vegetables that are considered hardier, such as onion, carrot, potato, sweet potato, English cabbage and

avocado, are first delivered by road on the Highlands Highway from the highlands to Lae, either in 20-foot (dry) containers, in 3-6 tonne open-back trucks or in public motor vehicles (PMVs) along with passengers, and then shipped to Port Moresby by sea. This long journey (along with various delays) usually takes 5-7 days. More perishable and higher-value vegetables, such as tomato, broccoli, cauliflower, capsicum, spring onion, French bean, sugar fruit, wombok and lettuce, are transported by air directly from the Highlands to Port Moresby. The flight takes about an hour. The latter could also be shipped in chiller containers from Lae to Port Moresby.

Review of quality, attributes and standards

Gavin (1994) suggests there are five approaches to defining quality. First is the transcendent approach of philosophy, whereby quality cannot be defined precisely; rather, it is a simple, unanalysable property that is learned and recognised through experience. The second is the product-based approach of economics, whereby quality is viewed as a precise and measurable variable; differences in quality reflect differences in the quantity of some combination of attributes possessed by a product. The third approach is user-based, whereby quality is defined by the extent to which consumer preferences are met and wants and needs are satisfied; it is "fitness for use' and is subjective and personal. Fourth, the manufacturing-based approach defines quality as "conformance to requirements" and "meeting specifications". Finally, the value-based approach defines quality in terms of "performance at an acceptable price" or "conformance at an acceptable cost".

In addition to the five approaches, Gavin puts forward eight dimensions by which a product's quality can be assessed, including:

1. Performance: core product or product benefits; e.g., nutrition, energy, self-indulgence, satisfy hunger or thirst;
2. Features: product characteristics, e.g., firmness, colour, sugar content, packaging and labelling;
3. Reliability: probability of a product's failing within a specified period of time, e.g., consistency in supply and product quality;
4. Conformance: meet specifications, e.g., size, colour, shape, uniformity, residue limits, etc;
5. Durability: a measure of product life, e.g., storage and shelf life;
6. Serviceability: speed and ease of repair; e.g., speed of delivery, credit, warranties, speed of recall or replacement;
7. Aesthetics: presentation and display; e.g., appearance (freshness, colour, shape, etc); and
8. Perceived quality: consumer's subjective measure, e.g., reputation and image of suppliers or stores.

Each of these dimensions can be seen as self-contained and distinct from the others (Opara 1989) and can be used as a source of competitive advantage or a point of product differentiation by which a company or a producer wishes to compete.

The applicability, and usefulness, of the five approaches and the eight dimensions proposed by Gavin above clearly depends on the nature of the product. For example, for arts, the transcendent approach may be more appropriate while for industrial products or component parts, the manufacturing approach would be more appropriate. For food products, it seems the product-based, user-based and value-based approaches may all be applicable given the complex nature of food products. Luckily, Nelson (1970) has shed light on how quality can be further defined.

Nelson classifies product attributes into three categories, "search good," "experience good" and "credence good" attributes, based on how readily verifiable the quality attributes are.

- "Search good" attributes refer to those characteristics which can be readily verified by seeing or touching. Appearance and physical attributes of fresh produce such as colour, shape, size, freshness, free of damage or defects are examples.

- "Experience good" attributes are those characteristics which cannot be readily verified by seeing or touching, but can be assessed by using or consuming the product. For fresh produce, sensory and eating quality attributes such as maturity, texture, flavour and shelf life are examples of experience good attributes.
- "Credence good" attributes are characteristics, such as nutritional value and food safety, which are difficult to verify even after using or consuming the product. Some such characteristics may be assessed through lab testing or long-term usage. But other credence attributes such as the reputation of the supplier, place of origin (e.g., Highlands vs coastal) and marketing claims such as environmentally friendly, natural, organic, animal welfare, workers' safety, fair trade, etc are more difficult to assess. Verification of these types of credence good attributes is normally done through some kind of "certification" schemes managed by accredited authorities.

There are two things to note regarding the nature of quality and the quality of agricultural products. First, quality is inherently a subjective property. Since it could mean different things to different people, there is potential for disagreement and confusion. Secondly, agricultural products are inherently heterogeneous in quality because of the biological nature of agricultural production. Because of this, there must be grading and standardisation by which the subjectivity and heterogeneity could be removed or reduced so that the quality of the produce can be determined and buyers' requirements can be communicated between trading partners. In addition to providing information to facilitate trade, other advantages of implementing grades and standards include reducing transaction costs, encouraging high-quality production and protecting consumer interests (Kohls and Uhl 1998).

Product grades and standards are in most cases defined based on objective measurements of search good attributes wherever possible, as suggested by the product-based approach to quality discussed earlier. Indeed, these are the basic principles behind the quality standards for fresh produce available around the world, such as the international standards developed by FAO/WHO (the Codex Alimentarius) and the United Nations Economic Committee for Europe (UNECE Agricultural Quality Standards) and private standards developed by, for example, Woolworths Supermarkets in Australia (the Produce Specifications of Woolworths Supermarkets). What is in common in these quality standards is the Standard Layout recommended by UNECE, which includes "minimum requirements", "quality classification" with 2 to 3 grades or classes, and "provisions" concerning sizing, maturity, tolerances, packaging, presentation and labelling. Some quality standards also set maximum levels of additives, contaminants and pesticide residue limits.

The other thing to note is there are two types of standards: product and process. A product standard, as discussed so far, is a set of criteria that a product must meet. A process standard is a set of criteria for the process by which a product is produced. Organic and fair trade standards are good examples of process standards. Both the product and the process can be certified, often through a third party, to provide written assurance that a product, process or service is in conformity with certain standards (Danker 2007). There are also private and public standards. Public standards, set by governments, can be mandatory or voluntary depending on whether compliance is required for a product to enter into a particular country or another state or territory. Private standards, set by the private sector or firms, are voluntary by nature in the sense that market participants are free to decide whether to adopt them or not. However, private standards can also be de facto mandatory if they have penetrated in the market to such an extent that suppliers wanting to participate in the market have no option but to adopt them.

Purchasing criteria

The decision to buy or not to buy a product, applying the so-called 'purchasing criteria', is influenced by a number of factors. For fresh produce, general purchasing criteria include:

1. Price;
2. Product quality;
3. Consistency in supply;

4. Packaging;
5. Shelf life;
6. Customer requirements;
7. Payment form/credit terms;
8. Convenience; and
9. Other considerations such as food safety, the environmental impact, worker's safety, fair trade, place of origin, etc.

Among the list, the survey results showed that the top two purchasing criteria for institutions (such as army barracks, schools and hospitals) are price and consistency in supply; for supermarkets, they are quality and consistency in supply; and for international hotels and airlines, quality and food safety. In terms of quality consciousness, overall, the catering services for the airlines has the highest quality requirements because they are servicing international flights and must comply with ISO 9000 quality assurance standards (one of which is maintaining the cool chain). As such, they rely mainly on imported products from Australia delivered on their own flights. The next most quality conscious buyers are international hotels and high-end supermarkets targeting expatriates and higher income households. This is followed by catering services to mine campsites. Institutional buyers serving army barracks, schools, hospitals and universities have the lowest quality requirements in general terms because of tight budgets despite their desire to provide quality meals to their customers.

These results suggest that quality requirements vary significantly from sector to sector depending on economic factors such as price and budget and other considerations such as regulation, reputation and public liability. These are consistent with the research conducted by Martin and Jagadish (2006, 2011) in PNG.

Price and quality relationships

Respondents were asked about how they defined quality. In most cases, quality means "freshness", "good size, good colour and good shape", and "long shelf life". A number of chefs also mentioned "food safety" as a determinant for quality. One way to determine whether there is a demand for quality or is to see whether prices vary with the quality attributes that are important to the buyers (Rosen 1974).

The question put to the buyers was whether the price they paid was adjusted for quality. The results indicated that in most cases, price was negotiated based on the quality of the produce and for some buyers there was some kind of grading scheme. This seems to suggest that there is a demand for quality. However, the relationship between price and quality is not strong. For example, one international hotel has two grades (Grade A and Grade B) for all the fresh produce it buys. The price for Grade A tomato is 1.80 kina/kg and for Grade B, 1.60 kina/kg. However, there is no quality specification or other clear indication for what constitutes Grade A or Grade B. The criteria appear to exist only in the head of the Head Chef and, from farmers' point of view, appear to change from time to time. In this case, even regular suppliers have no idea as to what the Head Chef considers Grade A or B. And in most cases, suppliers would simply accept the results without questioning how the decision is made for fear of offending the buyer and jeopardising future business opportunities. This means little feedback was received by farmers.

In Mt. Hagen, one wholesaler has three grades posted on the bulletin board at the receival depot. For tomatoes, the requirements for Grade A are "large, half ripe and fresh" (1.50 kina/kg); for Grade B, "medium, ripe and fresh" (1.30 kina/kg), and for Grade C, "small, odd shape and over ripe" (0.60 kina/kg). Again, there is no indication of what is meant by "large", "medium", "small'', "half ripe", "ripe", "over ripe" or "fresh". The wholesaler's main customers are international hotels, supermarkets and catering companies in Port Moresby. He claims that he sends only "the best produce" to Port Moresby and he receives very few complaints. Among his customers, international hotels want good quality produce; supermarkets require long shelf life; and their biggest buyer, a catering services company, does not worry too much about price or quality, as their emphasis is on volume and consistency of supply. To control quality, the

wholesaler tells his suppliers what he wants and produce is checked when they arrive. Based on the observations made at the depot, it is doubtful that any clear messages on quality requirements have been sent through to the suppliers as the produce being delivered is often a mixed bag with great heterogeneity. "A mixed bag with variable qualities and rotten ones at the bottom" was the most common complaint from buyers regarding the sourcing of fresh produce.

For another wholesaler in Mt Hagen, quality is also very important to his customers, which are high-end supermarkets and international hotels in Port Moresby. The wholesaler sorts produce into three grades upon delivery based on freshness and shelf life. It was explained that Grade A produce is usually fresher and has a longer shelf life than Grade B while Grade C is unacceptable and is rejected. For this operator, there is nothing specific about his quality requirements of "freshness" or "shelf life". What is more, he pays his suppliers an average price for what has been delivered and charges his customers the same price for both Grades A and B.

Several observations were made at urban open markets and supermarkets. They suggested that pricing in the open markets was based predominately on size while there was no clear linkage between price and quality across the supermarkets. At some supermarkets the high price seemed to be justified by the quality of the produce (especially in terms of uniformity in size, colour and freshness) while at other stores there was no justification whatsoever for the high prices or the poor quality found on the shelf.

It seems contradictory that the wholesalers are sending the best quality produce to supermarkets in Port Moresby while the quality being observed on the supermarket shelves appears otherwise. The answer turns out to be quite straightforward – the quality has simply deteriorated during the long journey to the market shelves due to transport and postharvest handling issues.

Quality control

The most serious problems in sourcing fresh produce mentioned by the survey respondents were quality deterioration and inconsistency in supply. This finding is consistent with what has been reported in other studies (Wilson 2008, Global Development Solutions 2008, Peter 2001, Epstein 2000, Burdon 1998, Daysh 1995). Among the many contributing factors, transport and logistics problems (poor transport infrastructure and hence long delays) are the most significant. Other contributing factors identified are poor packaging and postharvest handling; seasonality; poor farming practices; shortage and high cost of seeds, fertilisers and farm chemicals; and the lack of competition. One respondent stated bluntly that, "quality issues" (such as buyers' requirements, communications and postharvest handling) are trivial compared with quality deterioration and inconsistency in supply caused by problems in transport and logistics.

Problems in transport and logistics have been the major complaints of fresh produce farmers and buyers alike for many years. Road conditions, both the main highways and feeder roads, continue to deteriorate. The Highland Highway, which is the mainstay of the PNG economy, is most problematic because of the difficult mountainous terrains and climatic and geological conditions (especially in the Chimbu areas) which are prone to potholes and landslides. Roads are frequently damaged by heavy rains especially during the wet periods, but there is no regular maintenance. Roads either don't get fixed until they are not passable or not fixed at all due to the lack of resources in relevant government agencies and poor coordination between them. In addition, trucks are often overloaded, causing further damage to already fragile structures, but there are no weight stations or checkpoints along the highway to inspect vehicular weights.

In addition, there are problems with landowners and law and order. Because 97% of the land in PNG is privately and communally owned by traditional landowners, some landowners do not allow the road to be fixed unless (a huge amount of) compensation payments are made. It is fair to say that there is no incentive for the landowners to have good roads because they don't use them and don't benefit from them in other ways. On the other hand, bad roads could provide, at least for some, potential opportunities

for making money through roadblocks and for stealing and robberies when traffic is slowed. In some cases, roads were deliberately sabotaged and roadblocks set up (by rascals) so that tolls could be collected. Such activities, although illegal, are not actively prevented by law enforcement.

In addition to poor road conditions, there is also serious congestion at the ports and hence more delays. It takes 5 to 7 days to deliver fresh produce from the highlands (via Lae) to Port Moresby by sea. Because of the problems with sending the fresh produce to Port Moresby by sea, higher-value produce is normally delivered by air from Hagen or Goroka. There are problems with airfreighting as well, due mainly to the lack of cargo space on passenger planes. When a flight is heavily booked, fresh produce gets bumped off and it does not get delivered until the next available flight. These delays, along with poor packaging and the lack of chiller facilities either at the airport or at the wholesalers' depots, often lead to serious spoilage and product losses.

Costs of transport are very high. A chartered cargo plane with a capacity of 1.2 tonnes costs around K10,000 from Hagen to Port Moresby, Tabubil or Wewak while on a passenger plane, it costs K5/kg. By sea, a 20-foot chiller container costs over K5,000 from Lae to Port Moresby, while a 20-foot open-cut dry container costs over K4000. Farmers opt to use dry containers because it costs less. This choice is quite risky because there is no insurance or compensation if something goes wrong.

Things are looking up, however. International aid agencies and development banks have been investing heavily in the transport infrastructure in PNG in recent years, including expanding and upgrading ports and airports, and highways across PNG. For example, the Australian Agency for International Development (AusAID) has several investments in the PNG transport infrastructure sector, aiming at keeping important transport infrastructure in operation to ensure social stability and economic growth while PNG implements reforms (AusAid 2007). Two of the major aid activities were the Transport Sector Support Program, which aimed to improve governance and capacity building and strengthen PNG's institutions, and the Key Roads for Growth Maintenance Project, which aimed to restore selected highlands roads, starting with the Highlands Highway in the provinces of Morobe and Eastern Highlands. It recognised the Highlands Highway as the single most important highway in PNG for trade volume and value.

The Asian Development Bank (ADB) has an extensive program of road renovation in the Highlands region, which is home to 40% of the population and the source for most of the country's mineral, petroleum, and agricultural exports (ADB n.d.). It is also expanding the main port, Lae, as well as strengthening PNG's major airports. ADB has funded six road projects in PNG since 1972 through eight loans totaling A$256 million, but acknowledges that implementation has been slow amid challenging conditions. It was stated that "To put the history of these road projects in context, one must consider that road building in PNG is far from easy. Security and land compensation issues make it hard to attract good contractors, especially in the Highlands."(ADB n.d.).

Poor packaging and postharvest handling are other significant factors contributing to quality deterioration. Most fresh produce is packed in flour or fertiliser bags made of polyethylene material. It is strong but does not 'breathe'. Because all transactions (including transport, entry to the market and buying and selling) are charged by bags (adjusted only marginally by the size of the bag), farmers often try to pack as much in as possible. A 50 kg bag can be extended with additional bits and packed, by specialist packers, so tightly with sweet potato that it can weigh around 100kg. Similarly, for other produce such as potato, cabbages, carrots, broccoli, etc, although not as tight or heavy. Because it takes 2 to 3 strong men to load and unload the heavy bags, they tend to be handled roughly and dropped to the ground, rather than being laid down gently.

Consignment trials conducted by Newman *et al*. (2011) have shown that such packing practices lead to severe skinning and breakages, which allow diseases to develop on the 5-7 days long journey to Port Moresby. Farmers were "shocked" when they were shown the damage to sweet potato resulting from the traditional packing methods, but they were reluctant to trial smaller bags or carton boxes, as recommended by the research, because the additional costs that they will incur. Equally importantly,

because the majority of sweet potato, as well as other fresh produce, is destined for the open-air markets and with price, not quality, being the main concern for most consumers, the additional costs incurred by using better packaging are not likely to be recovered from higher prices. It seems that, for farmers to change the current packaging and postharvest handling practices, there must be institutional changes to the pricing system, including pricing by weight and by quality.

In the formal market, buying and selling are done by weight, but still there are no explicit standards or grades for locally produced fresh produce. As discussed earlier, implementing grades and standards can provide guidelines for quality assurance and postharvest management practices,[5] reduce transaction costs and encourage high-quality production. It may be the case that PNG previously did not have the need for change because of its stage of economic development and the demand conditions. However, it has to now if it wants to capitalise on the marketing opportunities created by the PNG LNG project and to meet the challenges of supplying quality produce. Otherwise, the increased demand for fresh produce from the PNG LNG project is likely to be met by imports (Chang 2011).

Conclusion

The market survey of fresh produce buyers was conducted in 2009 in main city centres in PNG to answer the following research questions: To what extent is there a demand for quality fresh produce in PNG? If this demand exists, to what extent is it being met? What are the constraints? The survey results showed that there was a demand for quality fresh produce but the demand has not been fulfilled because of serious problems in transport and logistics that resulted in quality deterioration and inconsistency in supply. The results also showed that supermarkets and international hotels had more stringent quality requirements compared to institutional buyers. However, the quality requirements were not well communicated between the buyers and their suppliers because of the lack of specific quality specifications based on clearly defined grades and standards. The current quality control practices of inspection have not been, and cannot be, effective without grades and standards.

Locally appropriate grading systems and quality benchmarks should be established and trialled to facilitate fresh produce marketing in PNG. Education and training should be provided to farmers and marketers alike to increase awareness of quality issues and proper postharvest handling techniques.

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[1] We would like to thank the editors and the reviewer for their valuable comments on an earlier draft, which have resulted in significant improvements to the paper.

[2] Lack of uniformity is the most distinguishing quality feature between imports and local produce on the supermarket shelf (Peter 2001, p.15). Introducing quality classification and quality premiums should encourage improvements in general quality of local produce.

[3] Sweet potato is by far the most widely produced and marketed fresh produce in PNG and more information is available on sweet potato from recent research than for any other type of produce. What has been observed in the sweet potato market could be indicative of what could be expected from other fresh produce. There are no accurate data on the quantity of sweet potato marketed in PNG, but Bourke (2005) estimated the quantity at 1% of production, which was estimated at 3 million tonnes a year (Bourke and Vlassek 2004). This would give rise to an annual quantity marketed of about 30,000 tonnes

[4] The amount of fresh food (mainly produce) sold in Port Moresby in 2005 was estimated as 15,000 tonnes (Bourke *et al*. 2009). Population in PNG was around 6.52 million in 2008 with some 500,000 in Port Moresby (ADB n.d.). On 1 April 2009, the exchange rate was A$0.51 for one PNG kina.

[5] Leamon (1989) suggests that an effective QA system in horticulture begins with the "definition of quality specification for the product".