

Supply chain risks and smallholder fresh produce farmers in the Gauteng province of South Africa

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ABSTRACT

A survey of 52 smallholder fresh produce farmers was conducted in the Gauteng province of South Africa to grasp how risk and its management affect the mainstreaming of smallholder farmers into formal, high-value markets. The study employed a supply chain analysis approach, which focused on the functions and risks that occur along the fresh produce chain. The results highlight the risks that impede the participation of smallholder farmers in formal, high-value chains. At the production level, risk is prominent from input procurement through to the post-harvest stage of the chains. At the retail and consumption level, risks are linked to the adherence to quality and quantity standards, including prescribed packaging, grading, labelling and traceability and transport requirements. As a result of these risks across the formal chain, smallholder farmers often resort to distributing their products in low-value informal markets. The consequence is that smallholder farmers tend to remain trapped in poverty, in part, because of their risk appetites and their ability to bear risk.

Further research is required in the areas pertaining to smallholder farmers' risk appetite and risk-bearing ability and mechanisms to deal with the particular risks in the value chain that impede their all-round ability to escape the "smallholder dilemma".

Key words: Smallholders, supply chain risks, fresh produce, high-value markets

Introduction

In the region of 1.5 billion people are estimated to be engaged in smallholder agriculture globally. They include 75% of the world's poorest, whose food, income

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and livelihood depend on agriculture in one way or the other (Ferris et al. 2014). The South African context is no different – with up to 20% of all households in South Africa described as agricultural households most of whom depend on subsistence or small-scale agriculture for part or all of their sustenance and livelihoods (KPMG, 2013).

There is general consensus that economic participation continues to be the best approach to address the smallholder's challenge and to improve the livelihood prospects for most rural households. The supposition is that growing populations, urbanisation, and improved communications and infrastructure globally generate opportunities to expand domestic and export markets for those farmers who can consistently link production with sales (Ferris et al. 2014).

Despite the opportunities offered by economic development, a general view of smallholder farmers' prospects globally, however, reveals a more discouraging situation. Ferris et al. (2014) notes that studies show that the majority of smallholders do not transition from subsistence to commercial operations. Obi, Van Schalkwyk and Van Tilburg (2012) confirm this observation in the South African context by noting that too little visible change in the circumstances of the rural, small-scale producers of South Africa is observable, despite far-reaching efforts by government to address the plight of these producers. A reasonable inference is therefore that most smallholder farmers face challenges that perpetually leave them locked in poverty.

The primary and ongoing themes in addressing the 'smallholder dilemma' globally focus on market access, capacity building and access to resources and institutions (Lyne & Martin 2008). Similar themes have been identified in the South African context by Obi et al. (2012). These themes are seemingly the primary stumbling blocks for typical smallholder farmers in making the transition to commercial status and transforming their economic outlook.

This paper adds to the discussion of the 'smallholder dilemma' in the South African context and offers further points of view in terms of the underlying reasons for their battle to access profitable and sustainable markets. The paper does not therefore aim to restate the well-known struggles that smallholder farmers face in accessing markets or which measures are generally recommended in addressing their dilemma. The approach is rather to posit whether supply chain risks influence smallholder farmers' success or lack thereof in accessing markets. To this end the influence of supply chain risks for smallholder fresh produce farmers in the Gauteng province of South Africa was studied in order to probe the idea.

Smallholder farmers typically face numerous challenges such as the following: production yields that tend to be low; post-harvest risks that are high; many barriers to market access with consistency of quality, inadequate volumes, spoilage, lack and

cost of transport and storage (Baliyan & Kgathi 2009; Hewett (2012); Humphrey 2006; Munyeche, Story, Baines & Davies 2011; Murray-Prior 2011; Shepard 2007; Torero 2011). Furthermore, with current trade liberalisation and globalisation trends prominent in agricultural food chains, the agri-food sector has become more concentrated, with increased vertical integration between sectors. This increase has raised issues of food safety, quality and traceability, which have become important requirements for market entry. Owing to these global changes, farmers are increasingly challenged to compete in markets that are far more demanding in terms of quality and food safety, more concentrated and integrated and much more open to international competition (Albert & Spinger-Heinze 2006). This set of demands causes smallholder farmers to forego market share to commercial producers who have the appetite for and the capacity to bear and manage the risks associated with producing 'commercial' volumes of good-quality produce on a consistent, long-term basis.

This study sought to identify the risks that create challenges for smallholder farmers to grow and distribute their produce in South Africa in a provincial setting with the focus on fresh produce in the Gauteng province. The study was conceptualised with the proposition that the range of risks along the fresh produce chain, and particularly those faced by smallholder producers, are the major contributors to the entrapment of these producers and of the consequences for them failing to sustainably engage mainstream markets.

Owing to the contentious nature of defining smallholder farmers, it is suggested that for the purposes of this discussion, smallholder farmers should be considered as those farmers who are somewhat land constrained, poorly linked to markets and more vulnerable to risk than larger farmers in the same area (Chamberlin 2008). Although this definition also has limitations, it is known that smallholder farmers are usually only associated with limited land availability, whereas many other aspects of smallness are just as important in characterising resource-poor, small farmers. In the specific case of this research, it implied black farmers with new and/or small farms who were on the database of the Gauteng Department of Agriculture and Rural Development (GDARD) and who were known to produce vegetables.

Literature review

Risk and agriculture

Jaffee, Siegal and Andrews (2010) succinctly describe the changing risk landscape in agriculture and agricultural value chains. They (2010: p vi) note that 'risk and

uncertainty are ubiquitous and varied within the agricultural context and are as a result of a range of factors'. These include the vagaries of the weather, the unpredictable nature of biological processes, the pronounced seasonality of production and market cycles, the geographical separation of production and end uses, and the unique and uncertain political economy of food and agriculture. Cervantes-Godoy, Kimura and Antón (2013) confirm this view by noting that agriculture is characterised by highly variable returns and is associated with unpredictable circumstances that determine the final output, value and cost of the production process. According to Chuku and Okoye (2009), shocks in agriculture are triggered by a system of multi-scalar stressors or risks. They (2009: p 1525) also note that 'these stressors interact in complex and messy ways to increase the vulnerability of agricultural role players and reduce their resilience to effects of disasters'.

Jaffee et al. (2010) highlight the fact that in light of the omnipresence of risks and massive structural changes in global and national agri-food systems, farmers, agribusiness firms and governments face new challenges in the design of risk management strategies. In terms of this, it is becoming increasingly important to understand and appreciate the risks and their impacts on the agri-value chain and to develop strategies and policies to overcome these perils. The value of characterising risk from an agri-supply chain perspective is therefore clear both for policymakers and stakeholders in order to shape policy and decision making. Torero (2011) emphasises the influence of risk by noting that the high risks of production and cycles of oversupply and price depression create financial risks throughout the distribution chain that inhibit investment and access to capital.

Table 1 summarises the general categories of major risks that the agricultural chain faces, with overviews of such risks. This summary contextualises risks in agriculture as a point of departure in analysing and understanding the impact of these risks for smallholder farmers in the Gauteng province of South Africa.

Smallholder farmers and the impact of risk

Although agriculture is generally associated with risk, a factor to consider is the impact of the different dimensions of risk on smallholders and their ability and appetite to participate in the agricultural chain. According to Cervantes-Godoy et al. (2013), smallholder farmers are most likely to be disproportionately vulnerable to the impacts of risk. Owing to this vulnerability, the consequences of these risks can be extreme, usually trapping smallholder farmers in a poverty trap or pushing them into deeper poverty. Eakin (2005) notes the relationship between risk and the fortunes of smallholder farmers, Torero (2011) also mentions the impact of risk along

Table 1: Categories of major risks facing agricultural supply chains

Type of risk	Examples
Weather-related risks	Periodic deficit and/or excess rainfall or temperature, hail, storms, strong winds
Natural disasters (including extreme weather events)	Major floods and droughts, hurricanes, cyclones, typhoons, earthquakes, volcanic activity
Biological and environmental risks	Crop and livestock pests and diseases; contamination related to poor sanitation, human contamination and illnesses; contamination affecting food safety; contamination and degradation of natural resources and processes contamination and degradation of production and processing environment
Market-related risks	Changes in supply and/or demand that impact domestic and/or international prices of inputs and/or outputs; changes in market demands for quantity and/or quality attributes, market demands for quantity and/or quality attributes; changes in food safety requirements, changes in market demands for timing of product delivery; changes in enterprise/supply chain reputation and dependability
Logistical and infrastructural risks	Changes in transport, communication, energy costs, degraded and/or undependable transport, communication, energy infrastructure, physical destruction, conflicts, labour disputes affecting transport, communications, energy infrastructure and services
Management and operational risks	Poor management decisions in asset allocation and livelihood/enterprise selection; poor decision making in use of inputs; poor quality control; forecast and planning errors; breakdowns in farm or firm equipment; use of outdated seeds; lack of in-farm or firm equipment; lack of preparation to change product, process, markets; inability to adapt to changes in cash and labour flows
Public policy and institutional risks	Changing and/or uncertain monetary, fiscal and tax policies; changing and/or uncertain financial (credit, savings, insurance) policies; changing and/or uncertain regulatory and legal policies and enforcement; changing corruption); weak institutional capacity to implement tenure system; governance-related uncertainty (e.g., market policies; changing and/or uncertain land policies and and/or uncertain trade and regulatory mandates
Political risks	Security-related risks and uncertainty (e.g., threats to property and/or life) associated with politico-social instability within a country or in neighbouring countries, interruption of trade due to disputes with other countries, nationalization/confiscation of assets, especially for foreign investors

Source: Jaffee et al. (2010:p 10)

with high transaction costs, which has a snowballing detrimental effect on their ability to get markets to work for them. Chamberlin (2008: pp 1) highlights the fact that 'most smallholders in most developing areas are probably somewhat land constrained, poorly linked to markets, and more vulnerable to risk than are larger farmers in the same areas. However, not all smallholders are equally land constrained, market oriented, or vulnerable to risk.

In the sub-Saharan setting, Livingston, Schonberger and Delaney (2011) observed that smallholders in disbursed supply chains (cereals, rice, vegetables) are exposed to a larger number of business risks and lower returns than those operating in integrated markets (fair trade cocoa, specialty coffee) where risks are more widely shared among chain actors. The result is that smallholder farmers generally remain constrained by their capacity to manage their risk-return trade-offs, which curbs their ability to exchange stable crop production for intensified agriculture.

Harvey et al. (2014) studied the vulnerability of smallholder farmers to agricultural risks and climate change in Madagascar. Malagasy farmers were found to be particularly vulnerable to any shocks to their agricultural system owing to their high dependence on agriculture for their livelihoods, chronic food insecurity, physical isolation and lack of access to formal safety nets. Unless well managed, risks in agriculture slow development and hinder poverty reduction.

The significance of risk to smallholder farmers is obvious, as it pertains to global, regional and local dimensions in the South African context. The difficulties that smallholder farmers have to navigate are likely to drive them into deeper vulnerability and trap them in a state of underdevelopment if there are no mechanisms to manage risks. These aftermaths can be ill-afforded in the South African setting where the development of smallholder farmers is a huge imperative for rural expansion, economic development and social cohesion.

Risk and the poverty trap

In light of their precarious situation, many smallholder farmers tend to be risk adverse and they are thus less inclined than non-poor groups to move up the 'risk-return' ladder towards potential higher incomes and returns. According to Livingston et al. (2011), this contributes to the growing income disparities in developing countries.

The consequences of the difficulties that smallholders face can be explained by the distinctive 'poverty trap' (Figure 1) as described by Dorward, Kirsten, Omamo, Poulton and Vink (2009). The 'poverty trap' is a typical, self-enforcing cycle in which the poverty stricken are inescapably caught. This trap is caused by a weak institutional and infrastructural environment where smallholder farmers' strategies

result in low economic activity, thin markets, high transaction costs and risks and high units cost that limit access to markets and development, which in turn result in constrained economic development of those farmers. The premise is that a change in smallholder farmers' risk-bearing or management capability is critical to escaping from the poverty trap. It is postulated that the central 'market access' theme as a stumbling block to the development of smallholder farmers is actually the result of farmers' inability to endure or manage risks rather than a superficial view of market access independently.

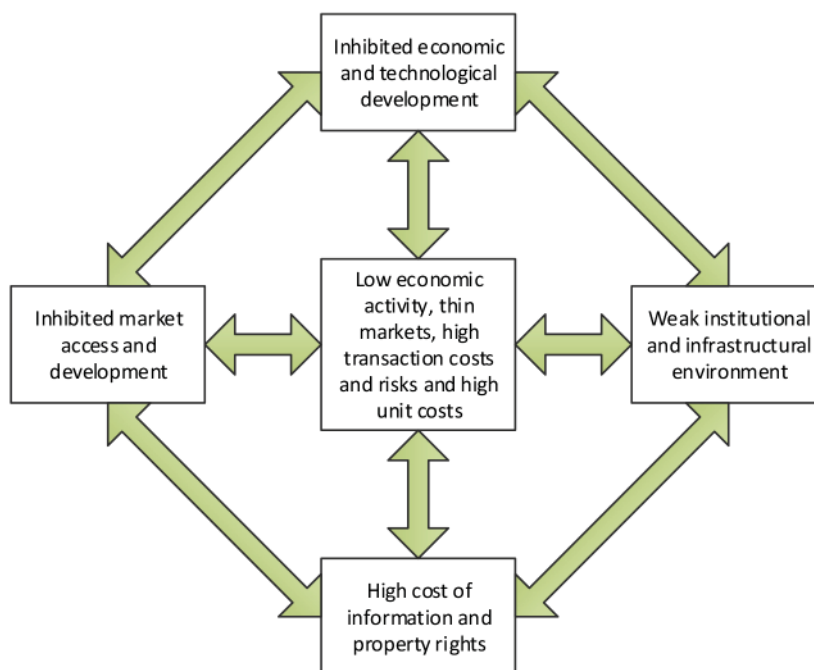


Figure 1: The classic poverty trap (adapted from Dorward et al. 2009)

The South African fresh produce sector

The South African fresh produce sector is economically significant and contributes 25% of the gross value of the country's agricultural economy. The main vegetables produced in South Africa include potatoes, tomatoes, onions, green maize and pumpkins. Vegetable production in South Africa has also been increasing generally, with a 2.7% annual growth in vegetable production over the past 28 years. This growth has tracked population growth but is also ascribable to, respectively, a 19% and

7% increase in the per capita consumption of potatoes and other vegetables during the past ten years (Department of Agriculture 2014). Fresh produce production and distribution in South Africa reflects the dualistic economic system of the country where a sophisticated, developed economy exists alongside a developing economy.

Fresh produce is produced by a small number of relatively large, established commercial producers, on the one hand, and a multitude of small-scale producers, on the other. Smallholder farmers who produce crops valued at no more than R100 000 (\pm US\$ 8 500) per annum, have a small market share in the formal fresh produce chain, accounting for only 3% of total supplies to the Johannesburg Fresh Produce in 2009 (Louw & Geysler 2009). In the same year, large-scale producers accounted for 16% of total supplies with harvests valued in excess of R10 million (\pm US\$ 850 000). Producers supplying produce falling in the R1 million to R10 million (\pm US\$ 85 000 – 850 000) category accounted for 60% share of total produce supplied.

Fresh produce in South Africa is marketed through formal channels (consisting of a relatively small number of large players) and informal channels (consisting of a relatively large number of small role players). The bulk of fresh produce in South Africa is marketed through formal channels mostly through fresh produce markets (FPMs). Direct marketing of fresh produce has been popular across South Africa because it offers producers security of payment, lower marketing costs, a better bargaining position for producers, lower prices for wholesalers and retailers, convenience, less handling and better quality (HSRC 1991). Historically, the direct marketing of fresh produce is also influenced by the quality, freshness and the availability of specialised farmers' facilities (Mollen 1967). Informal trade continues to play a part in the distribution of fresh produce in South Africa. Informal trading in South Africa is largely influenced by the history of the country, with many consumers in townships where informal shops (shebeens & spaza shops) and street traders (hawkers) generate large volumes of product sales on a national scale. Stalls situated along the roadside are a common phenomenon in South Africa, on roads where there are large volumes of traffic and that are situated close to urban consumer markets and the product source area. The marketing of fresh produce in South Africa is influenced mainly by transportation and storage, as well as the grading and packing of fresh produce (HSRC 1991).

Fresh produce in South Africa is distributed through the following channels: FPMs, export channels and direct sales to wholesalers, retailers, hawkers, processors, institutional buyers and consumers. A portion is also held back for producers' own consumption and for seed for the coming seasons. The distribution channel that is used to market fresh produce is largely influenced by the nature of fresh produce. A large proportion of fresh produce is distributed through FPMs. Statistics released by

the Department of Agriculture, Forestry and Fisheries (DAFF 2011) show that 48% of fresh produce in South Africa was distributed through FPMs in 2011, with direct sales and own consumption accounting for 42% of the fresh produce distributed, while processors and exports accounted for 7% and 3% of the fresh produce sold in South Africa respectively (Figure 2).

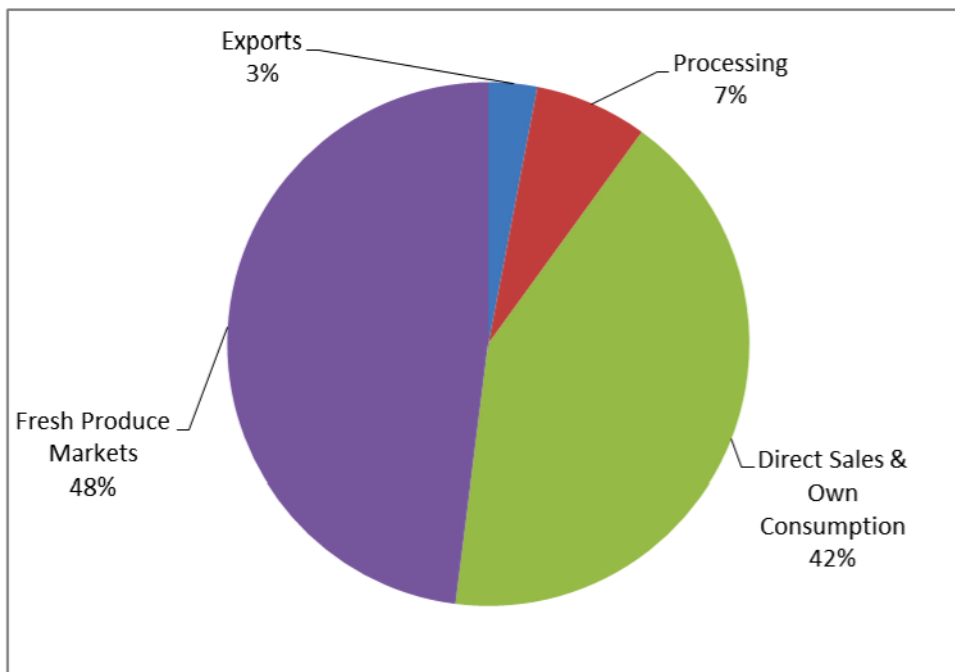


Figure 2: Distribution of fresh vegetable sales according to distribution outlet (2010/1) (compiled from DAFF 2011)

Methodology

This study employed the supply chain analysis approach (Rich, Baker, Negassa & Ross 2009) and made use of both primary data to conduct the supply chain risk assessment. Data was collected through individual interviews with the supply chain participants involved in the relevant chains. Sources of data that were used in the study included the following: farmer surveys, structured interviews with FPMs (markets and agents), supermarkets, processors, representatives of local/regional government departments and institutional buyers. Structured questionnaires were administered to a total of 52 smallholder farmers in the three farming regions of the Gauteng province by way of visits to these farms and one-to-one interviews.

These farmers were randomly identified from a database provided by the Gauteng Department of Agriculture and Rural Development (GDARD). The regions included in the study were Randfontein, Germiston and Pretoria. Semi-structured interviews were used to gather information from the other chain stakeholders pertaining to the demand attributes for farmers to compete in their various markets, as well as their perceptions of the risks affecting smallholder farmers and their ability to participate in formal markets. The country's two fresh produce markets (Johannesburg & Tshwane), one wholesaler, three supermarkets, one institutional buyer and one processor who procures produce, among others, from producers in Gauteng, were interviewed.

The number of smallholder farmers in the survey ended up being somewhat less than ideal owing to the limitations in interviewing more farmers. However, assuming a smallholder farmer population of 10 000 in the province, a 95% confidence level and an 87.5% confidence interval yielded the minimum sample of 52 that was required. Despite the fact that the confidence interval for the particular sample was suboptimal, it was deemed tolerable in light of the general homogeneity of issues and responses among the farmers.

A supply chain risk assessment was conducted for farmers as well as various end markets, with risk being assessed at key transaction points along the supply chain. These transaction points were input supply, production and marketing. Activities that formed the supply chain risk assessment are indicated below.

- *Supply chain analysis*: This section used the supply chain mapping technique for the smallholder fresh produce industry using baseline data gathered from the field survey. Mapping techniques were used to trace the flow of fresh produce from the smallholder farmers to the end markets and the various intermediaries along the chain, together with their functions and value-adding activities.
- *Risk analysis*: This section was conducted from both the demand and supply side, identifying and characterising the range of risks faced by the players operating in the supply chain. The demand side focused on the risks faced by end markets when procuring produce from smallholder farmers, while the supply side focused on the risks affecting farmers' fresh produce business that are likely to limit their participation in formal value chains.
- *Risk management and vulnerability assessment*: This section focused on identifying the existing risk management strategies and measures undertaken by supply chain participants and third parties, such as government institutions and private companies.

Results and interpretation

Farmers' socioeconomic characteristics

Part of the study considered the socioeconomic characteristics of the smallholder farmers in order to understand the context of the various characteristics of the farmers that could have an impact on the risks that influence their business, as well as their ability to mitigate or manage the various risks (Table 2).

Table 2: Socioeconomic and demographic variables of 52 respondents

Socioeconomic or demographic variables	% of respondents
Ownership structure of enterprise <ul style="list-style-type: none"> • Private • Cooperative • Partnership • Company 	83% 9% 6% 2%
Gender <ul style="list-style-type: none"> • Male farmers • Female farmers 	44% 56%
Age <ul style="list-style-type: none"> • Percentage younger than 35 years • Percentage older than 35 years 	19% 81%
Highest level of education <ul style="list-style-type: none"> • Completed primary education • Completed secondary education • Completed tertiary education 	8% 58% 35%
Access to finance <ul style="list-style-type: none"> • Self-financed • External finance 	77% 23%
Types of finance <ul style="list-style-type: none"> • Commercial banks • Mining companies • Local government institutions • Family and friends • Self-financed 	4% 6% 8% 3% 77%
Complementary farming enterprises <ul style="list-style-type: none"> • Livestock 	58%
Access to farming infrastructure and equipment <ul style="list-style-type: none"> • Access to greenhouse • Privately owned tractors • Hired tractors • Hand implements 	56% 15% 40% 46%

Source: Survey conducted by authors

Supply chain and distribution channels for smallholder fresh produce

The smallholder fresh produce supply chain is characterised by various distribution channels used by the farmers who were surveyed. These include FPMs, retail supermarkets, hawkers, local consumers, greengrocers and institutional buyers such as government hospitals.

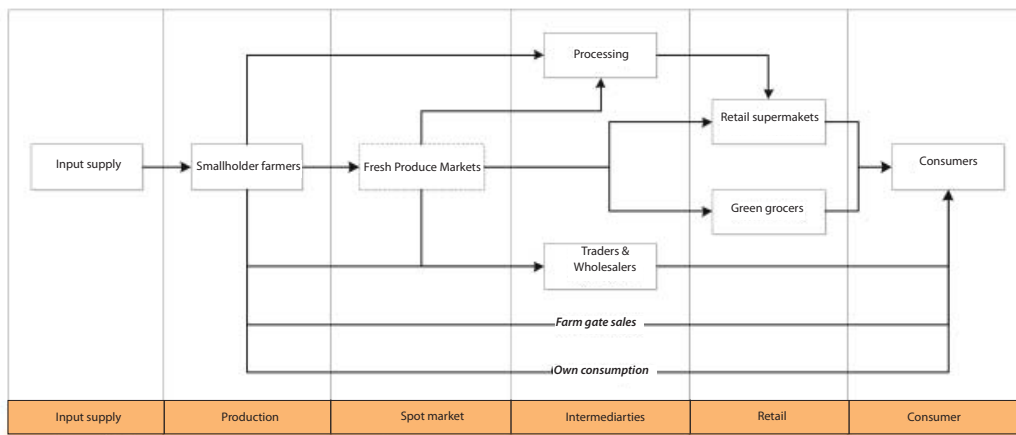


Figure 3: Smallholder fresh produce supply chain

According to information supplied by the farmers, markets are selected on the basis of the highest prices offered, as well as markets that have the lowest marketing costs and that offer security and swiftness of payment. Marketing channels were classified into formal (FPMs, greengrocers, institutional buyers and supermarkets) and informal markets (hawkers and farm-gate sales to local consumers). Farmers do not distribute all their produce through one channel, but use various markets, depending on demand and accessibility. Figure 4 shows the distribution channels used by the farmers to sell their fresh produce. Because farmers can use multiple channels for the marketing of their produce, it was possible to note one or more channels. The percentage value indicates the percentage of farmers who use the particular marketing channel.

Most smallholder farmers sell their produce in informal markets. The primary informal channels include sales to informal traders or hawkers (62%) and direct sales to local consumers (52%) through farm-gate sales. Although the informal channel is synonymous with low prices, its marketing costs were far lower since this channel does not require produce to be graded, packaged and labelled, and there are no transport requirements since products are sold directly at the farm gate. In addition, farmers reported that farm-gate sales to traders and local consumers offered more

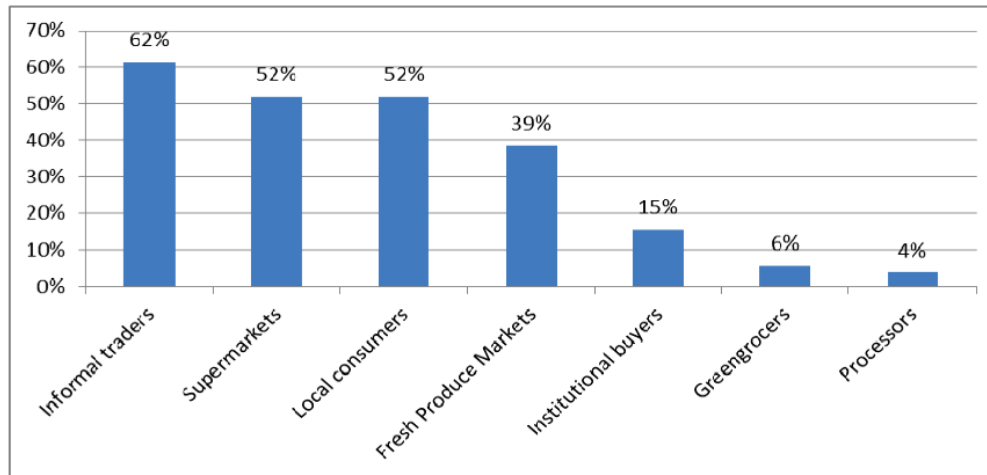


Figure 4: Fresh produce distribution channels

security and swift payments, as they received payment at the point of sale as opposed to selling through FPMs, where payments were received several days after the produce had been delivered. In some instances, farmers also failed to receive payment if their produce could not be sold.

Wholesale FPMs

Wholesale FPMs are the primary spot market for fresh produce in South Africa. South Africa's FPMs function as commission markets with agents who trade farmers' produce on their behalf. Prices for the produce are determined by market forces and farmers receive payment after their produce has been sold, which may take two to three days after delivering their produce to the market. FPMs have various requirements for farmers, which include sorting, grading, packaging and labelling of their produce to provide for traceability. These requirements are legally determined by the Agricultural Product Standards Act 119 of 1990. Farmers are also required to deliver their produce under clean and hygienic conditions that will maintain the quality of the produce. Deliveries are often required to be done under specific temperatures to avoid spoilage and to maintain the freshness of the produce. Farmers were again required to make consistent deliveries and to make sure that they delivered their produce on time.

Institutional buyers

The role of institutional buyers was assessed through interviews with the Gauteng Shared Service Centre (GSSC) procurement department, which was responsible for procuring fresh produce for government hospitals and social development entities in Gauteng. Smallholder farmers who sell to government institutions do so through contract arrangements set up by the GSSC. Farmers enter into a contract with the GSSC whereby they commit themselves to deliver fresh produce to public hospitals around Gauteng against a specified purchase order.

Under the contract, with the exception of the winter season, farmers are compelled to deliver 80% of the vegetables harvested from their farms. The products delivered are required to meet packaging requirements, which take into account the absence of damage or deterioration resulting from transportation and/or storage. Farmers are also supposed to produce a R918 certificate from the Provincial Department of Health, which states that produce from the farms is acceptable on the basis of the following: the hygienic conditions of the farm; produce being delivered in closed clean transport; the provision of records of their production, pest control and packaging processes; and the farm having access to a pack house. Notwithstanding these requirements, GSSC procurement is increasingly leaning towards freshly cut, processed, ready-to-cook vegetables delivered under specific temperature conditions. This additional requirement introduces further impediments to smallholder farmers accessing this channel.

Processors

A structured interview was conducted with a major South African fresh produce processor who processes 75% of South Africa's processed fresh produce. The business model adopted by the processor that was interviewed is that growers are contracted to grow produce for processing for the particular grower. Processors source their produce directly from smallholder farmers and indirectly from FPMs.

Retailers

Retailers generally operate from a system of central procurement where a national or regional procurement division is responsible for the acquisition of the necessary fresh produce for distribution. The primary procurement channels that retailers employ from a central procurement point of view are directly from farmers through growing programmes or via the FPMs. Through this approach, retailers seek to secure appropriate quantities of a variety of fresh produce within minimum quality parameters.

Smallholder producers, however, are not the major suppliers for retail channels that largely rely on commercial production for obligatory volume and quality demands. Some supermarket groups have significant numbers of smaller suppliers and encourage smaller producers to become suppliers within the confines of their requirements.

Nevertheless, most retailers have pilot programmes with smallholder producers, the aim of these programmes being to mainstream these producers. These vary in success because retailers aim to find workable models. Some have become sceptical about such programmes as a result of financial losses and vast numbers of man hours, funding and other investments made into such programmes. In many instances it was reported that the initial planning and conceptualisation of these programmes does not match what happens in reality.

Supply chain risk analysis

Farmers provided information on the key risks that affect their fresh produce businesses at the input supply stage, during production and at the post-harvest and marketing stages. A demand-side analysis took into account the risks faced by various end markets when they procure fresh produce from farmers. The analysis investigated the perspectives of the stakeholders further along the chain with regard to the risks impacting on smallholder producers that prevent the mainstreaming of smallholder farmers into formal high-value markets.

Supply-side risks: farmers

Input supply risks

According to information supplied by the farmers, two major risks are encountered during the input supply stage, namely the costs and quality of the inputs. Most of the farmers in the sample (62%) complained about the costs of the inputs, citing that they were too expensive. Hence farmers were forced to cut back on their input purchases and reduce their levels of production. The yield and income realised also declined. In addition, the low production levels may exclude farmers from selling to formal markets that require consistent deliveries to the market. A number of farmers (15%) reported that some of the inputs they purchased were of poor quality, that seed germinated poorly and often produced vegetables of poor quality, which failed to sell in formal high-value markets.

Production risks

During the production stage, farmers reported inclement weather (e.g. frost, hail and drought), pests, diseases and wild animals, water shortages and unskilled labour

as the major risks affecting their fresh produce business. Over 72% of farmers cited weather-related risks; 79% reported pests and diseases; 27% reported the shortage of water; and 15% reported the lack of skilled labour.

Weather-related risks, pests and diseases were reported to affect both the quantity and quality of the produce, thus creating challenges for farmers to sell to the high-value markets. A shortage of water was reported by farmers who use municipality water for irrigation. They stated that because of the high cost of water, they had reduced the amount of land cultivated to reduce water consumption. This reduction in land cultivated resulted in farmers producing a limited quantity of produce. Farmers who reported unskilled labour as a challenge indicated that some of their workers lacked the knowledge on how to apply chemicals properly, and in some cases, workers were reported not to weed properly, which affected the quantities harvested and the quality of the produce.

Post-harvest and marketing risks

Post-harvest and marketing risks that were identified in the study were low market prices, lack of access to markets, lack of transport, competition, poor produce quality and a lack of packaging material. Several farmers in the sample (32%) reported low market prices as the major challenge they faced in marketing their produce. These farmers associated low prices with the informal market as a result of oversupply to the specific market. Closely related to this risk was the significant competition between the farmers. Farmers who highlighted competition as a challenge reported that competition leads to the oversupply of produce in the market, which results in farmers receiving low prices for their produce. Some of the farmers (19%) reported that they were faced with a challenge in accessing markets to sell their produce. Failure to access markets was found to be related to other challenges cited by the farmers, which included an oversupply of produce in the market, poor quality produce (10%) that failed to sell on the market and lack of transport to deliver produce to the market (15%). Lack of packaging material was mentioned by 17% of farmers, who reported that this limited their ability to sell their produce to high-value markets.

Demand-side risks: formal end markets

FPMs

It emerged from the interviews that the main risk faced by FPMs when facilitating the sale of fresh produce from smallholder farmers related to the quality of produce

delivered by the farmers. FPMs reported that as a result of poor storage and transport facilities and, in most cases, poor packaging and grading, farmers often delivered poor-quality vegetables to the market, which failed to sell. Poor quality was also ascribed to poor agricultural practices by smallholder farmers. Another challenge for FPMs when facilitating the sale of fresh vegetables from smallholder farmers related to the untimely delivery of produce. Produce often arrived at the market late after the market had closed, and producers therefore had to wait for their produce to be sold the next day. Inconsistent delivery was also reported as a challenge for FPMs as they failed to secure sufficient produce from farmers. Farmers often choose not to sell through FPMs because of the packaging and labelling requirement, which requires all fresh produce to be branded, labelled and graded at the farm to enable traceability and to comply with the requirements of the Agricultural Product Standards Act. Packaging and labelling often come at a high cost for these farmers, as they have to purchase the packaging material and seldom have ready access to infrastructure to facilitate sorting, grading, packaging and labelling.

Institutional buyers

Interviews with the GSSC revealed the various challenges and risks faced by public hospitals and institutions in sourcing fresh vegetables from smallholder farmers and their perspective on the challenges facing smallholder farmers. The following challenges and risks were identified:

- failure to invoice quantities correctly
- contracted farmers opting to purchase produce from other farmers in order to meet their contractual obligations, which is against the stipulations of the contract
- poor farming capability and production skills
- transport and logistics problems, as some farmers are located far away from the hospitals
- poor quality produce
- inconsistent supply

Processors

Interviews with the processors revealed general challenges and risks for producers and processors in relation to the sourcing of fresh produce from smallholder farmers. The processors identified the following challenges and risks:

- *Location*: Firstly, from a processor's perspective, the location of the fresh produce in relation to the location of the processing facilities is of critical importance. Moreover, sufficient volumes are required to constitute a commercially viable location.

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- *Water and irrigation rights and infrastructure:* Processors noted that without access to water and irrigation, the producers of vegetables are unlikely to be able to produce vegetables that meet commercial processing requirements. These requirements are essential to ensure that fields grow and ripen evenly so that fields can be harvested at one time and within a short space of time. In addition to the availability of water, it was also noted that water quality is a significant risk in terms of fresh produce production. The risk factors, in terms of water quality, relate to biological, heavy metal and uranium contamination.
- *Safety and quality:* In light of the significant risks that accompany food products, the processor highlighted the need for food safety and quality. This is a non-negotiable dimension in production and is one of the significant risks in the value chain. The processors tend not offer growing contracts to producers who are unable to maintain a minimum food safety and quality standard. Most farmers, irrespective of their background, battle to produce within the guidelines of Good Agricultural Practices (GAP). In this regard, the processor was working with all its suppliers towards GAP certification.
- *Import competition:* Competition from cheap, imported processed vegetable products poses a direct threat to the feasibility of food-processing enterprises in South Africa. Anecdotally, these imported products are predominantly from China and Brazil. The result is that local processing companies struggle to remain viable because they find it difficult to compete with such imports.
- *Infrastructure:* The processor noted that local, regional and national infrastructure plays a key part in the fresh produce sector. Transport infrastructure in particular fulfils a major role in the distribution of inputs and the collation of produce. Quality efficiency and cost are thus challenges and a risk for the fresh produce value chain. The poorer and the more costly the repairs required to the infrastructure are, the greater the detriment is to the whole fresh produce chain.
- *Support to emergent and/or small farmers:* Emergent and/or small farmers face specific challenges over and above those faced by established producers. These mainly include support from government agencies, which tends to be uncoordinated and a general lack technical know-how and advice. Both these factors limit producers' ability to produce to expectations, which in turn, results in producers remaining in the poverty trap.

Retailers

The interviews with retailers revealed general challenges and risks from both a producer's and a retailer's perspective. These challenges and risks were classified into the following three primary groups:

Production

The fact was emphasised that access to pollution-free good-quality water is an absolute requirement for successful food production. Access, together with water infrastructure (including reliable irrigation systems), was highlighted as a key success factor for commercial vegetable production.

The input costs to produce a commercial quantity of good-quality vegetables of the desired variety are significant. Depending on the crop, these costs can run into many hundred thousands of rand per hectare. The challenge highlights the difficulties for most resource-poor smallholder farmers to produce fresh produce commercially.

Smallholder farmers, as individuals, struggle to produce sustainably and continuously to meet the requirements of scale required by market agents or the procurement divisions of retailers. Smallholder farmers produce too little, too inconsistently and in a too uncoordinated manner for retailers to be interested in procuring from them. Retailers are unable to accommodate inconsistent deliveries and/or inadequate products and consequently limit their exposure to smallholder producers. In principle, when farmers enter into growing programmes with retailers, they are expected, within reasonable limits, to deliver what they are required to deliver. Failure to do so will result in the relationship with the retailer not growing and eventually being terminated.

The retailers generally agreed that individual, uncoordinated production on landholdings of one, three or five hectares (ha) will not enable producers to enter formal markets, and the extent of these landholdings is insufficient to ensure sustainable, commercially oriented production. The more accurate and reliable the deliveries are, the better the chance of producers growing their business with retailers.

Post-harvest

Food safety and quality are non-negotiables for retailers, who have a legal and moral obligation towards consumers to offer high-quality, safe and authentic food for sale. Moreover, adherence to food safety and quality standards and other regulations is required and imposed by law. Supermarket representatives thus mentioned that they could not accept raw material that is not temperature controlled and that hazard analysis and critical control point (HACCP) compliance would become a non-negotiable throughout the chain.

To varying degrees, supermarkets now require producers to adhere to the South African Good Agricultural Practices (GAP) framework. In time, compliance with this framework will become mandatory for those producers wishing to delivery to supermarkets.

The introduction of the Consumer Protection Act 68 of 2008 has also prompted retailers to draw a 'line in the sand' in terms of product quality and safety for suppliers. Given the risks that the above Act effected for retailers, their approach to procurement is more calculated and has influenced the requirements that producers need to comply with.

The general consensus among the supermarket representatives in terms of the post-harvest challenges that smallholder farmers face was that adherence to the quality and safety aspects of a product is the main challenge. Retailers stated that is particularly difficult to comply with the food safety and quality standards for fresh vegetables. Notwithstanding these challenges, many smallholder producers are engaged in vegetable production as a cash crop.

Marketing

It was the general view of retailers that most emergent farmers would not succeed in selling to them because of the continuity, transport and quantity shortcomings on the producers' part and the range of strict requirements on the retailers' part. In terms of the marketing options for small or emergent growers, if producers wish to enter the formal market, the obvious first step would be to link producers into the national fresh produce market system and to develop from there.

The rationale is that many farmers lack infrastructure, transport and the ability to coordinate activities. The concept of a coordinated receipt, sorting, grading and packaging facility is currently being supported by the national government and the private sector.

In terms of transport, retailers were able and willing to collect produce, but the majority required the produce to be delivered to the retailer's distribution centre. It is therefore essential for producers to have this capacity. Not having access to transport or the ability to deliver produce are significant impediments in terms of accessing formalised markets. Retailers also require refrigerated transport to ensure maintenance of the cold chain throughout the process, from production to consumption. The transport requirements to access formalised markets are therefore significant and continue to grow in complexity and the number of requirements.

Retailers emphasised that a number of general challenges in the South African market impact on the fresh produce sector in general. These constraints were reported to stretch across the sector. Two constraints are discussed below.

- The production of fresh fruit and vegetables in South Africa is facing deteriorating conditions because of the challenging production environment, including declining water quality and availability, an unstable labour environment, detrimental climate change and increasing production costs and uncertainty.

- Many government initiatives are making the fresh produce industry increasingly difficult, especially for new entrants and role players. These initiatives include stricter hygiene and quality requirements, packaging, sorting and grading standards.

Major impediments for small farmers include exposure to all of the above-mentioned challenges and unfavourable terms of payment, both of which are problematic. Retailers are also not organised to handle hundreds of small suppliers and the possibility of success in this regard is therefore limited. At the same time, marketing avenues like the FPMs are well suited to handle large numbers of small suppliers, provided that the minimum requirements are met.

Risk management strategies

The study considered the capability of smallholder farmers to manage risks affecting their fresh produce business. Strategies that were reported include the following:

Input supply risk management mechanisms

Those farmers who reported that high input prices are a challenge seek inputs from cheaper markets and in some cases reduce input purchases as a means to avoid paying too much for inputs. Farmers who reported poor input quality as a challenge did not have any risk mitigation strategies to address the challenge. The lack of a mitigation strategy was mainly because farmers can only determine that their inputs are of poor quality after germination and the only option is for them to purchase other inputs.

Production risk-coping strategies

Farmers reported using pesticides and chemicals to address the problem of pests and diseases. These chemicals, however, are reported to come at a high cost and farmers thus tend to apply less than the required amounts, and in some instances, they fail to apply any pesticides. For weather-related risks, farmers reported using greenhouses to protect their produce from harsh weather conditions such as hail and frost. The challenges of unskilled labour are addressed by mentoring the workers and demonstrating how to apply chemicals.

Marketing risk-coping strategies

Farmers reported that they prefer to hold on to their crop until prices are more favourable in the market and when a strong demand for their produce arises.

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However, only 24% of the farmers reported having access to a storage facility either through private or shared ownership.

In other cases, farmers resort to selling to hawkers and local consumers if their produce fails to sell to formal markets, either because of failure to meet quality standards or to access packaging material. Farmers who were involved in livestock production reported that when their produce fails to sell they feed the produce to their livestock.

Risk management assistance

The majority of farmers (54%) reported receiving external support from various institutions, which include farmer organisations, government, neighbouring farmers and private companies to help them with their risk management (Table 3).

Table 3: Institutions offering risk management assistance to farmers

Institution	Risk management assistance
Government	Extension services Input support Pack houses Boreholes and water tanks Access to markets
Farmer organisations	Collective marketing Production advice Tractors Receive government support Credit
Neighbouring farmers	Transport Marketing Credit
Agricultural Research Council	Inputs
Mining companies	Access to markets

Source: Survey (2013)

Government support, farmer organisations, neighbouring farmers, private companies and FPMs are discussed below.

- *Government support:* The most common support offered by government is through extension services where farmers obtain information on good agricultural practices to assist them with their production. Although all farmers reported that they are regularly visited by extension workers, 21% of the farmers reported that they

did not find the extension services helpful. Government also supports farmers by providing inputs for their various agricultural practices, with 23% of farmers reporting having received inputs from government to help them. Government was also reported to offer infrastructural support to farmers in the form of pack houses, greenhouses, boreholes and water tanks. In addition, government also support farmers and help them to access markets through contract arrangements through the GSSC, where farmers supply to government institutions. Farmers also receive financial support through local government programmes like the Gauteng Enterprise Propeller which offers loans and enterprise and skills development support.

- *Farmer organisations*: Farmers also receive risk management support from farmer organisations where they receive a range of support, including funding, labour, farming equipment (tractors) and extension support. Farmers receive better assistance from government when they were in groups. Farmers also receive access to transport and markets by selling in groups, which helps them to reduce the transaction costs of selling their produce to the markets. However, not all farmers are members of a farmer organisation or union. The majority of these groups are informal and not registered.
- *Neighbouring farmers*: Farmers often receive external support from neighbouring farmers who provide support mainly through credit facilities and transport.
- *Private companies*: Private companies, which include mining companies and the Agricultural Research Council (ARC), also support farmers in coping with risk by offering input support and access to output markets.
- *FPMs*: These markets extend risk management support to smallholder farmers mostly through their market agents who offer farmers advice on quality and quantity requirements. Furthermore, FPMs advise farmers on suitable modes of transport and educated farmers on which products to transport together in order to avoid spoiling the products.

Conclusions and recommendations

This research, based on a limited sample and geographic area in South Africa, confirmed the well-known and usual problems faced by smallholder farmers in this particular context. This study also suggested that risk in the value chain affects the quantity and quality of farmers' produce in their specific supply chains and ultimately their ability to participate and compete in formal, high-value markets. These risks were categorised as input procurement, production, post-harvest and market risks. The impact of these risks is potentially severe and adversely affects

smallholder producers in particular, who probably have a limited appetite for and ability to manage or bear these risks or their consequences. The surveyed farmers' current risk management strategies are also underdeveloped with risk avoidance being a primary strategy. Ultimately, the inability of smallholder farmers to manage or bear risks and their general preference for rather avoiding risk results in decision making and outcomes that are not conducive to accessing markets feasibly and sustainably.

Based on the research and the conclusions, a number of specific recommendations can be made. These recommendations primarily relate to policies for developing smallholder farmers in the Gauteng province of South Africa. Broadly speaking, creating an enabling environment for the province's smallholder farmers will provide the foundation for their economic development and overcoming their challenges, including the influence of risk. Christy, Mabaya, Wilson, Mutambatsere and Mlanga (2009) propose essential, important and useful enablers for such economic development. Access to infrastructure, risk management tools, value chain coordination mechanisms and human resource development are among the noteworthy elements of enabling environments relevant to smallholder farmers in the Gauteng province. Torero (2011) adds that accompanying institutions that can reduce the marketing risk and transaction costs in the process of exchange between producers and consumers are a further requirement for creating an environment for economic development.

In light of the findings of this study and the broad recommendations, a number of specific recommendations include the following broad guidelines:

- Develop programmes and funding models to improve access to infrastructure for smallholder farmers. This should include the following:
 - production infrastructure (water and irrigation infrastructure, green houses, etc.)
 - post-harvest infrastructure (sorting, grading, packaging and storage facilities)
 - supporting infrastructure (roads, fences, etc.)
 - equipment, human capital development
- Develop or improve access to risk mitigation mechanisms with specific consideration of insurance and disaster relief tools designed to ensure business continuity in response to risky events.
- Expand extension services to provide farmers with information on GAP as well as how to best produce, handle, harvest, store, sort, grade, package, label, transport and market their produce as per the market requirements and to reduce post-harvest losses.

- Support the development of collective institutions for farmers to reduce transaction costs in their activities. This would include planning, financing and implementing programmes or schemes in collaboration with retailers and FPMs to forge closer relationships with smallholder farmers. A collective fresh produce hub falls within this sphere and would be an ideal platform from which to achieve economies of scale.
- Pursue closer relationships in the value chain to encourage more formalised relationships such as contracting, which is an inherent tool to manage specific dimensions of risk throughout the whole supply chain.
- Support smallholder farmer development in terms of capacity building in all aspects of agricultural production and management.
- In addition to the specific measures that are suggested, a culture of the well-developed ex-ante and ex-post risk management approaches should be fostered among smallholder farmers and stakeholders in their value chain.

In conclusion, it is recommended that further research should be conducted in a number of areas pertaining to smallholder farmers' risk appetite and risk-bearing ability and their mechanisms to deal with the particular risks in the value chain and how this impedes their all-round ability to graduate from small-scale to commercially oriented production.

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