– CHAPTER 2 –

Commodity exchanges and ICT

2.1 Introduction

This chapter looks at the literature on commodity exchanges and ICT. It begins by looking at the background, and then looks at the relationship between ICT and agriculture. It then discusses commodity exchange markets in more developed markets as well as in Africa. The chapter then discusses commodity exchange models and then market information systems.

2.2 Background

ICT has been seen to have a positive influence in the livelihoods of farmers in several developing countries such as India, Uganda, Kenya, Ethiopia and Malawi (Asenso-Okyere & Mekonnen, 2012:17). The impact is experienced through various means as ICT has been seen as an enabling technology. However, sustainability and scale have been major issues that have hindered the success of ICT in African agriculture. Some technologies used by farmers are radios, mobile phones, computers and the internet.

Some of the ways that ICT can be of benefit to agriculturalists are access to market information; distribution and supply chain management and traceability; financial services (mobile banking); farm extension services, access to sector experience and research; and commodity exchanges/warehouse receipt systems. Since the 1980s, several African countries have used liberalised agricultural systems and have not experienced any major food crises because of it (Coulter & Onumah, 2002:319). However, due to the nature of their establishment, the systems have become very inefficient and are not fully developed. One of the ways in which these liberalised systems have enabled transparency and efficiency in the agricultural market is through agricultural commodity exchanges.

2.3 Relationship between ICT and agriculture

Agriculture plays an important role in the livelihoods of people in Sub-Saharan Africa by giving rise to positive socio-economic growth. The majority of Africa's food is produced by small farmers while the poverty levels are the highest (Asenso-Okyere & Mekonnen, 2012:6) Approximately 70% of Africans rely on agriculture as the source of their well-being. Furthermore, in Africa, 70 to 80% of the population is rural, thus they farm on small pieces of land that are two hectares or less in size (Bremner, 2012:2).

ICT technologies that are of major use to farmers are mobile phones, radios, computers, the internet, digital cameras, geographic information systems and global positioning systems (USAID, 2010a:1). ICT-based applications rely a lot on the channels of communication such as the internet, mobile phones and computers. Mobile phones have by far been the most accessible to African farmers, considering the fact that the areas they live in are inaccessible and underdeveloped. The benefits realised by many through the use of ICT in agriculture are reduction in transaction costs, increase in access to markets, provision of information on critical market information and improvement of communication inside the value chain (Maritz, 2011)

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Market information systems ensure that delivery of products is done timeously, quality grades and standards control are instituted, and weather and climate conditions are known (USAID, 2011:1). The sustainability and scalability of the projects through the different channels of communication relies heavily on donor support. Though the impact of ICT cannot be observed directly it is important to note how the impact would have been without ICT and the cost effectiveness of using ICT technologies (USAID, 2010a:3). ICT-enabled tools or applications can be used to reach those end-users who use non-ICT channels such as blackboards at a village for small-scale farmers. In such a case ICT can be used in the background to disseminate information.

According to the Merriam-Webster dictionary online (2012), "a commodity exchange market is an organised market where future delivery contracts for graded commodities (as grains, cotton, sugar, coffee, wool) are bought and sold". Contracts traded are spot prices, forwards, options and futures. More complex commodity trading includes interest rates, swaps, ocean freight as well as environmental contracts. Examples of commodity exchanges in Africa include the Ethiopia Commodity exchange (ECX), Uganda Commodity Exchange

(warehouse receipt system), Zambian Commodity Exchange (ZAMACE) and SAFEX (South Africa).

According to Coulter and Onumah (2002:323), a warehouse receipt is defined as "a document issued by warehouse operators as evidence that specified commodities of stated quantity and quality, have been deposited at particular locations by named depositors." A warehouse receipt system is a locally, regionally or nationally managed system which deals with the issuing, transference and control of warehouse receipts. The warehouse receipt system, much like a commodity exchange differs in that it is usually a foundation for a commodity exchange and is less technically oriented.

Commodity exchange systems provide transparency in discovery of prices and this facilitates better prices while increasing efficiency between buyers and sellers (USAID, 2010:1). The movement of crops is avoided resulting in the reduction in spoilage, transport and transaction costs. Secondly, temporal and spatial arbitrage can be exercised. The former refers to arbitrage between time periods while the latter refers to arbitrage between different places. While commodity exchanges provide several functions, the two common functions are to enable the discovery of prices and to manage price risk (Ahuja 2006:155). While it is widely believed that commodity exchanges create or determine market prices for commodity trade, it should be noted that prices are determined by market conditions. Commodity exchanges, therefore, are only present to enable an organised market where buyers and sellers can meet to trade freely in various commodities of interest.

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2.4 More developed commodity exchanges

While South Africa's commodity exchange market is the most advanced in Africa and the only one using options, there are larger and more advanced commodity exchanges in both developing and developed countries such as those in the USA, India, China and Australia. Only the commodity exchanges of India and the USA will be discussed in this section. The USA will be discussed first due to it having the longest history of futures trading and is also the world leader. This is relevant to the South African case which is also the leader in Africa. India will be discussed due its great propensity of small-scale farmers which is the focus of this study. Some African countries shall be discussed in the next section.

2.4.1 United States

The US is recognised as the world's first commodity exchange which is based in Chicago. However, it is believed that the very first derivatives trader was the London Royal Exchange in 1841 (Chance, 1998). The commonly known US commodity exchanges are the Chicago Board of Trade (CBOT), Chicago Mercantile Exchange (CME), Kansas City Board of Trade (KCBT), New York Board of Trade (NYBOT) and New York Mercantile Exchange (NYMEX). The Chicago Board of Trade was formed on 1848 and was located along Lake Michigan which allowed it to be a good storage point for grain. It also served as a trading and distribution point. There was a major problem of seasonality of the crops which resulted in the storage facilities not being able to contain the sudden increase in harvests. At the same time the facilities were unused during the off-season period. Due to this fluctuation in storage, prices also changed rapidly. To deal with this problem, some traders decided to use a system of "locking in" prices where the seller would agree on a price with the trader in the present and deliver the grain in the harvest period. This was instrumental as a hedging or speculation technique. Contracts became more of what they currently are today due to their standardisation in 1865 (Chance, 1998).

Trading in futures was banned and reconstituted several times in a few countries during the 1800s including Japan and parts of Europe (Lambert, 2011:43). In 1922 the Grain Futures Act was put in place in order to regulate the futures market. 1936 saw the banning of trading in futures as well as in other countries. The CME became the first trader of non-physical commodities in 1972. In 1973 the Chicago Board Options Exchange (CBOE) was instituted and this coincided with inception of the famous Black-Scholes formula used for pricing options. Following that, CBOT created the first futures contracts in interest rates. Treasury bond futures were started by KCBT in 1977. CBOE decided to create the CBOE 100 index in 1983 but later transferred it to Standard and Poor's upon which it became S&P 100 index (Chance, 1998). Currently the S&P 100 index is a sub-set of the S&P 500 and lists the top 100 exchange-based US stocks. In 2007 CME merged with CBOT under the CME Group name. This was followed the CME Group's acquisition of NYMEX in 2008 to become the world's largest derivatives trader. KCBT was later acquired by CME in 2012.

The 1980s brought in swaps and other more complex derivatives. Most of these came about with the investment in the integration of mathematicians and physicists' ideas with

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derivatives trading. Derivatives' trading has been involved in the many of the world's financial collapses. However, its history owes it particularly to commodity trading.

2.4.2 India

India is an Asian developing country with the second largest population in the world at 1.2 billion. The agricultural sector employs 52% of the labour force, while providing approximately 17% of the country's GDP (The World Factbook, 2012). The majority of India's population is rural while the most of farmers are small-scale. Eighty per cent of India's farm sizes are small at less than two hectares while the world average is 3.7 hectares (FAO, 2002:3). India's commodity markets go back almost as far back as the very first commodity exchanges in the world, that is, Chicago (Chicago Board of Trade), in the United States.

Derivatives trading in India started in 1875 and were met with a lot of criticism as they were thought to cause speculation which would negatively affect the commodities traded (Vashishta & Kumar, 2010:20). Commodity options and cash-based commodity futures were then prohibited in 1952 with the Forward Contracts (Regulation) Act, immediately following the start of democratic rule. In the early 1960s droughts ensued resulting in many farmers defaulting on their forward contracts (Ahuja, 2006:154). From then on commodity markets were discontinued up until the 2000s. The government decided to encourage commodity trading with the aim of matching modern exchanges by using instruments such as electronic trading.

Currently there are 22 regional commodity exchanges in the country although there are only four national-level commodity exchanges namely the Multi Commodity Exchange of India (MCX), the National Multi-Commodity Exchange of India Limited (NMCE), the Indian Commodity Exchange (ICEX) and the National Commodity and Derivatives Exchange Limited (NCDEX). MCX is currently the fifth largest commodity exchange in the world.

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2.5 Commodity exchanges in Africa

The end of the colonial era saw the agricultural industry in most African countries not being able to sustain the livelihoods of people, yet agriculture was critical to ensuring the economic and social well-being of the countries. Following World War Two, there was a shift towards using marketing boards as a strategy to ensure price stability (Robbins, 2011:8). The majority of these marketing boards were controlled by the state and in some cases controlled almost the whole country's agricultural output. Marketing boards had the function of negotiating prices with large trading firms, while also collecting taxes from farmers. Due to a host of problems including corruption and stifling bureaucracy, producers began to receive only small percentages of their products' selling prices (Robbins, 2011:8). Most marketing or control boards were dismantled with the arrival of the market liberalisation era, with the aim of increasing efficiency in the agricultural industry. This also came about as a result of suggestions under the International Monetary Fund's (IMF) structural adjustment programmes in several sub-Saharan African countries (Tollens, 2006:2).

Governments began to provide public market information services with the help of the Food and Agriculture Organisation (FAO). However, following the liberalisation process, many private players entered the market and began to compete with state-owned organisations for services such as providing market information services (Robbins, 2011:9). The result was that it became costly to provide market information to small-scale farmers as state radio stations became virtually non-existent. This led to the widening of the information gap between traders and the small farmers. Coupled with the rapid increase in input prices in the past two decades, small-scale farmers have now lost much of their bargaining power. To solve this problem, governments decided to reform the market based on the commodity exchange system (Robbins, 2011:9).

In Africa, commodity exchange markets have been introduced in a few countries namely Uganda, Ethiopia, Zambia, Zimbabwe, Kenya, Malawi, Nigeria and South Africa (UNCTAD, 2005:3). The commodity exchanges in these countries are the Uganda Commodity Exchange (UCE), Ethiopia Commodity Exchange (ECX), Zambian Agricultural Commodity Exchange (ZAMACE), Zimbabwe Commodity Exchange (ZIMACE), Kenya Agricultural Commodity Exchange (KACE), Malawi Agricultural Commodity Exchange (MACE), Abuja Securities and Commodity Exchange (ASCE) and South Africa Commodity Exchange (SAFEX)

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respectively. The agricultural commodity markets in Africa were created to tackle problems that impeded efficiency and fairness in the market system. The issues include the absence of competition, market information and transparency, credit, bargaining power of small-scale farmers, poor quality standards and insufficient production volumes (Pote, 2008:47).

In Zambia, Malawi, Kenya and Ethiopia and Uganda, the systems were created using a theoretical model where the commodity exchange would be linked to a warehouse receipt system (Robbins, 2011:10). According to these systems, it was proposed that each agricultural district would have a warehouse with a capacity of 20,000 tons which would be certified by the exchange. Secondly, all commodity parcels in the exchange were to be assessed to see whether they met the quality standards of the exchange. Warehouse receipts were to be assigned by the traders to be used by the farmers as collateral so as to borrow from banks. In turn, physical parcels of commodities would be exchanged for them (Robbins, 2011:12). A pyramid of the difference flows that were proposed by the sponsors of the programmes in the five countries mentioned above can be seen in Figure 1 below.

For Ethiopia, ECX was seen to be the only one which followed the proposed guidelines set by the sponsors of the projects in the five countries. The rest of the commodity exchanges in the other countries have shifted from their intended focuses (Robbins, 2011:14). KACE and MACE are no longer referred to as commodity exchanges but are now more of market information services where prices and volumes traded are distributed through Short Message Service (SMS) using mobile phones. UCE has had challenges with getting funding and the government is in the process of sourcing them. The main problem they have faced is that there is very low turnover such that it inadequately covers the costs of exchange. Many of the donors of the projects in these countries have been USA-based.

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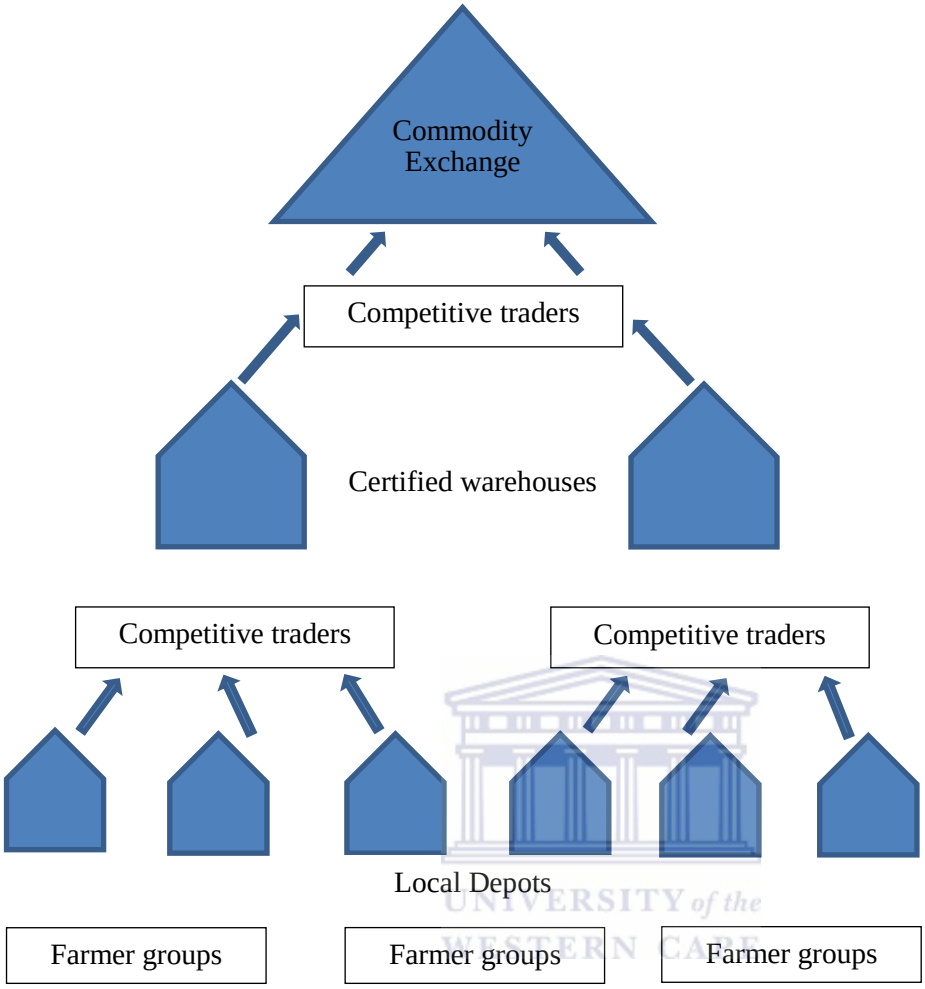
Figure 2.1: The new trading system



Source: Robbins (2011)

The proposed new trading system shown above begins with individual small-scale farmers who come together to form small farmer groups with their local peers in the farming community. They then send their collective produce to local depots for storage before going to competitive traders. The farmers are issued warehouse receipts stating the quantity and quality of their products and then also pay the warehouse owner storage fees. The receipt is tradable and can be used as loan collateral. The competitive traders then take the produce from the different local depots to certified warehouses where grading, packing and testing and certification are done. The new owners of the products then trade them in the commodity exchange (Robbins, 2011:11).

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ECX was established in 2007 but trading only started in 2008 (Edossa, 2010:1). Several challenges were experienced in the launch of the ECX system. There were no proper commercial warehouse operators; therefore no deposits could be made. Secondly, there was no proper clearing houses or an electronic network for banks and this hindered having inter-bank transfers. There were several power failures and a telecommunications structure that was unreliable. There were also no software programs to support the proposed business model.

The Ethiopian case was set up with the idea of promoting order, transparency, efficiency and integrity (Edossa, 2010:2). The Ethiopian vision was highly ICT-driven. The ECX system was established with 20 trading centres, 50 warehouses and over 2,000 market information kiosks situated all over the country. There were also 50 data display boards but they had no inter-connectivity.

The envisioned ICT plan for ECX involved a system which has the ECX Data Centre, which houses the market trading system and market information system. The trading system would then be interlinked with warehouses, banks (clearing institutions) and information kiosks. On the other hand, the market information system was to have inter-linkages with electronic display boards; global exchanges and data providers; an SMS system or IVR (interactive voice response) system; and lastly web users. The market information system would be the more electronic side of the exchange which is powered primarily by the internet (Edossa, 2010:4).

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With most of the issues mentioned above resolved, it can be noted that there were over 430 members in the ECX system, with over 3,000 clients. Small-scale farmers who are in the system are over 2.4 million. There are now seven partner banks with five commodities being traded. The future outlook is to have online spot and futures trading and an integrated electronic data exchange centre (Edossa, 2010:8).

MACE was established as a dualistic programme which has both estate and small-scale farmers (Khando, 2009). As agriculture employs over 85% of the population it also accounts for 40% of GDP. Prior to its launch, it had been observed that there was a problem in getting market information on time and on a regular basis. MACE was then set up in 2004. It came up as a result of the Initiative for the Development and Equity in Agriculture (IDEAA) Programme. The IDEAA programme proposed a market information system that is pro-poor.

Their goal was to build capacity for small-scale farmers as they constitute a large proportion of the traders in the exchange. ICTs were also one of the strategic goals of the programme (Khando, 2009).

Some of the technologies implemented by MACE were farmer-managed information centres, SMS and a radio programme. The database for MACE has 14 rural markets and four farmer-managed market information systems. It was found that small-scale farmers in Malawi face challenges in the accessing of finance. It was also found that they do not benefit directly from charging high prices which occur as a result of price seasonality. This is because of the fact that they sell their produce either before or soon after harvest so as to get cash as this is also coupled by the inability to access finance as mentioned above. Small-scale farmers also sometimes buy commodities at high prices so as to meet their food requirements. Poverty levels and food security are thus negatively affected. (Khando, 2009)

The Agricultural Commodity Exchange for Africa

According to UNCTAD (2005:1) the Abuja Treaty of 1991 had plans for creating an African commodity exchange to be known as the Agricultural Commodity Exchange for Africa (ACE) which would link all the different commodity exchanges in the various countries in Africa. Such a programme would have the potential of improving regional integration, making trade much easier than it currently is. With the establishment of the African Union in 2001 the idea for ACE was reiterated. Three models were proposed in the conference and were seen to become very viable and will be discussed below.

As South Africa was seen to be the most successful commodity exchange in Africa, there was a lot of debate on whether a commodity exchange for the whole of Africa would be viable. In Zambia and Zimbabwe, with ZAMACE and ZIMACE respectively, the markets were completely cash-based. It is said that in the whole of Africa, over 20 commodity exchange programmes were instituted but were highly unsuccessful. However, some of the programmes are still in use in other countries such as Ethiopia. Some lessons can be learnt from other countries on the potential success of a commodity exchange market. African conditions have made it difficult to establish a successful commodity exchange (UNCTAD, 2005:23).

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The ACE was eventually formed in 2004 with its headquarters in Malawi (Rashid *et al* 2010:1). However, though ACE was established as a commodity exchange dealing with spot and futures markets, it only currently has the function of price information provision and assisting the World Food Programme (WFP) in its food procurement efforts.

2.6 Commodity exchange models

While there are several models on commodity exchanges that can be used, here are five different models that were seen to have the potential of being most successful. Each has its own advantages and disadvantages. The first is a stand-alone, low-cost open outcry exchange, which is a place where people come together physically to trade, governed by a set of trading rules. The second is a stand-alone, low-cost, low-service electronic exchange. This is more of an exchange where people meet on a willing buyer and willing seller basis through the use of a bulletin board. The third model is a stand-alone high-service outcry exchange and this was the original model used on the USA. The fourth is a stand-alone high-service electronic exchange and is the most widely used exchange model. The last model is the high-service regional exchange service where variable and fixed costs are shared nationally (UNCTAD, 2005:8).

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Model one was used in many African countries such as Zimbabwe, but the surpluses that were generated were not enough to upgrade the systems. Model two was used in East Africa with major trading in coffee but the positive results are yet to be seen. SAFEX uses model four and its success has been as a result of its focus on financial derivatives. As the operating costs were very high, SAFEX decided to use its own software created by local programmers. The sponsors were for the idea and this resulted in its success. There has been talk of other African countries adopting Indian-based software, seeing that the agricultural commodity market in that country has been successful. However, due to the lack of financial backing, start-up costs remain extremely high (UNCTAD, 2005:9).

2.7 Market information systems

Markets provide an opportunity for buyers and sellers to come together and transact. In order for these transactions to be mutually beneficial, there is a need for participants to have

information such as on current prices and market trends (Shepherd, 1997:1). The supply of timeous and adequate market information has been seen to be of benefit to farmers, policy makers and traders greatly. The provision of information allows farmers to plan their production while on the whole enabling a country to prepare for a food crisis in the event that it may be looming. Market information systems or services (MIS) provide for one such need. Shepherd (1997:2) defines an MIS as a service that is usually public-operated which performs regular price information collection on, at times, quantities of common agricultural products from wholesale markets, rural markets and retailers; and then distributing this information regularly and timeously using different forms of media to traders, policy makers, farmers, governments as well as consumers.

MISs were put in place to deal with some of the asymmetries that came about as a result of economic liberalisation (Tollens, 2005:2). This had come as one of the suggestions under structural adjustment programmes from the IMF. The goal was to ensure that there was an improvement in the bargaining power of farmers, increasing transparency while promoting market efficiency. In some countries, MIS were set up as services that would provide information to governments as they monitored economic liberalisation so that they could intervene whenever it was necessary. Several MIS in developing countries were initially setup to serve the government more rather than to assist farmers (Tollens, 2005:2). The combination of an MIS and a commodity exchange as a service within a country is of particular significance in the African context. The MIS serves a market price information provider while the commodity exchange acts as a facilitator of fair and efficient agricultural trade. South Africa's commodity exchange market (SAFEX) is the only one which has both these functions while also allowing for futures trading.

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2.8 Conclusion

This section began by looking at the relationship between ICT and agriculture and its relation to commodity exchanges. It went on to define commodity exchanges and warehouse receipt systems. It then discussed functions of commodity exchanges and looked at different ones in both developed and developing countries. Following that, commodity exchange models were discussed then market information systems.

– CHAPTER 3 –

The South African agricultural market

3.1 Introduction

This chapter primarily focuses on the South African agricultural market. The next section shall look at a brief background of the South African agricultural market. Following this the chapter will define what a small scale farmer is in the South African context. The agricultural policy environment is then discussed followed by government support programmes that have been put in place to support small-sale farmers. The constraints that small-scale farmers face are discussed and then the South African agricultural commodity exchange market is discussed. The chapter then concludes.

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3.2 Background

South Africa commands the most developed economy in Africa. It is also one of the emerging industrialised countries in the world, with a per capita gross GDP which is more than four times the African average. Together with Brazil, Russia, India and China it forms BRICS which is an association of the five major emerging industrialised countries in the world (John, 2012:2).

With a population of over 50 million, South Africa's agricultural sector employs approximately 30% of the country's workforce. The majority of these are informally employed such that they use agriculture as a survival mechanism. South Africa's agriculture can be described as a dual economy as it has both commercial farmers and small-scale farmers, with the latter being the majority (Goldblatt, 2010:18).

In most developing countries, agriculture serves as the foundation of their economies. Agriculture can be divided into primary and secondary. Primary agriculture in South Africa contributes roughly three per cent of GDP, but due to linkages within the economy the agricultural-industrial sector contributes approximately seven per cent (Department of Agriculture Forestry & Fisheries, 2012). Compared to other African countries, this is a very

small share of GDP. As previously mentioned, South Africa's main GDP contributor is services at approximately 68% (The World Factbook, 2012). Agriculture contributes only seven per cent of formal employment in the country and about seven per cent of total exports. Only 12% of the country's land is arable and can be used for the production of crops, while three per cent is seen as high potential land (Department of Agriculture Forestry & Fisheries, 2012). Sixty-nine per cent of the country is suitable for livestock production. The main agricultural activities in the country are crop production (with maize as the largest contributor), cattle ranching and mixed farming in the bushveld[1]. Sheep farming is mainly practiced in the arid regions (See Appendix A.1). Table 1.1 shows GDP contribution by different sectors.

South Africa is the largest maize producer in the Southern African Development Community (SADC) region. It is estimated that there are between 50,000 and 60,000 commercial farmers in South Africa (Walker, 2004:6). It is also estimated that 8,000 of them are responsible for the production of most of the maize crop (Hannon, 2012:4). The rest of the maize crop is produced by small-scale farmers who market their crop individually or through cooperatives. Maize is the most produced crop as it is the staple food of Southern Africa. Other major crops produced in the country are wheat, sugar cane and sunflower seed. In terms of horticulture, the country is the largest producer of protea flowers in the world (Conradie & Knoessen, 2009:2). Table 3.1 shows production of major crops and horticultural products in 2010 while Table 3.2 shows the gross value of agricultural products in 2010.

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Table 3.1: Production of major crops and horticultural products (2010)

Crop	Production ('000 tonnes)
Maize	13 431
Sugar cane	16 866
Potatoes	2 089

[1] The bushveld is a sub-tropical woodland area of Southern Africa. It consists of mainly grass and low scrub with small patches of tall scrubs and trees (Spriggs, 2012)

Citrus fruit	2 167
Vegetables	2 506
Wheat	1 967
Grain sorghum	226
Sunflower seed	509
Soya beans	566
Subtropical fruit	670

Source: Department of Agriculture Forestry & Fisheries (2010)

Table 3.2: Gross value of major agricultural production (2010)

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Agricultural Product	**Gross Value (R '000)**
Poultry and poultry products	29 598
Cattle and cattle products	15 203
Maize	13 522
Milk	9 253
Deciduous and other fruit	8 757
Vegetables	7 802
Citrus fruit	6 455
Sugar cane	4 825
Potatoes	4 775
Sheep and goats slaughtered	3 677
Viticulture	3 474
Wheat	3 191
Hay	3 116

Pigs slaughtered	2 924
Subtropical fruit	2 088
Sunflower seed	1 504
Soya beans	1 431
Wool	1 424
Groundnuts	453
Tobacco	346
Grain sorghum	314

Source: Department of Agriculture, Forestry & Fisheries (2012)

3.3 Small-scale farmers in South Africa

For one to understand the issues that surround small-scale agriculture there is need to have a proper understanding of what a small-scale farmer is. However, common terms that describe small-scale farmers are small holder farmers, subsistence farmers, resource-poor farmers or peasant farmers (Machethe *et al*, 2004:8). Another common term is 'emerging farmers', which is coined to beneficiaries of land reform programs. Different criteria have been used to describe small-scale farmers. The most common criteria are: purpose of production (whether for subsistence/home use or for commercial use/selling); racial group (generally either black or white); size of farm land; and income level (whether one is rich or poor). In South Africa, the racial criteria has traditionally been used where small-scale farmers commonly refers to black farmers (Machethe *et al*, 2004:9). The white farmers are commonly referred to as commercial or large-scale farmers. With the land reform, some black farmers have graduated into commercial farmers although the proportion is very small (Kirsten & van Zyl, 1998:552). It should also be noted that a majority of the small-scale farmers are poor and are often referred to as middle-income farmers. The rest are usually referred to as subsistence farmers.

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In South Africa, the term "small-scale farming" has been largely used to characterize farming practice in the former homeland[2] areas. The farming practices are seen as archaic and non-productive, with the pieces of land generally very small. There has always been a lot of scepticism regarding small-scale farmers and their abilities. They have been generally viewed as farmers without much potential to become large-scale commercial farmers. Commercial farmers on the other hand, have been seen as highly productive with large farm sizes and using advanced mechanisation. Output or turnover can be used to classify a farm's size because it is possible for a small farm to produce a higher output than a larger farm. The differences are also determined by the type of agricultural activity as some agricultural activities such as cattle ranching require larger pieces of land than say, horticulture. The type of managerial skills can also be used to assess the viability of a farm considered as a "small-scale farm" (Kirsten & van Zyl, 2010:555).

It is also necessary to properly define what a small-scale farmer is because it helps to note the policy environment in the country and how highly marginalised small-scale farmers are and looked upon lowly by South African (Cousins, 2010:20). Small-scale farms are just as viable and profitable as large-scale farms, thus if they are properly defined, the policy issues surrounding them can be addressed effectively so that they not be viewed in a negative light as has generally been the case. If government has the proper definition of small-scale farmers then they can effectively target this group of farmers to provide the necessary support.

The following definition is suggested by Kirsten & van Zyl, 2010:555): "A small farmer is one whose scale of operation is too small to attract the provision of the services he/she needs to be able to significantly increase his/her productivity."

3.4 Agricultural policy

In the history of South Africa, the government has intervened in the agricultural sector up until the 1980s where major changes began to be instituted (Vink & Kirsten, 2000). The reforms that have occurred can be traced back as far as the early 20th century where a host of laws were in effect. Both commercial and small-scale farmers were affected differently by

[2] Homelands were areas in South Africa during the apartheid era reserved for black South Africans. These areas were not considered as economically productive (Wittenberg, 2003:12)

the regulations as shall be discussed in this section. One important point of note is the distribution of land which highly favoured the white farmer minority. Two periods will be looked at below, that is, the pre-deregulation period and the deregulation period up to the present.

3.4.1 Pre-deregulation

Beginning 1910, the South African government passed a number of land legislations. The key ones are from this period onwards are the Land Act of 1910, the Land Settlement Act of 1912, and the Marketing Act of 1937 (Vink & Kirsten, 2000). With the establishment of the Union of South Africa in 1910, racial discrimination with regards to the distribution and access to land began to be put in place. As the years went on more of similar laws were rolled out. One major point of note from the period of 1910 to World War 2 was the Land Act which resulted in whites' and blacks' share of land being split 87% and 13% respectively despite blacks being the larger population. However, most of the blacks' share of land was owned by the government. The result of all these factors was that the production of land in these areas was severely hindered.

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The Land and Agricultural Bank was formed to favour the white commercial farmers. The Marketing Acts of 1937 and 1968 were instituted to assist white farmers marketing efforts, while actively segregating black farmers. Prior to this, they had limited support in terms of agricultural pricing (OPM 2000:1). The Land Settlement Act of 1912 resulted in white farmers getting rights to public land. The number of white farms started to increase during this period, while the black population began to increase above the carrying capacity of the homelands. It became clear that the legislations put in place favoured only a few large commercial farmers (Vink & Kirsten, 2000). One example of these was the beef production, where only a select few large commercial farmers were given licenses to use controlled abattoirs. Smaller farmers were then forced to use the uncontrolled ones resulting in low producer prices.

After World War 2, with food production in the homelands under threat, production and labour opportunities for blacks began to increase (Vink & Kirsten, 2000). Mechanisation and use of improved biological technology in the white commercial farmer areas began to increase as well. As black farmers were seen as not having the skills to manage commercial

farms, despite historical evidence opposing this view, government began to roll out several projects aimed at agricultural development in the homeland areas.

Starting in the early 1980s, several changes in agricultural policy began to take place. According to Vink & Kirsten (2000), the constitution of 1983 came into place and was aimed at primarily supporting white commercial farming. The agricultural policy proposed was intended on ensuring that South Africa was made self-sufficient in terms of food and that raw materials were made available at relatively cheaper prices than they currently were. Farmers began to receive various subsidies particularly in the maize, wheat and dairy markets as well as premium producer prices while they gained access to improved biological and mechanical technology.

3.4.2 Deregulation to present

Most aspects of the deregulation of agriculture in South Africa began to be implemented in the mid-1980s. The market began to become highly liberalised with some macro-economic changes coming into effect (OPM, 2000:2). Following the liberalisation of the financial market from the de Kock Commission's recommendation, interest rate subsidisation on loans by the Land Bank reduced significantly. Borrowing money for agricultural purposes started to become expensive owing to the increase in interest rates by the Reserve Bank (Vink & Kirsten, 2000). With financial restrictions reduced, the value of the Rand began to decline resulting in production costs rising at a faster rate than output prices. Labour movement controls were also reduced and the result was an increase in informal sector activities.

The Development Bank of South Africa (DBSA) came up with programmes to assist farmers in the late 1980s. Under these programmes, individuals were selected to work as project managers working under the directorship and supervision of the programme sponsors. There was no support for small-scale farmers (Vink & Kirsten, 2000). However, many of these projects were expensive to run as they were capital-intensive resulting in losses being realised. The Farmer Support Programme was introduced in 1986 to assist rural communities and small-scale farmers in the form of support services rather than the previous schemes which focused on investment in agriculture.

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Following the Marrakech agreement in 1993 to liberate international trade, the new South African government in 1994 started deregulation of agricultural trade, moving from import substitution to export-led growth (Vink, 2000). Several tariff lines were reduced or removed as the market became more and more liberalised. As a result of these implementations, exports have more than doubled since then. Many of the tariffs were managed by agricultural control boards in each industry within the agricultural economy (OPM, 2000:3).

The new South African government in 1994 came in with hopes of rectifying the social and economic injustices of the past which had resulted in increased poverty and wealth or income inequalities. Other concerns of the government were food security and creation of jobs (Vink & Kirsten, 2000). The government was thus faced with two options, that is, to either continue with the deregulation process or to use the control boards as a means of assisting small-scale farmers and consumers (OPM, 2000:3). The government decided to deregulate. The deregulation process has resulted in both negative and positive outcomes for commercial and small-scale farmers. One of the main outcomes of the deregulation process was the establishment of a futures exchange market as a branch of the Johannesburg Stock Exchange (JSE) known as the South African Futures Exchange (SAFEX).

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3.5 Government support for small-scale farmers

Following democratisation in 1994 the South African government, unrolled several strategies to aid small-scale farmers' marketing efforts. As mentioned earlier, some of these include The Land Redistribution for Agricultural Development programme (LRAD), Comprehensive Agricultural Support Programme (CASP), Micro Agriculture Finance Institute of South Africa programme (MAFISA) and the Broad-Based Black Economic Empowerment Framework for Agriculture (AgriBEE). These four shall be discussed in this section.

3.5.1 LRAD

The LRAD programme was established within the Land Redistribution Programme (LRP). The LRP is grouped into three, which are restitution, redistribution and tenure reform (Department of Agriculture Forestry & Fisheries, 2009:3). Under redistribution there are three sub-groups set up to provide land for settlement, agricultural development and

enterprises that are not agriculturally-related. The primary goal of LRP is to ensure that 30% of the commercial agricultural land in South Africa is transferred to blacks within 15 years from the commencement date of the programme. In this case 'blacks' collectively refers to the previously disadvantaged population which are Africans (blacks), Coloureds (mixed race) and Indians. Some of the main goals of LRAD are to ease congestion in the former homeland areas, ensuring the establishment of small to medium sized farms for blacks, encourage growth in the agricultural sector and to enable the recipients to increase their socio-economic well-being. Under the program the recipients receive a grant to be used for agricultural purposes after meeting the requirement of a specified minimum contribution (HSRC 2003:4). While the LRAD has been somewhat successful, one major problem noted was that of operating under the willing buyer willing seller principle. Considering that South Africa has the second highest Gini index in the world at 65 (after its neighbour Namibia), the gap between the rich and the poor is very large thus the willing buyer willing seller principle has been difficult to put into practice (The World Factbook, 2012).

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3.5.2 CASP

Following an agricultural sector fiscal review by the then Department of Agriculture in 2003, it was realised that there was inadequate farmer support from the agricultural share of spending in the national budget (Department of Agriculture, 2003:5). In addition to the LRAD programme, the CASP was then established. According to the document, six areas would be the focus of the programmes and four beneficiary groups. The six areas are: infrastructure (both on-farm and off-farm), development of markets and businesses, capacity building, regulatory and advisory structures, financial services and, information and training. The beneficiary categories are those who are hungry and susceptible, households and subsistence, farms and businesses' activities and, the agricultural macroeconomic system. The financing area eventually led to the establishment of MAFISA. The Department of Agriculture sent some assessment teams over the 2004 period to monitor progress that had been made by provinces. It was established that although identification of important projects was done, the delivery systems of CASP at provincial level were not very effective. Secondly, the tender and procurement system was noted to be very burdensome leading to

many delays in the process. CASP was revised and in 2005 several of the issues were addressed while more issues arose (Department of Agriculture, 2003:13).

3.5.3 MAFISA

As stated earlier, MAFISA was an off shoot of CASP. It was established as a pilot project credit policy in 2005 with the sole purpose of providing finance for agricultural development. Some of the goals of MAFISA are poverty reduction, viable business development, socio-economic improvement and transforming small to medium sized businesses into larger commercial ones (Department of Agriculture, 2005:3). Funding was to be provided by development finance institutions (DFIs) in Limpopo, Eastern Cape and KwaZulu-Natal provinces. The end users targeted were active participants in the respective sectors of the agricultural economy, whether they are small subsistence farmers, small-scale farmers, emerging farmers, farm workers and community based organisations supporting agriculture. The main requirement was that each recipient should be a member of a previously disadvantaged group. The programme engineers emphasised the fact that MAFISA was not a hand-out programme as the borrowed funds were expected to be repaid, therefore saving was encouraged (Department of Agriculture, 2005:6).

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3.5.4 AgriBEE

On the 22nd of September 2004, the then President Thabo Mbeki released a draft framework for AgriBEE, with the aim of ensuring broad based black economic empowerment (BBBEE) in agriculture. The main aim of BBBEE was to promote racial and gender equalities in the economy by actively supporting "blacks" to ensure that they are enabled to act as managers, owners, professionals and skilled individuals (Department of Agriculture, 2004:4). A black enterprise is one that is 50.1% or more owned by a black person including some notable managerial control. The entrepreneurial skills of farmers were aimed at being unlocked, and making sure that rural households and communities are given access to infrastructure, land and ownership. The framework also set out to reduce illiteracy in the farming community by 2010 and to set up training programmes for farm workers and enterprises giving them management and technical skills (Department of Agriculture, 2004:8).

3.6 Marketing constraints of small-scale farmers

Small-scale farmers face a number of constraints in their attempts to market their crops or livestock produce. Some of these shall be discussed below, namely inadequate access to finance, market information, infrastructure, technology; and low quantity and quality of output.

3.6.1 Inadequate access to finance

Agricultural activities are mainly found in rural areas where the infrastructure is poor and the population densities are low. This results in increased client search costs and monitoring costs for would-be financers (Vink & van Rooyen, 2009:27). Weather is another element that poses a significant risk to a proposed agricultural projects' funding. Land also takes up much of a farmers' start-up budget while it may take long for returns to be realised. It is due to these reasons that it is difficult for commercial banks to offer finance to small-scale farmers. Furthermore, due to the small size of the farming activities, there are usually little or no assets that a small-scale farmer may use as collateral to secure a bank loan.

In the apartheid era, the Land Bank had been setup to provide white commercial farmers the needed finance for agricultural purposes. The smaller subsistence-based farming operations were thus disadvantaged. The Agricultural Credit Board (ACB), under the Department of Agriculture, was then put in place to assist those white commercial farmers (the majority) that did not qualify for Land Bank loans (Vink & van Rooyen, 2009:28). Following democratisation the government decided to close down the ACB, with the assets being transferred to the MAFISA programme focusing on emerging farmers. Following the removal of the ACB, the positive effects of the changes in finance policy have been quite small as commercial farmers were forced to shift to commercial banks that cannot provide the funding they require. Small-scale farmers on the other hand have not gained any sustainable access to finance.

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3.6.2 Inadequate access to market information

Information is vital to the farmer as it acts as a facilitation tool in the decision making process. Most literature that focuses on market information in the majority of developing

countries uses the assumption that it is a public good. This implies that public market information systems are of importance in the agricultural sector (Montshwe, 2006:15). The accessibility of information in any market is of particular importance in ensuring proper participation of players in that market. According to Frick & Groenewald (1999), there is an increasing demand of agricultural information and data in South Africa. At the same time, the rate of supply of agricultural information is much lower resulting in a shortage in the market. This has arisen due to factors such as globalisation of trade, product specialisation and the constant introduction of new technologies.

Some of the roles that have been attributed to market information are that it creates competition between traders and suppliers, reveals market opportunities and serves as a precursor to control and planning of marketing incursions (Frick & Groenewald, 1999). This undoubtedly has the potential of allowing small-scale farmers to assess the existing market conditions such as required quantities and quality; current prices; as well as gaps that exist within the market. In South Africa reliable agricultural data has been hard to obtain due to the policy changes that have been implemented in the country from the period of regulation to deregulation (Montshwe, 2006:16).

Data collection began in 1915 with the Department of Agriculture requesting monthly livestock and crop reports from selected respondents (Frick & Groenewald, 1999). In return for the collection of data, the government would then supply the farmers with the combined data approximations. The 1930s introduced control boards which regulated agricultural marketing activities in the country. In accordance with the Marketing Act, it was compulsory for control boards to collect data for which ever sector they represented. This resulted in reliable data being collected although publishing was at times delayed. However, with the disbanding of control boards during the 1990s' deregulation process, only a few sectors of the agricultural economy managed to remain (Willemse, 1996). The Marketing of Agricultural Products Act of 1996 came in with a directive to collect data for only a few of the products such as maize, cotton, wool and meat, to name a few. This resulted in data collection for some products being reduced significantly and in some cases discontinued. Furthermore, in 1998, the Central Statistical Service announced that it would postpone data collection due to budget constraints. The agricultural census was then done in 2002 followed by another in 2007. The need for data in the market has resulted in a need for an agricultural market information system that meets the requirements of small-scale farmers.

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3.6.3 Inadequate infrastructure

More often than not, small-scale farmers do not have storage facilities for their crop harvests or livestock. For those that do, the facilities may at times be deemed not conducive by the buyer of the product. Small-scale farmers primarily produce for subsistence purposes, while those that decide to sell their surplus produce, have no proper storage facilities as selling may not be part of their plan. Mostly commercial farmers have access to grain silos as these meet the quality of storage requirements of the majority of large buyers. Small-scale farmers are unable to get large contracts for their produce as they do not have these facilities, as large contracts are accompanied by competitive market prices. This results in small-scale farmers selling their produce to intermediaries who have the required facilities and in so doing lose out on profit margins. This has adverse effects on the farmers' livelihoods. Other farmers resort to farm-gate marketing as they can avoid transport and storage costs, while on the downside receiving mediocre prices (Mazibuko & Oladele, 2012:1621).

There is also a lack of vehicles, poor transport, poor roads and road networks. Without vehicles or a reliable transport system, the small-scale farmer cannot transport their product to the market or to acquire the required inputs for production. The lack of vehicles can be primarily be caused by lack of capital. As mentioned earlier, a large number of small-scale farmers reside in the former homeland areas where the transport systems were not designed to cater for agricultural businesses. The transport systems in these areas were set up with the intention of segregating the indigenous population by cutting them off from the areas where the colonial masters dwelled. The homeland areas were usually designed with one major road leading out of the area for security reasons as the government could easily prevent uprisings by blocking off the roads (Ortmann & King, 2007:238).

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3.6.4 Inadequate technology

Agricultural technologies can be classified under either production technologies or ICTs. Production technologies are, for example, use of pesticides and fertilisers, technical skills, use of genetically modified seeds, and general farming and irrigation methods, with the goal of improving efficiency. The South African agricultural market, dualistic as it is, comprises low technology for small-scale farmers with high technology on the opposite end for commercial farmers (Pote & Obi 2007:3). The presence of monopolistic control boards resulted in

competition in the market and this lead to low market efficiency. This resulted in farmers being disincentivised from acquiring marketing skills as they did not have the opportunity to do so (Pote & Obi, 2007:5). Small-scale farmers in South Africa have inadequate access to both these types of technologies. The end result is lower efficiency and output than they would have had if they had adopted these.

3.6.5 Inadequate quantity and quality of output

The lack of proper technologies, infrastructure and information can have adverse effects on the quantity and quality aspects of small-scale farming. Since small farmers produce mainly for subsistence purposes they tend not to produce a large enough output to meet the requirements of large buyers in the market (Montshwe, 2006:15). On the other hand, without the technological skills and access to current market information, small-scale farmers do not often meet the quality requirements of the buyers. The Agricultural Product Standards Act No. 119 of 1990 sets quality requirements for different types of agricultural products, according to sector (Department of Agriculture Forestry & Fisheries, 2010). The standards state packaging, grading, labelling, marking and quality of each product. Many small-scale farmers are unable to meet these requirements due to limited skills and capital among other challenges, resulting in them resorting to farm-gate marketing, which has adverse implications on their pricing.

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3.7 South Africa's commodity market

Commodity markets in South Africa have been highly biased towards commercial agriculture unlike other African countries that mainly focus on small-scale farmer participation. South Africa's agricultural produce, though contributing a small percentage to GDP, comes mainly from a few commercial farmers. The hundreds of thousands of small-scale farmers do not seem to participate much in the South Africa commodity exchange. According to Qeqe and Cartwright (2004:5) in the 2001/2002 financial year, there was an agricultural turnover of about R1.2 billion in the South African market. However, just under 0.7% of this amount came from black farmers.

Following the market liberalisation process of the 1980's, SAFEX was set up in 1988 trading in financial futures. After the attainment of democratic rule in 1994, the Agricultural Markets Division (AMD) was established as a branch of SAFEX in 1995. As mentioned, initially potato and beef futures were traded although only on a cash basis (Vink & Kirsten, 2000). White and yellow maize contracts were launched in 1996 and this coincided with the Agricultural Marketing Act of 1996 under a deregulated market system. Option derivatives were introduced in 1998 for these maize products while sunflower seeds were introduced in 1999. Five commodities are currently traded on the SAFEX which are white maize, yellow maize, wheat, soybean and sunflower seed.

The Johannesburg Securities Exchange (JSE), which is the country's national stock exchange, bought out SAFEX members in 2001 and established the Agricultural Products Division under the SAFEX brand to continue the services offered by the AMD. There are currently 60 trading members and five clearing members. The number of clients served is over 12,000 and these include millers, producers, banks, agricultural firms and cooperatives. At the moment SAFEX allows for the discovery of prices of grains as well as efficient management of price risk in both South and Southern Africa. Oil and precious metals have of recent been added to the list of derivatives traded by SAFEX.

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3.8 Conclusion

South Africa is noted as the country with the highest GDP per capita amongst African countries. Following a period of a strong regulatory environment dating back to the 1930s, the country entered a deregulation phase after democratisation in 1994. The government has set up programmes over the years to aid farmers marketing and socio-economic efforts. Some of these are LRAD, CASP, MAFISA and AgriBEE. Small-scale farmers in South Africa face some marketing constraints such as a lack of adequate finance, marketing information, infrastructure, technology, as well as meeting quantity and quality of output standards. South Africa's ICT-enabled agricultural commodity market (particularly SAFEX) was then discussed.

– CHAPTER 4 –

Assessing the agricultural commodity exchange market

4.1 Introduction

This chapter is set to assess the current situation regarding the South African commodity exchange market holistically. This is important as it helps to identify gaps and map out the extent of these problems. Once the issues have been identified, only then can plausible solutions be considered. This section shall assess the agricultural commodity market in terms of accessibility to the market and the commodity exchange environment and draw from the experiences of other developing countries. Following this, solutions to the problems identified shall be proposed with a focus on case studies of other commodity markets similar in some way to South Africa in terms of technology or market characteristics.

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4.2 Small-scale farmer participation in commodity markets

Neither small-scale nor emerging farmers have operated or are currently active in the SAFEX commodity exchange (SAFEX, 2013:1). The only participants of the commodity exchange are commercial farmers. However, SAFEX has recently introduced lower tonnage contracts for maize and wheat to allow small-scale farmers to participate in the commodity exchange market (SAFEX, 2013:1).

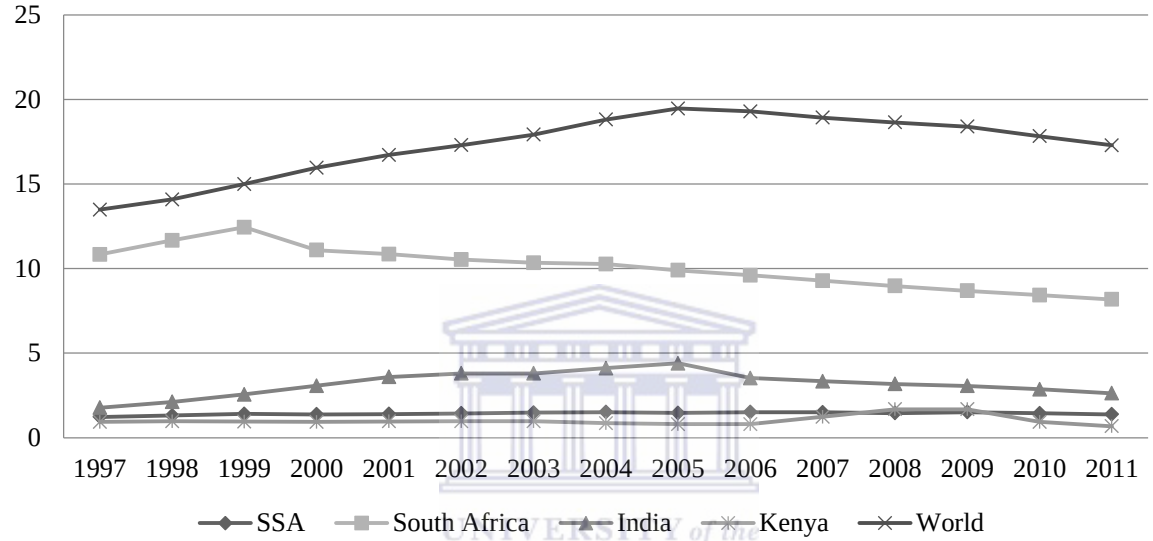
4.3 Analysis of historical ICT infrastructure indicators

From the time of South Africa's democratisation in 1994 and the complete and final phase of deregulation of the agricultural market beginning in 1996, positive changes in ICT infrastructure can be observed. ICT indicators that are mainly of use to farmers and their on-farm activities are mobile phones, fixed telephone lines, the internet (including broadband) and mobile phone coverage. The listed technologies shall be discussed below in comparison to some of the countries which shall be used in case studies.

4.3.1 Fixed telephone lines

The graph below shows the total number of fixed telephone lines (per 100 people) also known as landlines and the trend from 1997 to 2011 for sub-Saharan Africa (SSA) South Africa, India, Kenya and the World (average).

Figure 4.1: Fixed telephone lines per 100 people (1997-2011)



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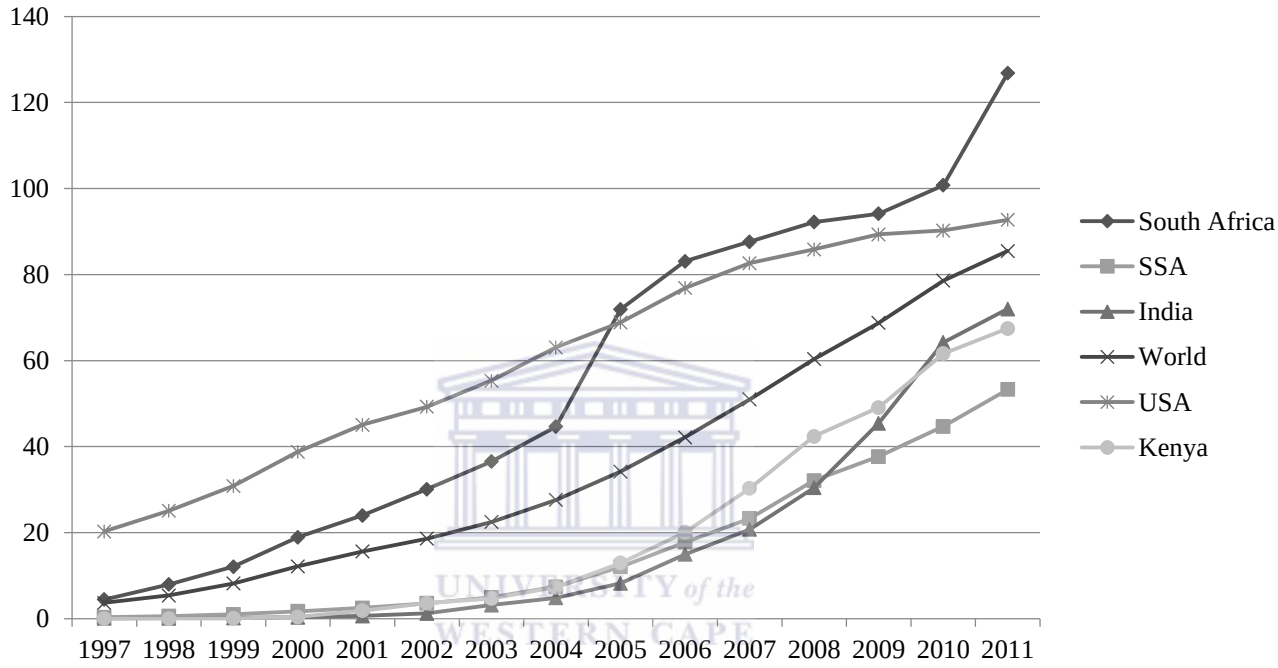
Source: World Bank (2012)

As the graph shows, there has generally been a negative trend in the growth of fixed telephone lines in most countries. The world average is only between 15 and 20 people per 100 people. South Africa has had a steady decline in telephone lines, although there were slight increases from 1997 to about 1999. Rural South Africa has been underserviced in terms of fixed line technology due to high setup costs. Kenya and SSA on the other hand are quite low at around 2 fixed lines per 100 people. The general decline in the number of telephone lines can be attributed to the rapid growth of mobile phones over the past one and a half decades (Vogelsang, 2011:2).

4.3.2 Mobile cellular subscriptions

The graph below shows the total number of mobile cellular (cell phone) subscriptions in South Africa, SSA, India, Kenya, the World (average) and the USA from 1997 to 2011.

Figure 4.2: Mobile cellular subscriptions per 100 people (1997-2011)



Source: World Bank (2012)

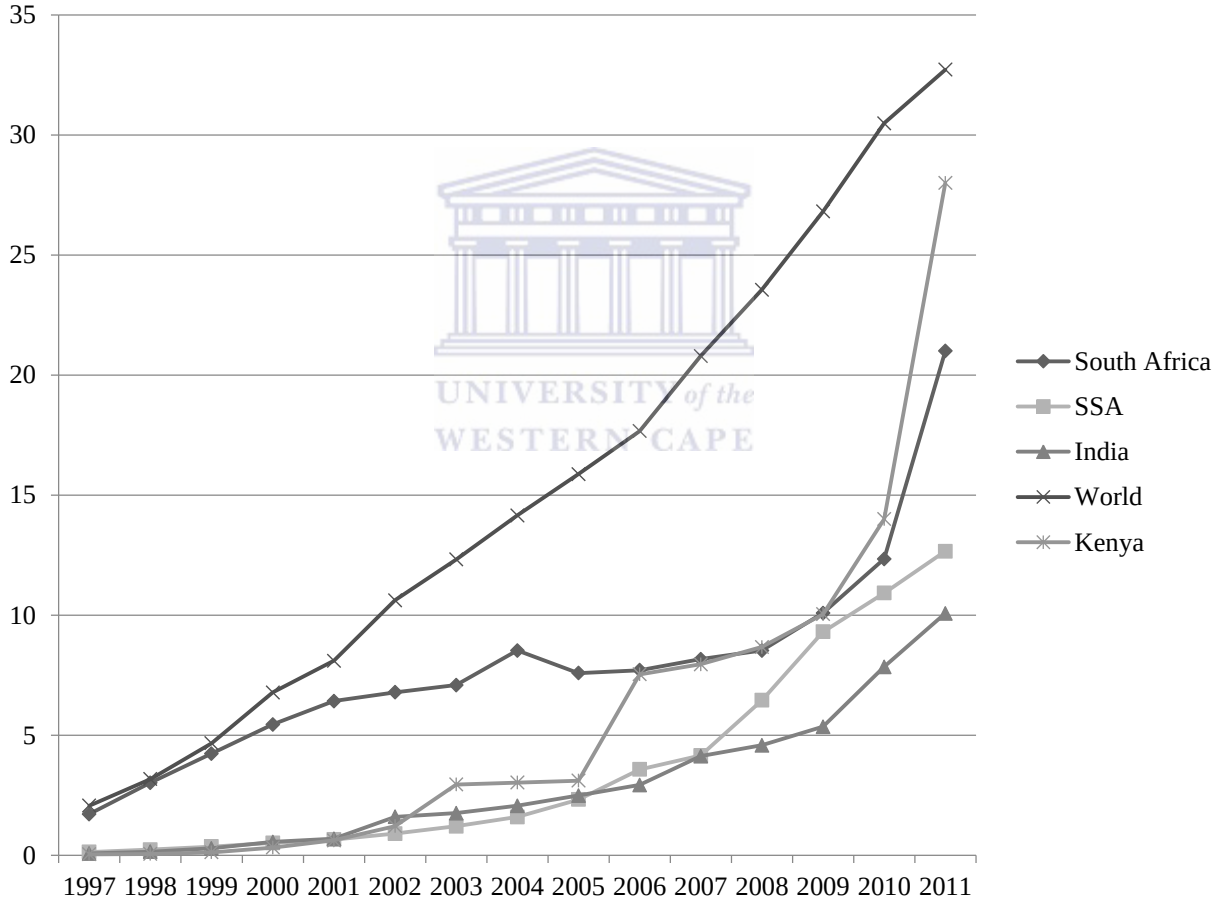
Mobile cellular technologies have become popular around the world, as seen by rapid increase in subscribers and improvements in functionality of these technologies. Seventy-five per cent of the six billion mobile phones around the world are in developing countries (Peyper, 2013). Africa has not fallen behind when looking at this growing trend. Looking at the graph above, it is evident that South Africa's mobile cellular subscriptions have been steadily increasing from 1997 up to 2011. From 2004 the number of subscriptions per 100 people in the country surpassed the USA while increasing the gap between South Africa and the world average. Among South Africa's low-income earners, usage differs between rural and urban dwellers. The urban dwellers are more likely to use their phones for the internet while rural folk tend to use the more traditional SMS. India being a leading country in terms

of information technology has had a steady increase in mobile subscriptions from 1997. This steady increase has been almost similar to the SSA and Kenya cases above.

4.3.3 Internet users

The graph below shows the number of internet users per 100 people in South Africa, SSA, India, Kenya and the World (average) from 1997 to 2011.

Figure 4.3: Internet users per 100 people (1997-2011)



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Source: World Bank (2012)

In general the number of internet users in all countries has been increasing from 1997 up to 2011. As of 2011 there were approximately 22 internet users per 100 people in South Africa, while for SSA it was approximately 13 per 100. South Africa on the other hand is one of the leading countries in terms of the number of technology companies in Africa. However, the

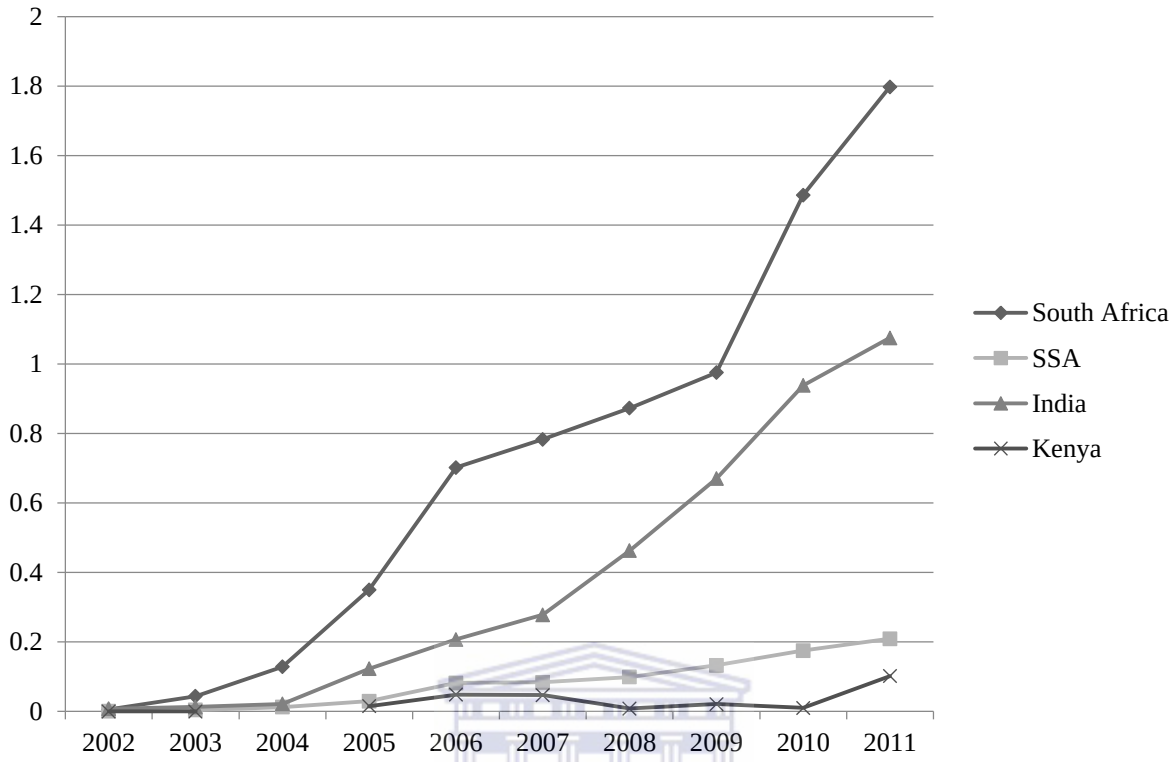
majority of the internet users are in urban areas and use the internet primarily for social networking, mobile banking and the news. The rural dwellers as mentioned before are more inclined to use their phones form SMS due to lack of knowledge on the use of internet technology as well as scepticism. India is an emerging economy in terms of technology advancement and had 10 users per 100 in 2011. Kenya has also had a steady increase in internet users with a significant increase from 2005 onwards. It surpassed South Africa after 2009. The Communications Commission of Kenya stated that most of Kenya's mobile phone users are now using their phones for browsing the internet, with a usage rate of over 98% (Mulligan, 2012). Voice calls on the other hand have reduced in number.

4.3.4 Broadband internet users

Broadband[3] is now becoming the standard network connection on both fixed lines due to its high speed. However, in rural areas where the majority of small-scale farmers dwell, mobile internet is the widely used. The mobile network standard is broadband internet offered at different speeds and prices. The figure below shows broadband subscriptions per 100 people from its inception in 2002 up to 2011. As one can see below, while South Africa is far ahead of SSA in terms of subscriptions per 100 people, the number of users is still quite low, especially when comparing to the world average. India on the other hand has been having an almost similar increase in its broadband subscriptions per 100. Kenya has had fluctuations in the broadband internet growth although there is a slight increase from 2010. The world average has been excluded from the graph because the number of users per 100 people cannot be graphically compared due to the great disparity.

[3] Broadband internet is a high speed internet service that is always on and has higher speeds than the outdated dial-up internet (FCC, 2009).

Figure 4.4: Broadband subscriptions per 100 people (2002-2011)



Source: World Bank (2012)

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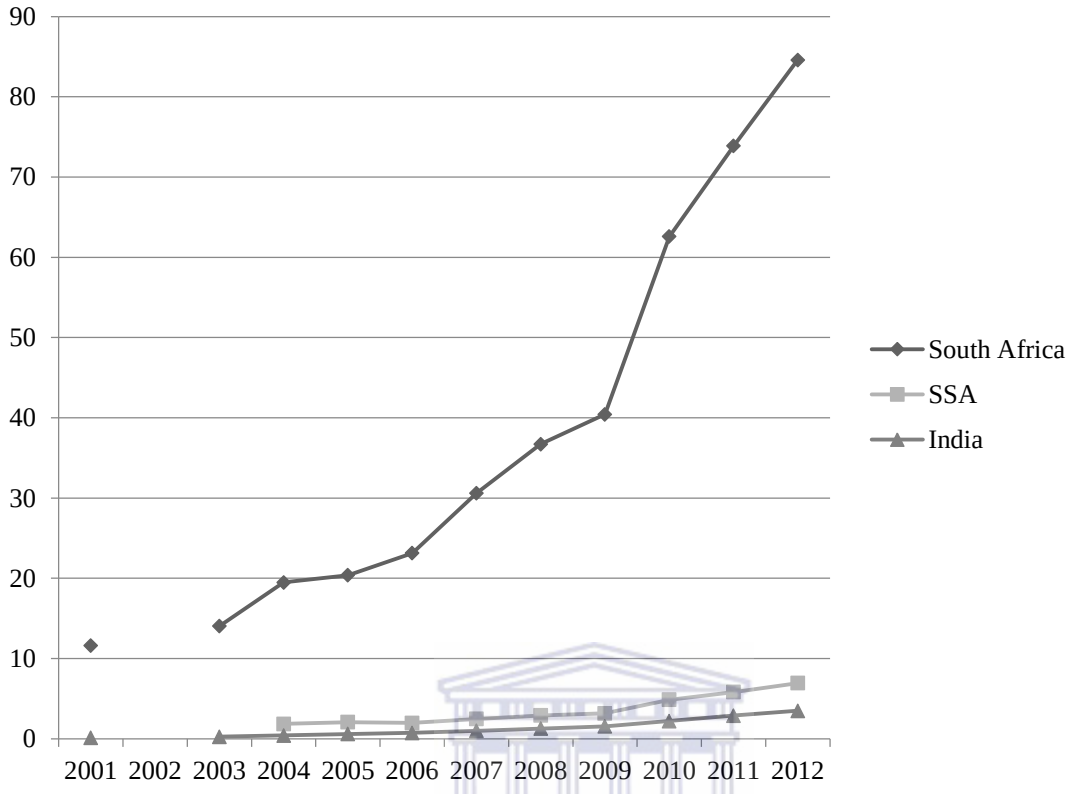
4.3.5 Secure internet servers

The purpose of secure internet servers is to enable encrypted data to be sent over the internet which is of great importance in electronic financial trading such as commodity exchanges. This safeguards the information flowing from one user to another creating a safe and secure connection. This could be of importance to small-scale farmers who may be sceptical on the safety of electronic transactions. The graph below shows the number of secure servers per one million people in South Africa, SSA and India from 2001 to 2012.

Figure 4.5: Secure servers per 1 million people (2001-2012)



Source: World Bank (2012)

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Looking at the graph it is observable that South Africa when compared to India or SSA is ahead in terms of the number of secure servers per million people. Most African countries have less than ten servers per million people. Unfortunately no data is available for 2002 for any country using the World Bank database. The USA and the world average have been excluded from the graph because they have much higher numbers of secures servers per one million people making them incomparable. Kenya on the other hand has much lower figures that cannot be graphed.

4.3.6 Mobile phone coverage

South Africa has a high mobile internet coverage area. Figures A.2-A.5 show the coverage maps of the two mobile operators according to the type of internet service[4]. One can observe that internet coverage in the country is available over almost all of South Africa. When compared to the agricultural map (Figure A.1), one can see that the only areas not covered are some of the dry areas in the Northern Cape. These areas are used primarily for grazing, mixed farming or no agricultural use due to the aridity. Secondly, the population density in these areas is quite low. The areas with high coverage are those in Gauteng, KwaZulu-Natal and the Western Cape, where grain farming, livestock, vegetable, fruit and vineyards are prevalent. These are the areas that command the most agricultural output as previously shown in Table 3.

4.3.7 Summary

One can note that the general trend has been a move away from the use of fixed telephone lines the world over, to an increasing use of mobile phones. Internet usage has also been increasing although not to satisfactory levels especially when looking at the modern broadband internet speed. It seems there is high coverage of mobile phones services in South Africa as shown by data from the country's two major mobile phone service providers. Small-scale farmers are therefore more likely to have mobile phones than telephone lines. However, only a few of them will have access to the internet despite the high coverage. This may be attributed to lack of education on technology use in the country. Currently the SAFEX price information service is web-based thus it is vital that small-scale farmers gain access to the internet in order to make use of the information provided therein.

[4] The country's two major mobile phone operators (Vodacom and MTN) offer mainly high speed internet known as GPRS and 3G. However GPRS is still the most widely used internet speed as it has more coverage than 3G although not as fast.

4.4 Analysis of South African national agricultural statistics

South African agricultural statistics are collected and published by Statistics South Africa. However, these statistics are mainly collected for commercial or large-scale farmers. Very little statistics on small-scale farmers are collected. Somewhat comprehensive statistics for small-scale agriculture were collected only in 2000 in the Report on the Survey of Large and Small-scale Agriculture (Statistics South Africa, 2002). Previous reports primarily focused on commercial agriculture. The report is the only one that focused on both large and small-scale agriculture. The statistics that relate to small-scale farmers will be discussed below.

Table 4.1: Farming activities by province and geographical region (2000)

	1000		
Province	**Former homelands**[5]	**Former RSA**	**South Africa**
Total	943	150	1093
Western Cape	-	23	23
Eastern Cape	392	15	407
Northern Cape	-	12	12
Free State	17	40	56
KwaZulu-Natal	189	26	216
North West	35	17	51
Gauteng	-	4	4
Mpumalanga	37	8	45
Limpopo	273	3	278

Source: Statistics South Africa (2002)

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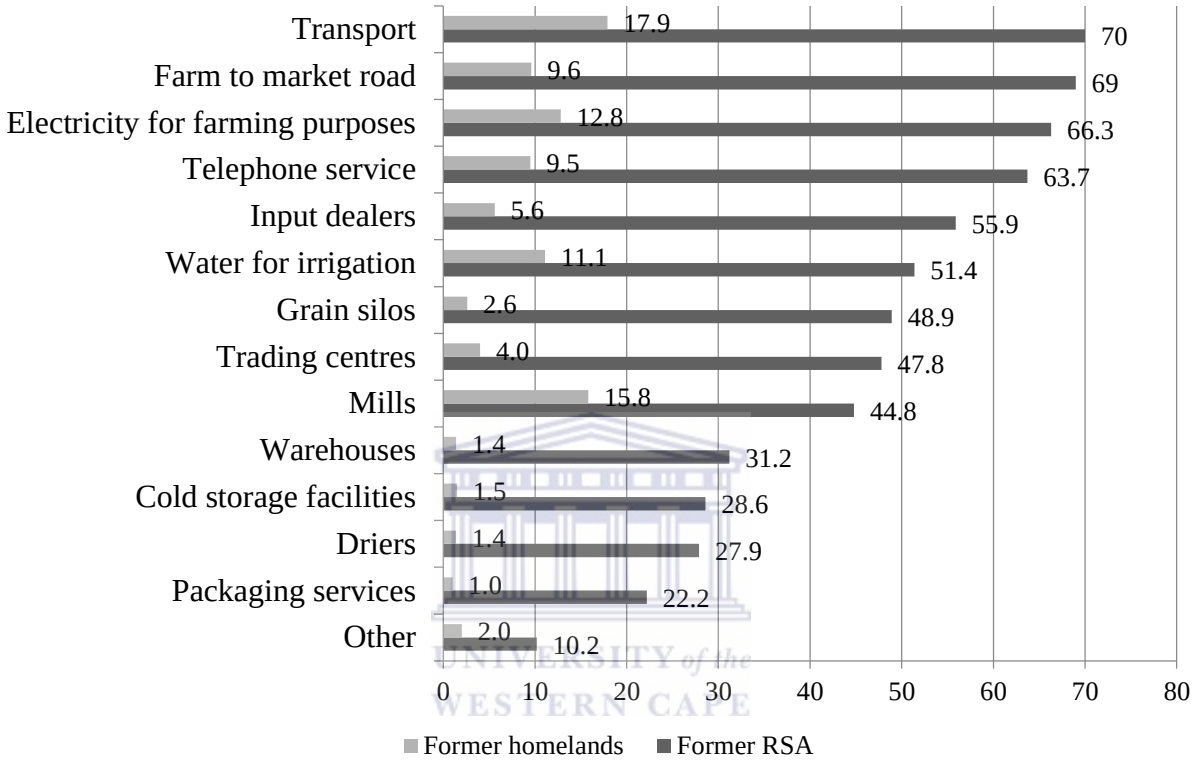
From the table above of 2000, it is seen that the majority of small-scale farmers are found in the Eastern Cape, followed by Limpopo and KwaZulu-Natal respectively which housed most of the previously disadvantaged in the apartheid era. On the other hand, the Free State,

[5] Former homelands represent small-scale farmers while Former RSA represents commercial farmers (Statistics South Africa, 2002).

followed by KwaZulu-Natal and the Western Cape respectively, has the largest numbers of large-scale farmers respectively.

Figure 4.6: Level of availability of service or facility (2000)



Source: Statistics South Africa (2002)

The graph above shows the levels of availability of services or facilities for farming operations in 2000. What is quite observable is that commercial farmers have the most access to services and amenities compared to their poorer counterparts. For instance comparing the telephone service, more than 60% of commercial farmers have access to it while only 10% of small-scale farmers have access. The telephone service is one ICT service that can be used for dissemination of information or for internet access. This means therefore that in 2000, only 10% of small-scale farmers had access to the internet through a fixed line.

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Fixed line use has reduced or remained stagnant in many parts of the world. It is now being replaced by internet-based telecommunications and mobile phones (Vogelsang, 2011:2). However, fixed lines are still the most reliable service compared to mobile.

Looking at storage facilities such as grain silos, warehouses and those for cold products, it can be observed that in terms of availability, the disparity between commercial and scale farmers is quite large. The same can be said for processing facilities such as mills, driers, packaging services. In terms of the input and output market access, commercial farmers have far greater access to input dealers and trading centres.

Table 4.2: Number of farming activities according to selected crops (2000)

	1000		
Type of crop	**Former RSA**	**Former homelands**	**South Africa**
Maize for grain	19	578	597
Maize for fresh consumption	10	531	541
Grain sorghum	2	33	35
Wheat	9	2	11
Dried beans	4	176	180
Soya beans	2	36	38
Groundnuts	3	61	64
Sugarcane	4	32	36
Sunflower seed	4	1	5
Cotton	1	0*	1
Lucerne and/or other hay	14	1	14
Tobacco	0*	3	3
Other field crops	3	2	4
Potatoes	6	117	123
Sweet potatoes	1	53	54
At least one type of crop	56	799	855

Source: Statistics South Africa (2002)

*This means that the figure is between 0 and 500

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The table above shows the number of farming operations according to selected crops in both the Former homelands and the Former RSA in 2000. The data shows that the majority of small-scale farmers are predominantly maize producers and grow the crop either for their own consumption or for commercial purposes. This is also the case with commercial farmers although their numbers of farmers are much less.

When one looks at the types of agricultural products traded by SAFEX, soya beans, maize and wheat are the most widely traded commodity derivatives. As shown, about 36,000 small-scale farmers produce soya bean, while only 2,000 are into wheat. There is therefore great potential for trading in commodity derivatives in some of these markets particularly maize.

4.5 Case study of India

India as mentioned before has a high number of small-scale farmers who participate or make use of the country's commodity exchanges. The country is also an emerging market particularly in terms of ICT use (Saravanan, 2013:3). It has become the one of new hubs of technology in Asia and the world at large. Seventy-eight per cent of India's total agricultural production comes from small-scale farmers and this is in contrast to South Africa where most of the production comes from commercial farmers (Singh *et al*, 2002:3). India has thus been chosen due to the lessons that can be learned by South African small-scale farmers in their quest to gain more access to the agricultural market and value chain.

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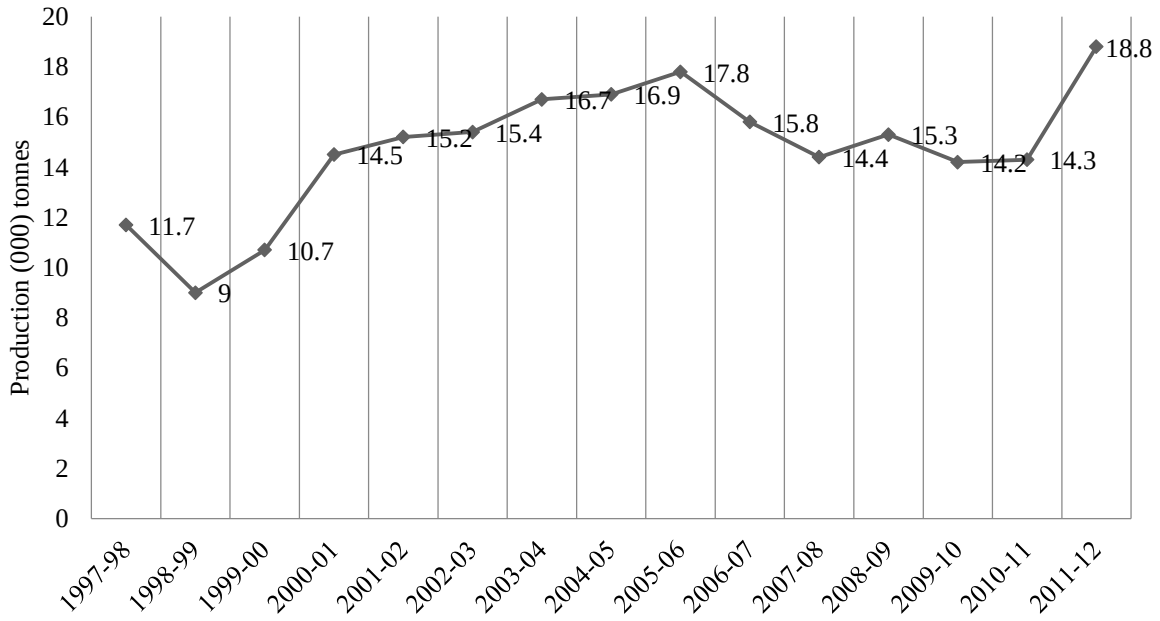
4.5.1 Commodities to be reviewed: Cardamom and Mentha oil

Cardamom and mentha oil have been rapidly increasing in production volumes as well as prices on the world market. India is the second largest exporter and producer of cardamom (a spice) after Guatemala (MCX, 2008:1). Mentha oil on the other hand is an extract from the mentha plant and is used for several medicinal and industrial purposes. It is also known as menthol mint or corn mint. India is the largest producer of mentha oil, far more than any other country (UNCTAD, 2009:91).

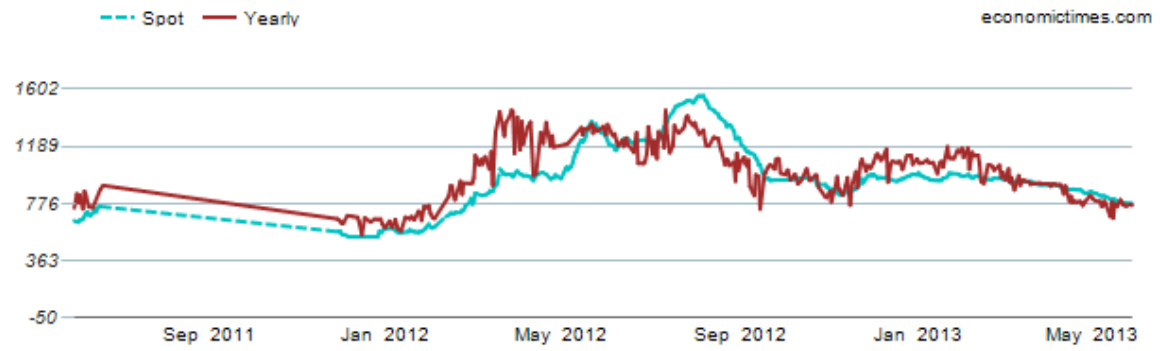
Figure 4.7: Production of cardamom in India (1997-2012)



Source: NMCE, MCX (2013)

The production of cardamom in India over the period from 1997 shows that there has generally been a positive trend in the production, increasing from almost 12,000 tonnes to almost 20,000 tonnes in 2012. Cardamom is sold through use of auction houses and traders are licensed by the Spices Board. The produce is cleaned, graded and packed before being stored in the auction warehouses. Traders then take the produce to bigger markets or it is directly exported. Most of the cardamom is consumed in India while on average only five to eight per cent is exported (MCX, 2008:2).

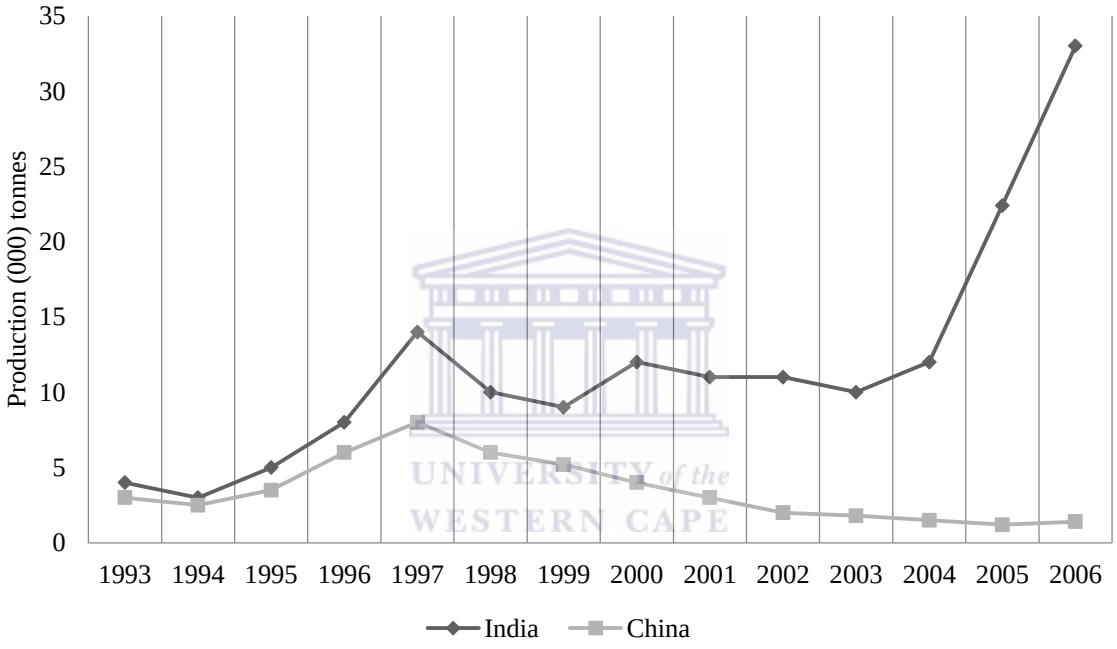
Figure 4.8: Cardamom spot price trend (2011-2013)



Source: The Economic Times (2013)

The spot price of cardamom as shown in the graph above has been fluctuating over the three-year period. However, significant increases have been observed during 2012 where the prices more than double only to reduce at the beginning of May 2013. This increase can be attributed to cardamom of lower quality being produced in Guatemala, as well as lower Indian production. Due to an increase in domestic production in 2012, the prices began to decline once more.

Figure 4.9: Production of natural mentha oil in India and China (1993 – 2006)



Source: NMCE (2010)

The graph above shows that in 1993, India and China's production volumes were quite similar but as time progressed India's production began to surpass China with a significant margin being seen from 2003 onwards. The major increases were observed in 2005 to 2006. In India mentha is produced mainly by small-scale farmers and those in marginal regions (UNCTAD, 2009:91). Due to increases in population, there was a rise in pressure on agricultural land. This prompted farmers to look for higher value crops to assist with food security issues. At the same time, world demand began to increase and this further allowed more small-scale farmers to enter the market. In the 1980s, world production was dominated by China and Brazil. However, awareness was created by farmer organisations through

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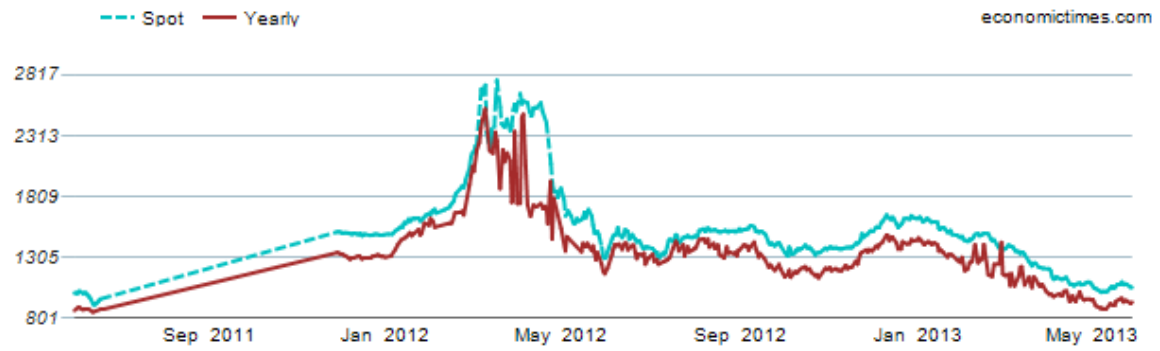
television, radio and training seminars. Farmers' willingness to plant increased gradually resulting in India surpassing Brazil first then China. The introduction of the futures market has therefore made it possible for these small-scale farmers to access the market more effectively and improve their livelihoods.

Figure 4.10: Mentha oil spot price trend (2011-2013)



Source: The Economic Times (2013)

The spot price trend of mentha oil for the three-year period shows a spike in prices from mid-2011, with prices almost tripling in mid-2012. However, prices began to decline once again at the beginning of May 2013 and have now stabilised. There has therefore been some price volatility in the first half of 2012. The increases can be attributed to increased speculation by farmers as well as reduced production.

4.5.2 Market Development: ICT environment for agriculture

Programmes to increase farmer awareness on price information and futures markets have been put in place in India. Some surveys that have been done to increase this awareness show that it is now high (UNCTAD, 2009:119). However, there are still some farmers who do not yet fully understand what a futures market is, how it can help them or how they may participate. More educational seminars therefore need to be put in place as well as capacity-building seminars.

Rural communities have been fortunate enough to benefit from the use of ICTs under the MCX programme. The increase in infrastructure through price tickers and terminals of trade has been beneficial to the rural community while distance barriers are reduced (UNCTAD,

2009:119). These electronic networks have facilitated the price discovery function particularly in the rural communities. Internet trading has also been established in the rural areas but network and connectivity problems have become a major issue. New technologies have thus been put in place to overcome this obstacle such as the technology known as Very Small Aperture Terminal (VSAT). A VSAT connects remote users interactively and permanently, avoiding the intermittent network issues previously experienced in some areas (Esselaar *et al*, 2004:6). This technology connects users through a satellite similar to satellite television. There is now documented evidence on the effectiveness of this system. Sahadevan (2007) finds that futures in mentha oil in 2005 were registered from 154 cities from 17 states. In 2006 it had increased to 183 cities from 20 states.

According to Saravanan (2013:3) at least 45% of the world's ICT projects are in India alone. India also has the highest amount of information kiosks in Asia spread across the rural parts of the country. Some of the projects are web portals that provide for functions such as information sharing though online discussions, content processing and dissemination. These information services are multilingual. There are also Village Knowledge Centres (VKCs) which allow for location specific generation of content. These are demand-driven and have community inclusion as well as ownership encouraged.

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Over 11,000 farmers in India have mobile tools provided by Ekgaon which allow them to access information on market prices, weather reports, and management of crops as well as educating them on agricultural methods that allow them to get the most out of their farming venture (World Economic Forum, 2011:2).

The main challenge for the farmers has been learning to use technology since for many it is a new experience. Illiteracy has been seen to be a barrier in farmers accepting new technologies. However, MCX has made it its mandate to ensure low-cost technologies are built which are customised according to the market characteristics (UNCTAD, 2009:119). One survey shows that some small-scale farmers are now organising themselves into groups so they may be able to participate in the commodity exchanges. On the other hand, diversification of the futures market has been seen such that India now has the highest number of commodities being traded in a futures market at 80 commodities (Ahuja, 2006:159).

4.5.3 Price discovery and price risk management

The main price discovery mechanism used by India's commodity exchanges has been electronic through the use of price screens and tickers (UNCTAD, 2009:104). These are distributed widely over all the country. Other mechanisms are the use of television, radio, the internet and mobile phones. In 2007 alone over 300,000 SMS messages with commodity price information were sent to farmers' mobile phones around the country (UNCTAD, 2009:104). Prices are also published in over 25 daily news publications and reach an estimated quarter of the farming community. The price information is distributed in several languages to cater for everyone and ensure that information sent out is useful to the recipients. The introduction of the futures market has therefore resulted in the removal of intermediaries, leading to farmers obtaining more value for their commodities (Seghal *et al*, 2012:34). Farmers have also acknowledged that spot price volatility has reduced since the introduction of the futures market. It has also been noted that farmers are using the price information for their cropping decisions. Surveys show that farmers now check their MCX prices before selling their produce. They also show that some farmers are now using futures prices as a hedging mechanism although the use is not prevalent (UNCTAD, 2009:108).

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4.5.4 Main lessons learnt

One of the main features of India's success in engaging small-scale farmers in commodity exchanges has been diversification through the production of high value products. One example is mentha oil which is mostly produced by small-scale farmers. India has taken advantage of the growing technology boom and has invested in technologies such as VSATs as well as making use of electronic display boards and price dissemination through SMS messages to mobile phones. India currently has the over 45% of the world's ICT projects. This means that South Africa and other developing countries need to invest more in ICT projects that are agriculture specific. Extensive farmer education has been pivotal in encouraging farmers to venture into high value crops. It is quite evident that the adoption of ICTs has not always been met with open arms. Rural dwellers are always sceptical of new technologies being introduced to them particularly because they fear the technologies may interfere or replace their traditional practices.

The mobile phone system has proven to be quite effective in India in terms of information dissemination. There are several publications providing agricultural information mostly provided free of charge and these have allowed for price discovery. South Africa has an extensive mobile phone coverage rate as well as local press in many local urban communities. Therefore this would be something worth implementing in the rural communities as well.

4.6 Harnessing mobile phone use: International evidence

Market information systems (MIS) have been used to provide market price information to farmers so as to allow them to make informed decisions on production as well as trade. It increases the negotiation power of farmers, rather than relying on intermediary traders for this information. It has been found that, in order for a particular MIS to work, the service provider needs to be able to at least break even or allow the project to make just enough profit to sustain it as transaction fees may be quite costly (USAID, 2011:1).

Before focusing on ICT applications that could be used with mobile phones, it is important to note the fact that mobile phones by themselves have a great impact on enabling distribution of market price information in the agricultural market. Jensen (2007:879) finds that in India, mobile phone coverage on its own has led to significant increases in market efficiency. His study finds that price differences across the markets have reduced as well as produce waste. Profits for fishermen have increased by nine per cent while prices have reduced by four per cent. A study in Niger by Aker & Mbiti (2010) finds that farmers increased their trade activities as soon as they had cell phones. Increases were found to be by at least 10% while their profits increased by 29%. Similarly, Muto & Yamano (2009) find that banana farmers in Uganda began to receive market information more as mobile phone coverage increased, resulting in their profits increasing by at least 10%.

Research from USAID (2011:2) finds that in order for an MIS to work, there needs to be a reliable network provider that can enable farmers to receive crop, price and weather information. Some of the services provided include interactive voice recognition (IVR), SMS, wireless application protocol (WAP) browsing as well as web-based internet browsing. Each service is provided at a fee which users have to pay in order to gain access. Internet

browsing on the other hand is only available on modern mobile phones also known as smart phones and these require more advanced networks. With the low availability of 3G networks in remote areas, GPRS is still a reliable option although has lower internet speeds.

Some partnerships between mobile network providers and governments or other organisations have had a positive impact on farmers. One example of such a development is the collaboration between Zain (a Zambian network operator), the Zambian National Farmers Union and the International Fund for Agricultural Development (IFAD) where commodity prices are sent to farmers through SMS (IFAD, 2012). Donor support has been seen to be an important aspect in the continued existence of these projects.

Third-party providers of MISs could be another option, apart from the network provider one. Some companies have been seen to have much interest in provision of agricultural price information and working with farmers in agricultural value chains. These third party providers make use of SMS and WAP mainly in information provision through mobile phone networks or internet service providers (ISPs). One example is the Reuters Market Light service used in India by a private company. Farmers have access to price, weather and crop information where they pay monthly subscriptions for the service. Cumulative subscribers are now more than 250,000 since the inception of the project (Dingra, 2009). Another example of an MIS by a third party provider is that of Google Trader launched in Uganda in 2009. Google partnered with MTN (an ISP) and created an internet platform as well as an SMS service. Currently, it was found to more expensive to send and receive messages as compared to the small amount they were charging users for the service. Donor support has also been seen to be important in the sustainability of this particular project.

A third option in the provision of MIS would be that of a government sponsored project. Market price information has been collected by governments as part of their food security planning. While the initial plan was not to provide this information for commercial purposes, some governments have started to provide this information through SMS services or government websites. According to USAID (2011:3), there is no information on whether these initiatives have been useful or not. In most cases it is not clear if the information is reliable. However, governments may issue this information as a public good so as to subsidise the cost particularly for small-scale farmers who may not afford it. Governments

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may also engage in public-private partnerships or outsource to third-party providers in order for MIS projects to be sustainable as well as scalable. Scalability has been seen to hinder access to these projects by farmers in other areas other than the ones where pilot projects were done.

Studies show that market information can be used to allow small-scale farmers to obtain higher prices as well as manage their sales (Svensson & Drott, 2010:4). One benefit of receiving information is a reduction is transport and logistical costs. Farmers would no longer need to travel to the nearest trader in order to get information which may not be up-to-date or reliable. In addition, commercial farmers have problems in trading with small-scale farmers due to non-standardised safety, storage and quality assurance facilities. In most cases the farmers are not aware of the market standards. Some farmers are now starting to make use of ICT solutions in order to improve their quality control for their produce and storage facilities.

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4.7 Development implications for the agricultural market

There is need to ensure that ICT solutions for agriculture create notable value rather than embarking on a project that may not be sustainable. The behaviours of farmers need to be changed as well. Many farmers have been using systems that they are now used to and have created contacts. It would be quite hard for them to adopt new systems if they are set in their old ways. Users also need to be able to learn how to use some of these technologies through workshops on computer training. Syngenta Foundation now has a smartphone-enabled for more advanced small-scale farmers (USAID, 2013:4). They have discovered that smart phone use has increased rapidly thus it is easier for farmers to use software applications that come with these new age phones. They have thus come up with agricultural insurance products for use over Africa. The applications are made as simple as possible and are attractive. ICT models put in place need to be able to be replicated in other agricultural or geographical areas. This will increase the applicability of the technologies.

There are now emerging trends particularly in social media as well as smart phone use. While it is important to ensure that farmers are educated on technology use, it has been noted that the visual interface alone on a smart phone can allow farmers whether literate or not to

use the different software applications that can be made available to them (USAID, 2013:4). As India continues to take forward steps in development of ICTs, one notable innovation has been the current design of a software platform tailored for farmers. These inventions are intended to cater for the illiterate and resource-poor. This technology includes touch screen readers. Microsoft has created a smart phone specifically for Africa and this will go a long way (Gent, 2013). Smart phone penetration in Africa is said to sit at 20% currently and is expected to increase to 50% by 2017 (Deloitte & GSMA, 2012:24). ICT solutions to be put in place need to be for both simple and smart phone users.

Several social networks are now more common such as Facebook and Twitter. In South Africa there is Mxit with millions of users on the platform. Currently the Whatsapp application's use has also grown exponentially with over 200 million worldwide users (Winkler, 2012). These social networks allow real-time interactions at low costs and in some cases free as compared to a telephone call or using the internet on a computer. In India, it was reported that farmers managed to organise themselves using social media and met, in doing so avoided an imminent price crash due to oversupply. Rural farmers do not participate as much as their younger or urban counterparts but it seems in the future it would be of benefit to them to embrace this technology. It can also be expected that the younger farmers will be more technology accepting than the current generation.

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4.8 Potential use of commodity exchanges with small-scale farmers in South Africa

South Africa leads the African continent in terms of technological infrastructure and innovation. However, despite this notion policy makers have not been able to adequately take advantage of this trend and translate it to better incomes and information provision for small-scale farmers. SAFEX is currently the most successful commodity exchange in Africa and does volume trading that far exceeds the aggregation of all other countries. It is also the only commodity exchange that has a futures market in Africa.

Government has tried to provide agricultural price information for farmers but the effectiveness has been quite low. One good example is the Limpopo province Department of Agriculture. They embarked on an E-Agriculture project to improve farmer access to information as well as the market (Department of Agriculture, 2013). In this project they

have provided basic ICT training to 236 farmers as well as 322 extension workers. While this is a commendable effort, more can still be done as there are over a million small-scale farmers in the country.

There is a need to invest in high value agricultural products such as horticulture by South African farmers. These high value products are more profitable as can be seen in the Indian case. They also enable diversification in the agricultural markets. Farmers therefore need education on different types of crops other than the traditional maize, wheat and livestock. The Indian case resulted in it becoming the world's top producer of mentha oil. The majority of the producers are small-scale farmers. There is need to assess the world market and see which products are in demand.

South Africa currently has two main VSAT network providers, that is, the state-owned Telkom and the privately-owned Sentech (Pater, 2005:46). The satellite networks service covers Southern Africa, therefore installation of these networks is not time consuming as the satellites are already in place. A point of concern would be the issue of the high end user costs especially for rural communities. However, most of these VSATs are currently used as payphones. Another network has been setup in several rural communities in the country. GTECH was put in place to handle the national lottery transactions. The implementation was at a significantly high rate of 100 sites per day. This is an indication that VSATs can be setup in a short period of time. These networks need to be adopted by rural agricultural communities to gain access to agricultural information as well as be able to trade electronically.

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4.9 Conclusion

This chapter set out to critically assess the agricultural commodity exchange market in the context of ICT. It began by looking at whether or not small-scale farmers are participating in the agricultural commodity exchange market, particularly SAFEX. It found that there is virtually no participation by small-scale farmers in South Africa. After analysing historical ICT indicators, the need for investment in mobile technology to assist small-scale farmers was realised. The case study of India was discussed as well as international evidence on the

use of mobile phones. Development implications for the agricultural market were then discussed as well as the potential usage of commodity exchanges in South Africa for the benefit of small-scale farmers.

– CHAPTER 5 –

Conclusion

South Africa is Africa's most developed economy with a GDP composed of mainly services and industry while agriculture contributes less than three per cent. Though contributing such a small percentage to GDP, agriculture provides livelihoods to approximately three million South Africans out of a population over 50 million. South Africa's agricultural market was highly regulated by the apartheid government which put in place policies to favour the white commercial farmers while actively marginalising the black farming community who were the majority of the South African population

The new South African government in 1996 decided to completely deregulate the agricultural market. The government came up with some support programmes such as LRAD, CASP, MAFISA and AgriBEE as a way to assist the previously disadvantaged black farmers. Though government has put in efforts to assist small-scale farmers, they continue to struggle in terms of accessing the market and this has detrimental effects on their livelihoods considering South Africa's high income inequality. Another positive outcome of the deregulation process was the establishment of SAFEX which is Africa's biggest and most successful agricultural commodity exchange. SAFEX is ICT-based and is currently the only one in Africa trading in futures.

ICT has been seen as positive tool in the agricultural market. Mobile phones have been the most accessible ICT device due to low setup costs and high availability. They main functions of a commodity exchange are to ensure price discovery and price risk management. ICT-enabled commodity exchanges have provided farmers with the much needed price, weather and production information. Commodity exchanges make use of market information systems which are mainly electronic through channels such as SMS systems or display boards. The benefits realised by many through the use of ICTs in agriculture are a reduction in transaction costs, increase in access to markets, provision of information on critical market information and improvement of communication inside the value chain (Picot *et al*, 1996:71).

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While South Africa has the most advanced economy as well as technology compared to other African countries, the benefits to small-scale farmers have not been realised. Small-scale farmers do not participate in the commodity market although SAFEX has now recently setup smaller tonnage contracts to allow small-scale farmers to start participating as well. Through the analysis of historical ICT infrastructure indicators, it was noted that there is high potential for the use of agricultural commodity exchanges through mobile phones. Internet coverage is highly available to most of South Africa a different speeds with very high mobile phone coverage. South African national agricultural statistics are mainly collected for commercial farming activities while small-scale farming is not regularly recorded.

India was used as a case study with main focus on the two main commodities traded on the commodity exchange which are cardamom and mentha oil. The majority of production and trading in India is done by small-scale farmers. One of the main features of India's success in engaging small-scale farmers in commodity exchanges has been diversification through the production of these high value products. Production of both commodities has increased rapidly over the past few years. India's ICT environment has improved drastically as they have made use of the mobile VSAT technology. Mobile phones have been seen as a beneficial tool in the success of India's commodity exchange. The need for farmer education was also realised.

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Mobile phone use has been noted as the most viable ICT in the potential use of commodity exchanges in South Africa. Different examples from mostly developing countries in Africa were discussed in relation to their mobile phone use in agriculture. Most studies found that the use of mobile phones alone before considering the internet resulted in a positive increase in small-scale farmers' access to the agricultural market. Market efficiency can be increased through the use of mobile phones as some studies have shown, while increasing profits by up to 29%. The need for reliable network operators was seen as a pre-requisite to the success of mobile phones in the establishment of a commodity exchange targeting small-scale farmers. Following the results of the different research some development implications for both the South African and African environment were then discussed as well as the potential uses of commodity exchanges based on these findings.

Bibliography

Ahuja, N. L. 2006. Commodity Derivatives Market in India: Development, Regulation and Future Prospects. *International Research Journal of Finance and Economics*, 2(2006)

Aker, J. C. and Mbiti, I. M. 2010. *Mobile phones and economic development in Africa*. Centre for Global Development Working Paper 211

Alao. 2010. *The impact of ICTs for Agricultural development in the rural community: A case study of Alice, Eastern Cape, South Africa*. Unpublished Thesis

Aliber, M. and Hall, R. 2010. *Development of Evidence-Based Policy around Small-Scale Farming*. Pretoria: Government of the Republic of South Africa.

Asenso-Okyere, K. and Mekonnen, D. A. 2012. *The Importance of ICTs in the Provision of Information for Improving Agricultural Productivity and Rural Incomes in Africa*. UNDP Working paper 2012-015

Bremner, J. 2012. *Population and food security: Africa's challenge*. Population Reference Bureau Policy Brief

Central Intelligence Agency. 2012. *The World Factbook: South Africa*. [Online]. Available: https://www.cia.gov/library/publications/the-world-factbook/geos/sf.html [March 16th 2013]

Chance, D. 1998. *Essays in derivatives*. John Wiley & Sons: London

Conradie, B. and Knoessen, H. 2009. *A survey of the cultivation and wild harvesting of fynbos flowers in South Africa*. PPSA Report 2009

Coulter, J. and Onumah, G. 2002. The role of warehouse receipt systems in enhanced commodity marketing and rural livelihoods in Africa. *Food Policy*, 27(2002):319-337

Cousins, 2010. *What is a 'smallholder'? Class-analytic perspectives on small-scale farming and agrarian reform in South Africa.* PLAAS Working Paper 16

Deloitte and GMSA. 2012. *Sub-Saharan Africa Mobile Observatory 2012*. GSMA: London

UNIVERSITY of the WESTERN CAPE

Department of Agriculture Forestry & Fisheries. 2009. *Land Redistribution for Agricultural Development: A Sub-Programme of the Land Redistribution Programme*. Government of South Africa

Department of Agriculture Forestry and Fisheries. 2010. *Agricultural Marketing Strategy for the Republic of South Africa*. Government of South Africa

Department of Agriculture Forestry and Fisheries. 2012. *Pocket Guide to South Africa 2011/12*. Government of South Africa

Department of Agriculture. 2003. *Agricultural marketing: Small-scale farmer marketing series*. Government of South Africa

Department of Agriculture. 2004. *AgriBEE: Broad-Based Black Economic Empowerment Framework for Agriculture*. Government of South Africa

Department of Agriculture. 2004. *Progress Report on the Implementation of the Comprehensive Agriculture Support Programme (CASP)*. Government of South Africa

Department of Agriculture. 2005. *MAFISA Pilot Project Credit Policy*. Government of South Africa

Department of Agriculture. 2013. *e-Agriculture project*. [Online]. Available: http://www.lda.gov.za/Additional%20Menu/EAgriculture%20Project/Pages/default.aspx [June 17th 2013]

Dingra. 2009. *Exclusive Interview with Amit Mehra – MD, Reuters Market Light – Enlightening Farmers*. [Online]. Available: http://www.watblog.com/2009/11/18/exclusive-interview-with-amit-mehra-md-reuters-market-light-enlightening-farmers/ [July 31st 2012]

Edossa, S. 2010. *The role of ICTs in promoting trade: the case of ECX's ICT-enabled platform*. ECX: Addis Ababa

Esselaar, S., Stavrou, A. and O'Riordan, J. 2004. *VSAT Case Studies (Nigeria, Algeria and Tanzania)*. LINK Centre: Johannesburg

FCC. 2009. *What is Broadband?* [Online]. Available: http://www.broadband.gov/about_broadband.html/ [August 20th 2012]

UNIVERSITY of the WESTERN CAPE

Frick, A. and Groenewald, J. A. 1999. The need for agricultural information in the new South Africa. *SAJEMS*, 38(4)

Gent, E. 2013. *Microsoft launches Africa only smartphone.* [Online]. Available: http://eandt.theiet.org/news/2013/feb/microsoft-africa.cfm [February 10th 2013]

Goldblatt, A. 2010. *Agriculture: Facts and trends - South Africa*. WWF-SA: Johannesburg

Hannon, P. 2012. South Africa looks far and wide for long-term growth. *African Agriculture Review*, 09(2012)

HSRC. 2003. *Land Redistribution for Agricultural Development: Case Studies in Three Provinces.* HSRC: Pretoria

IFAD. 2012. *Trading Commodities via SMS*. [Online]. Available: http://www.ifad.org/newsletter/pf/5.htm#3 [February 9th 2013]

Jazairy I., Alamgir, M. and Panuccio, T. 1992. *The state of world rural poverty: An inquiry into its causes and consequences*. IFAD. Intermediate Technology Publications: London

Jensen, R. T. 2007. The Digital Divide: Information (Technology), Market Performance and Welfare in South Indian Fisheries Sector. *Quarterly Journal of Economics*, 122(3)

John, L. *Engaging BRICS: challenges and opportunities for civil society*, Oxfam India Working Paper 12

JSE, 2005. *Agricultural Derivatives 101*. JSE: Johannesburg

Khando, S. 2009. *Enhancing the linkages between WRS and Exchanges: MACE's experiences*. Improving the functionality of commodity markets in Eastern and Southern Africa through warehouse receipt system and market-based interventions Workshop

Kirsten, J.F. and Van Zyl, J. 1998. Defining small-scale farmers in the South African context. *Agrekon*, 37(4)

Louw, A., Chikazunga, D., Ndanga, L., Bienabe, E. and Jordaan, D. 2008. *Improved small scale farmer access to fresh produce agri-food markets in South Africa*. Regoverning Markets Policy brief.

UNIVERSITY of the
WESTERN CAPE

Machethe, C.L., Mollel, N.M., Ayisi, K., Mashatola, M.B., Anim, F.D.K. and Vanasche, F. 2004. *Smallholder Irrigation and Agricultural Development in the Olifants River Basin of Limpopo Province: Management Transfer, Productivity, Profitability and Food Security Issues*, Water Research Commission Report Number 1050/1/04

Maritz, J. 2011. *How mobile phones are transforming African agriculture*. [Online]. Available: http://www.howwemadeitinafrica.com/how-mobile-phones-are-transforming-african-agriculture/8704/ [April 1st 2012]

Mazibuko, N. V. E and Oladele, O. I. 2012. Use of storage facilities by small-scale farmers in the Lejweleputswa District Free State, South Africa, *Life Science Journal*, 9(3)

MCX. 2008. *Cardamom*. [Online]. Available: http://www.mcxindia.com/Uploads/Products/18/MCX_English_Cardamom_180613.pdf

Merriam-Webster dictionary online. 2012. *Commodity Exchanges*. [Online]. Available: http://www.merriam-webster.com/dictionary/commodity%20exchange [March 2nd 2012]

Michigan State University. 2007. *Homelands (Bantustans) and Agricultural Resources, 1984*. [Online]. Available: http://overcomingapartheid.msu.edu/image.php?id=65-254-102 [July 5th 2013]

UNIVERSITY of the
WESTERN CAPE

Montshwe. 2006. *Factors affecting participation in mainstream cattle markets by small-scale cattle farmers in South Africa*. Unpublished Master's Thesis

MTN. 2012. *MTN Coverage*. [Online]. Available: https://www.mtn.co.za/travel/pages/coveragemap.aspx [December 19th 2012]

Mulligan, G. 2012. *Kenyans Use Mobile Devices For Internet Browsing, Not Calls – CCK* [Online]. Available: http://www.ventures-africa.com/2012/10/kenyans-use-mobile-devices-for-internet-browsing-not-calls-cck/ [March 15th 2012]

Munyua, H. 2007. *ICTs and small-scale agriculture in Africa: a scoping study*. International Development Research Centre: Toronto

Munyua, H., Adera, E. and Jensen, M. 2008. *Emerging ICTs and their potential in revitalizing small scale agriculture in Africa*. World conference on agricultural information and IT.

Muto, M. and Yamano, T. 2009. The Impact of Mobile Phone Coverage Expansion on Market Participation: Panel Data Evidence from Uganda. *World Development*, 2009

NMCE. 2010. *Report on cardamom*. [Online]. Available: http://www.nmce.com/files/study/cardamom.pdf [April 21st 2013]

NMCE. 2013. *Historical Data*. [Online]. Available: http://www.nmce.com/marketdata/hdata.aspx [April 21st 2013]

OPM. 2000. *A Revolution in the Market – the deregulation of South African agriculture*. OPM Supporting Strategies for Economic and Social Reform Paper 3

Ortmann, G. F. and King, R. P. 2007. Agricultural cooperatives II: Can they facilitate access of small-scale farmers in South Africa to input and product markets? *Agrekon*, 46(2)

Pater, D. 2005. VSAT in Sub-Saharan Africa. *Elektron*, 07(05)

Peyper, L. 2013. *Mobile phone usage in SA*. [Online]. Available: http://finweek.com/2013/01/22/mobile-phone-usage-in-sa/ [May 18th 2013]

Picot, A., Ripperger, T. and Wolff, B. 1996. The Fading Boundaries of the Firm: The Role of Information and Communication Technology. *Journal of Institutional and Theoretical Economics*, 152(1996)

UNIVERSITY of the
WESTERN CAPE

Pote, P. P. T. 2008. *Technical constraints to smallholder agriculture: case study of Nkonkobe municipality, Eastern Cape, South Africa*. Unpublished Thesis.

Qeqe, N. and Cartwright, A. 2005. South Africa's Agricultural Commodity Markets. *Commodity Markets*. Surplus People's Project: Cape Town

Rashid, S., Winter-Nelson, A. and Garcia, P. 2010. *Purpose and potential for commodity exchanges in African economies*. IFPRI Discussion Paper

Robbins, P. 2011. *Commodity exchanges and smallholder farmers in Africa*. London: International Institute for Environment and Development/Sustainable Food Lab

SAFEX, 2013. *Introduction of a 10 ton white and yellow maize contract.* Johannesburg Stock Exchange Commodity Derivatives, Market Notice A1185A.

Sahadevan, K. G. 2007. *Advantages of commodity futures trading through electronic trading platform for farmers of Uttar Pradesh: A study of potato and mentha*. A report for Multi Commodity Exchange of India Limited

Saravanan. 2013. *ICTs for Agricultural Extension in India: Policy Implications for Developing Countries*. New India Publishing Agency: New Delhi

Sehgal, S., Rajput, N. and Dua, R. K. 2012. Price Discovery in Indian Agricultural Commodity Markets. *International Journal of Accounting and Financial Reporting*, 2(2)

Shepherd. A. W. 1997. *Market Information Services – Theory and Practice*. FAO Agricultural Services Bulletin 125

Singh, R. B., Kumar, P. and Woodhead, T. 2002. *Smallholder Farmers in India: Food Security and Agricultural Policy*. FAO: Bangkok

Spriggs, A. 2012. *Southern Africa: Southern Botswana, southern Zimbabwe, and northern South Africa.* [Online]. Available: http://worldwildlife.org/ecoregions/at0717 [July 19th 2012]

Statistics South Africa. 2002. *Report on the survey of large and small scale agriculture*. Statistics South Africa: Pretoria

Svensson, J. and Drott, D. Y. 2010. *Tuning in the Market Signal: The Impact of Market Price Information on Agricultural Outcomes*. Stockholm University: Stockholm

Tadesse, T. 2010. *Ethiopian Commodity Exchange (ECX)-Connecting farmers to the market.* Swedish Business School: Sweden

The Economic Times. 2013. *Markets*. [Online]. Available: http://economictimes.indiatimes.com/markets [May 19th 2013]

Tollens, E. F. 2006. *Market information systems in sub-Saharan Africa: Challenges and opportunities*. International Association of Agricultural Economists Conference Poster Paper

UNCTAD. 2005. *Progress in the Development of African Commodity Exchanges.* Report by the UNCTAD Secretariat at the Extraordinary Session of the Conference of Ministers of Trade – Arusha

UNIVERSITY of the
WESTERN CAPE

UNCTAD. 2009. *Development Impacts of commodity exchanges in emerging markets.* United Nations: Geneva

USAID. 2010a. *African Agriculture and ICT: An Overview*. USAID Briefing Paper

USAID. 2010b. *ICT to Enhance Warehouse Receipt Systems and Commodity Exchanges in Africa*. USAID Briefing Paper.

USAID. 2011. *Using ICT to Provide Agriculture Market Price Information in Africa*. USAID Briefing Paper.

USAID. 2013. *Using ICT to Enhance Marketing for Small Agricultural Producers*. USAID Briefing Paper.

Vashishta, A. and Kumar, S. 2010. Development of Financial Derivatives Market in India- A Case Study. *International Research Journal of Finance and Economics*, 37(2010)

Vink, N. 2000. Agricultural policy research in South Africa: Challenges for the future *Agrekon*, 39(4)

Vink, N. and Kirsten, J. 2000. Deregulation of agricultural marketing in South Africa: Lessons learned. *FMF Monograph*, 25(1)

UNIVERSITY of the
WESTERN CAPE

Vink, N. and Van Rooyen, J. 2009. *The economic performance of agriculture in South Africa since 1994: Implications for food security*. Development Planning Division Working Paper Series No.17, DBSA: Midrand

Vodacom. 2012. *Vodacom Maps*. [Online]. Available: http://www.vodacom.co.za/personal/internet/coveragemaps [December 19th 2012]

Vogelsang, I. 2011. *The relationship between mobile and fixed line communications: A survey*. Boston University: Boston

Walker, C. 2004. *The land question in South Africa: The challenges of transformation and redistribution*, HSRC: Pretoria

Willemse, J. 1996. *Information in South African agriculture: Frustrations and opportunities.* Paper presented at the AGROCON ’96 Conference

Winkler, R. 2013. *WhatsApp Surpasses 250 Million Active Users*. [Online]. Available: http://blogs.wsj.com/digits/2013/06/20/whatsapp-surpasses-250-million-active-users/ [July 8th 2013]

Wittenberg, M. 2003. *Decentralisation in South Africa*. ERSA: Pretoria

World Economic Forum. 2011. *Multiplying Agriculture by the Power of Mobile*. World Economic Forum: Geneva

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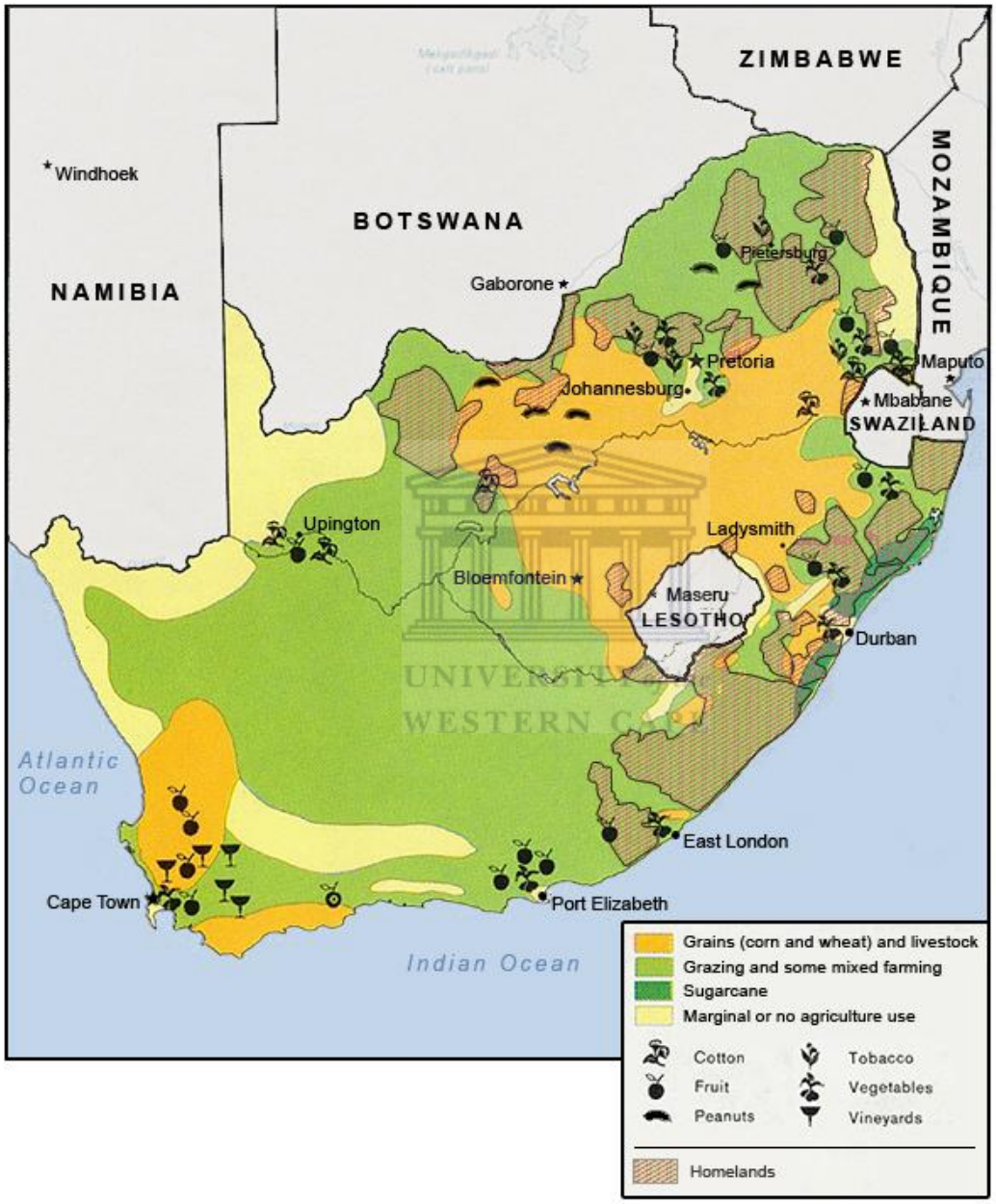
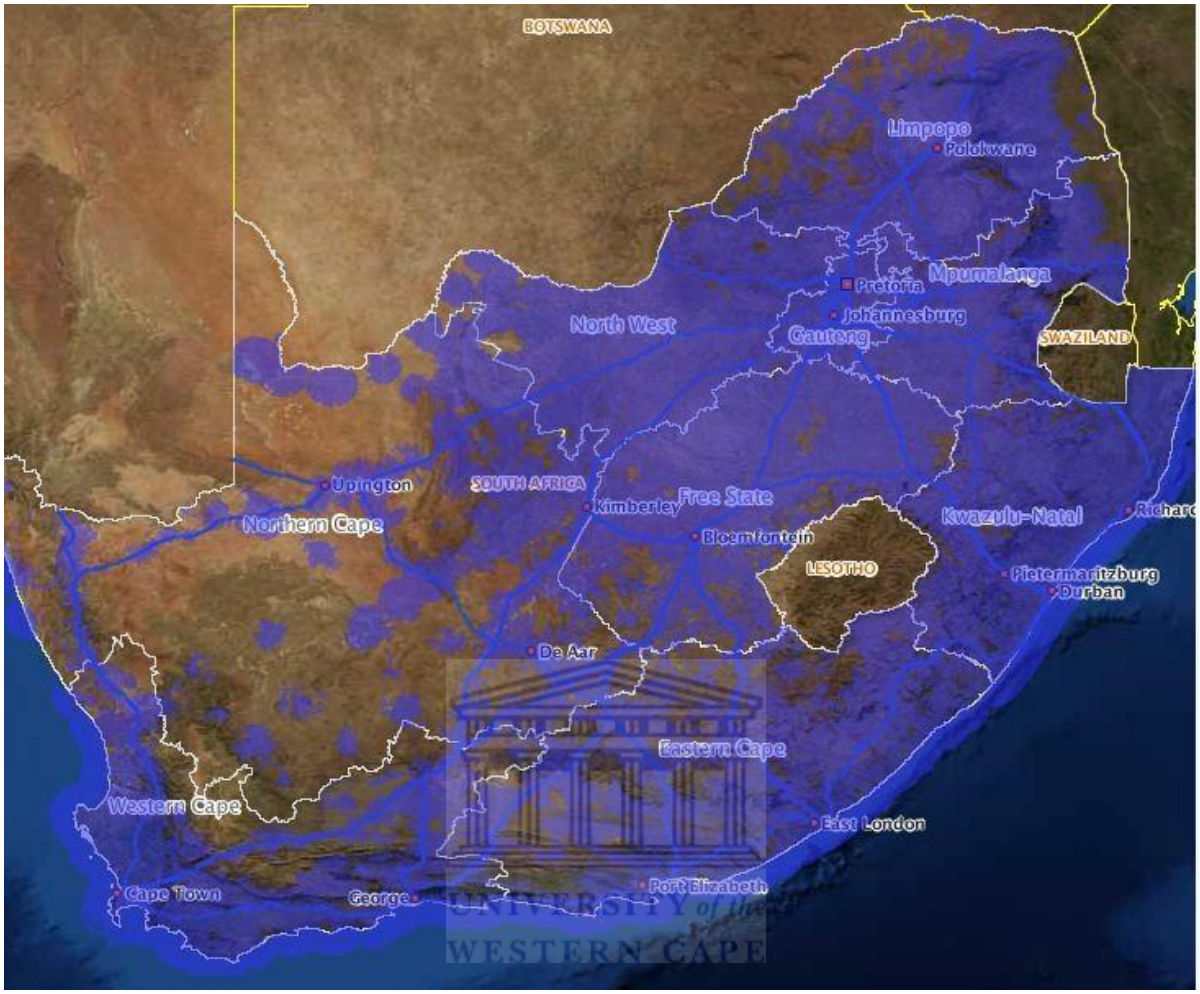
Appendix

Figure A.1: Homelands and Agricultural Resources (1984)



Source: Michigan State University (2007)

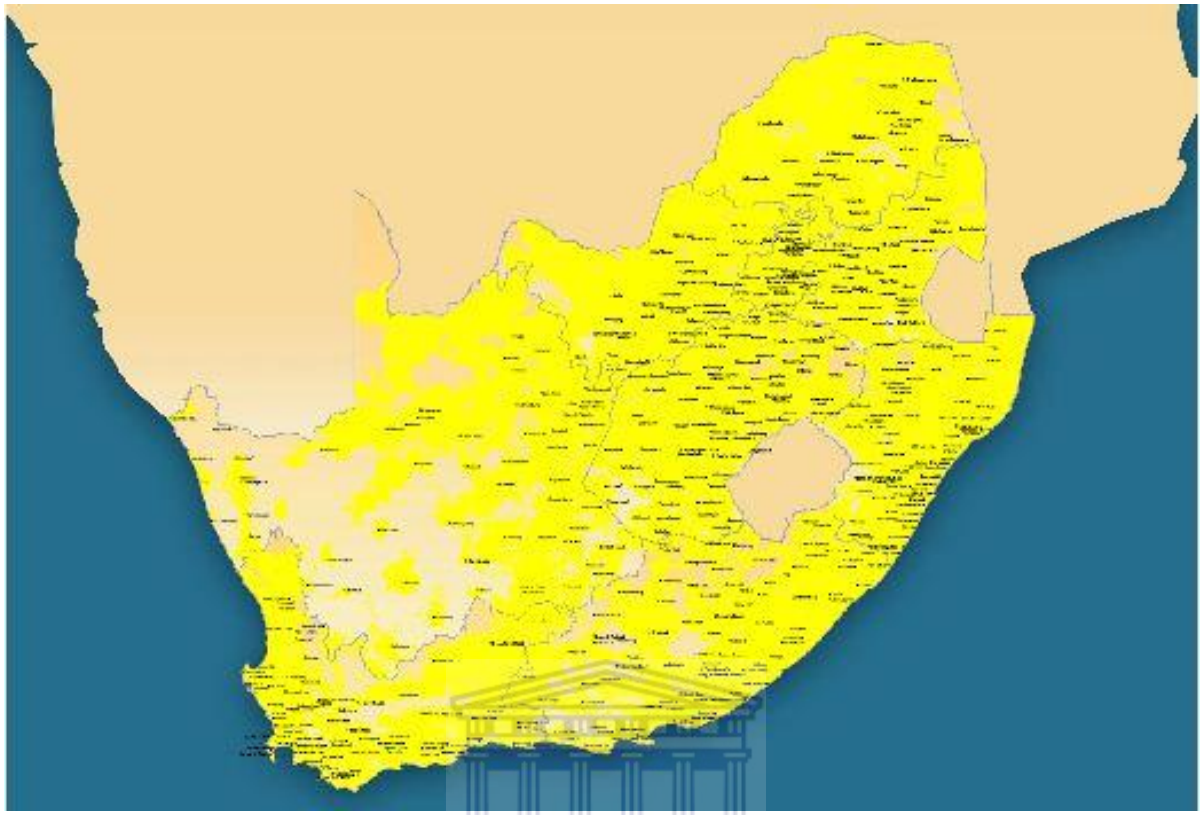
Figure A.2: Vodacom Cellular Network (GPRS coverage)



GPRS coverage

Source: Vodacom (2012)

Figure A.3: MTN Cellular Network (GPRS coverage)



	GPRS coverage

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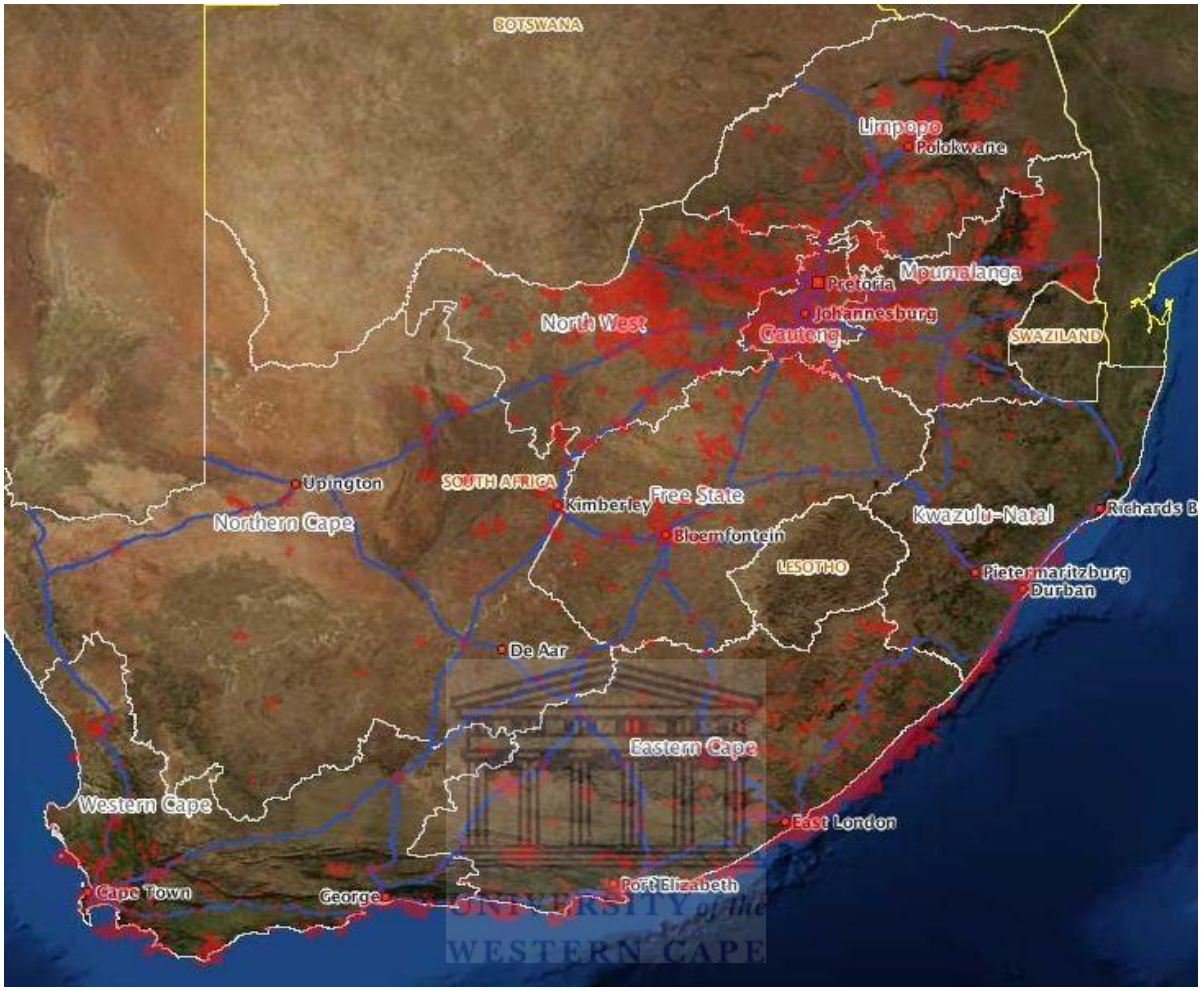
Source: MTN (2012)

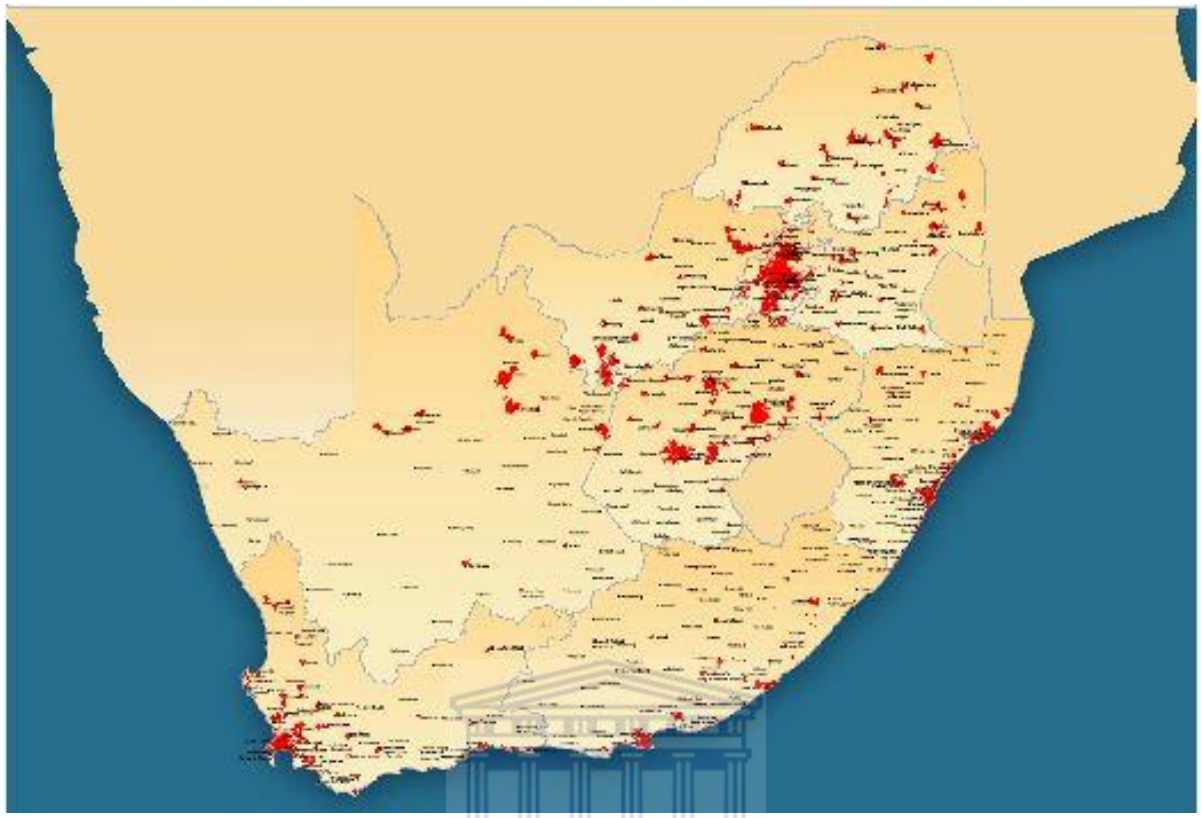
Figure A.4: Vodacom Cellular Network (3G coverage)



3G coverage

Source: Vodacom (2012)

Figure A.5: MTN Cellular Network (3G coverage)



3G coverage

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Source: MTN (2012)