FACTORS INFLUENCING FARMERS' CHOICE AMONGST VARIOUS MARKETING ALTERNATIVES FOR MAIZE IN SOUTH AFRICA

BY

ANTHONY NORMAN BOWN

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

Anthony N. Bown

ABSTRACT

A postal survey was conducted in 1998 amongst a sample of 800 National Maize Producers' Organisation (NAMPO) members in the major maize producing regions of South Africa, namely the Northwest Province, Mpumalanga and the Free State. Study objectives were (1) to measure the extent to which large-scale commercial maize farmers were using, and intended to use, alternative maize marketing strategies which have evolved since the abolition of the Maize Board in 1996, and (2) to identify the business and personal factors influencing their use of price risk management tools (forward contracts, futures contracts, and options).

The average age of respondents was 47 years. Respondents had a mean of 24 years farming experience and 14 years of formal education. They grew an average of 918 ha of maize annually, whilst mean annual turnover per farm was R 2.9 million, of which 68 percent was derived from maize. Seventy-two percent of respondents reported owning a personal computer for use in the farm business, and of these, 37 percent had Internet access. Farmers generally rated their skills in marketing management lowest relative to other aspects of management. Respondents had a better understanding of forward contracting than the more complex concepts of Futures contract and Options trading on the South African Futures Exchange (SAFEX).

Most respondents used a portfolio of maize marketing channels in order to spread price risk in accordance with a sequential marketing strategy. Results indicate that sample maize farmers are making increased use of the forward contracting market relative to the spot market, while on-farm use of maize is also increasing. Both the percentage of respondents using SAFEX and the percentage of the value of the annual maize crop in the sample regions that was hedged on SAFEX increased markedly over the three-year study period. The hedging ratio - defined as the ratio of the crop hedged to that unhedged - rose from 27 percent in 1997/98 to 49 percent for 1998/99 and a projected 50 percent in 1999/2000.

Amongst maize marketing intermediaries, elevators (eg. cooperatives and former cooperatives) handled approximately half the value of the annual maize crop in the study areas, and commercial users (eg. Millers) directly bought 15 percent of respondents' maize. Small traders/agents handled roughly 10 percent, and large traders (eg. Louis Dreyfus) another 10 percent of study farmers'

annual maize crops. No users of currently operating Internet-based maize trading systems were identified.

Survey respondents were classified as lower- and higher- level users of price risk management tools, based on their scores for an index of price risk management use. The index took into account three aspects of price risk management behaviour exhibited by sample respondents: the use of forward pricing mechanisms, the number of different marketing channels used, and the relative proportions of the producer's annual crop passing through these channels. Higher-level users of price risk management tools tended to operate larger farms, and be younger, less experienced, but more educated, computer adopters who were less likely to individually own their operations.

Ordinary Least Squares (OLS) regression was used to estimate the effects of respondents' business and personal characteristics on their scores for the index of price risk management. The use of maize storage facilities, off-farm employment, use of formal crop insurance, operators' number of years of formal education and the proportion of farm turnover arising from maize all positively influence sample farmers' use of price risk management tools. Both the scale-dependent benefits and fixed transaction costs associated with using price risk management tools can be spread over a larger volume of output as the volume of maize marketed increases. The Operators' self-rated score of marketing management ability was negatively related to the use of price risk management tools, in contrast to the findings of previous studies in the USA.

Many respondents indicated concern about a lack of competitiveness in the local spot market, and perceived that large maize buyers were manipulating maize prices. Farmers should use SAFEX Agricultural Marketing Division (AMD) Futures prices as guidelines in "discovering" prices when negotiating with maize handlers and millers about cash maize sales. Producers should also monitor their local basis (the difference between the local spot price and the nearby Futures price) to identify opportunities for the profitable transportation and/or storage of maize.

A need was identified for further education of maize farmers regarding the use, costs and benefits of available maize marketing alternatives. Weekly agricultural magazines and maize marketing seminars may be the most effective mediums through which to inform maize farmers about prices

and marketing services. Further research opportunities were identified in the monitoring of farmers' maize marketing activities as the South African maize market matures, and in establishing recommended hedging ratios for South African maize farmers.

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INTRODUCTION

Maize was the second largest contributor (R 4.7 billion), after poultry, to the total gross value of agricultural production in South Africa (R 38.2 billion) in 1997. The crop is consistently planted on more than 40 percent of South Africa's arable land annually (Directorate: Statistical Information, 1999). South African maize production is concentrated in the Northwest province, Free State and Mpumalanga which, respectively, accounted for 32 percent, 33 percent and 21 percent of average annual maize production in the five years since 1993/94 (Directorate: Statistical Information, 1999).

The marketing of maize in South Africa was highly regulated from the early 1930's until the mid 1990's, with the crop being marketed through a single-channel system administered by the Maize Board, which also set producer prices. Pressure for agricultural commodity market liberalisation mounted in the 1980's and culminated in the abolition of most agricultural commodity control boards - including the Maize Board - by the Marketing of Agricultural Products Act of 1996 (Mielies/Maize, 1997a). Minimal tariff protection against maize imports, commencing below an equivalent US dollar price (currently US$ 100/ton), is the only remaining government price support for South African maize producers.

The deregulation of a market does not necessarily imply that it will automatically become a competitive market. Preliminary interviews with certain role players in the South African maize industry revealed that there is a perception that the maize market in South Africa is far from competitive and that prices are being manipulated to the detriment of farmers. The deregulation of maize marketing has placed the responsibility for the marketing of this important agricultural commodity in the hands of individual producers, who now probably face considerably more price risk. A variety of new farm-level maize marketing alternatives have consequently evolved in recent years and the marketing channels that farmers employ to market their crop are changing. Flexible, sequential marketing strategies allow farmers to spread sales over time, thereby managing price risk (Musser *et al.* , 1996:66). Three main markets have emerged for maize in South Africa: the spot (cash) market, forward contracting and the derivatives (Futures contracts and Options) market. Producers may now sell maize to whoever they please for whatever price they can get in the cash (spot) market, or forward contract their crop to assure prices prior to

harvest (van der Merwe, 1998). The derivatives market involves the trading of Futures and Options contracts, usually through the South African Futures Exchange (SAFEX). Physical delivery of maize is generally avoided, but acceptable price levels are "fixed-in" prior to delivery (Futures contracts), or minimum prices are guaranteed, with potential left for gains from positive price movements (Options contracts) (Frank, 1992). Some other innovative marketing alternatives to emerge include Internet and electronic cash marketing.

The objective of this study is to identify which marketing alternatives that South African commercial maize farmers are using and to what extent these alternatives are currently being used. The influence of the personal and business characteristics of the farm and farmer on farmers' marketing choices will also be examined and results will be made available to participating marketing institutions (eg. SAFEX) and farmers. To the author's knowledge, no South African studies have yet identified how farmers are marketing their maize since the demise of the Maize Board. Previous international studies have tended to focus on the adoption of a single marketing alternative in isolation, this study examines farmers' use of a range of substitutable price risk management marketing alternatives.

The study instrument is a postal survey questionnaire sent to a sample of 800 National Maize Producers' Organisation (NAMPO) members in 1998 in the major maize producing regions of South Africa: the Northwest province, Mpumalanga, and the Free State. This information will be compared with measured farm business and farmer characteristics to identify factors that significantly influence producers' use of various marketing alternatives. The way in which farmers adapt to market deregulation can influence their marketing choices. Both agribusiness firms and policy makers need to be aware of what factors influence these choices so that they can formulate appropriate services and adjust to farmers' changing needs. This information may also help firms and government to identify what type of farmers are more likely to use, and benefit from, their respective services and policies. The results of this research will be sent to various role players in the South African maize industry, with a view to improving maize marketing services currently offered to local farmers.

This thesis first examines the characteristics and history of South African maize marketing to provide a background for interpretation of the study results. The role that Information Technology

may play in local maize marketing is then considered. Next, the study outlines the maize marketing alternatives currently available to commercial South African maize producers, with special reference to price risk management tools. Previous research on topics relevant to the subject of this thesis is then reviewed to identify gaps in the local literature on the use of maize marketing alternatives. The development of the postal questionnaire and sample selection are then discussed before the results of the study are presented and interpreted. Management and policy implications of these results are considered in a concluding section.

CHAPTER 1

THE CHARACTERISTICS AND HISTORY OF MAIZE MARKETING IN SOUTH AFRICA

The maize market in South Africa has been characterised by a high degree of Government intervention in the past. This has come at a high net cost to society. "Intervention results from perceived market failure and results in political failure where interest groups manipulate government for their own benefit" (Wright and Nieuwoudt, 1993:51). However, mere government withdrawal from, and deregulation of a market is, in itself, no guarantee that the market will automatically tend towards perfection. Stock markets, which are often considered to most closely resemble perfect markets, are highly regulated. Appropriate institutions enforce the "rules of the game" and promote the competitiveness of these markets, maintaining the confidence of market participants (Nieuwoudt, 1998). This Chapter outlines the history and characteristics of the South African maize market.

1.1 The history of the South African maize market

Historically, the marketing of maize has been subject to a high degree of government intervention, which started with the Mielie Act of 1931 (Vigne, 1996). A single-channel marketing system administered by the Maize Board persisted from 1944/45 to 1995. Maize could only be sold to the Maize Board or agents of the Board (eg. cooperatives) in the major maize-producing regions of South Africa. Under this system, the producer price of maize was supported and fixed. Initially this price was based mainly on production cost estimates and was released just prior to harvesting under a "single channel, fixed price" system (Van der Vyver and Van Zyl, 1989). Producers thus had an incentive to overestimate their production costs.

In 1986 the price determination procedure was altered, with market supply and demand conditions becoming the primary determinants of the maize price. An indication of the expected price was given as a "price scenario" which was announced at the beginning of every season to ensure that production was market oriented (Maize Board, 1996). This "single channel pool scheme" was maintained until 1995 and represented a shift in policy towards a more liberal maize market. In May 1995 a "surplus removal export pool system" of marketing was installed. Under this scheme,

single channel marketing on the domestic market was abolished. The Board, however, continued to be the sole marketing channel for exports, the price of which served as a floor price in the market. During regulation, South Africa was a net exporter of maize. The volume of surplus production available for export varied considerably with variations in the national harvest. The Maize Board maintained a stabilisation fund to accumulate any export profits to compensate for losses incurred on exports in subsequent years but losses significantly outweighed profits (Maize Board, 1996).

Many academic studies highlighted the high social costs of the Maize Boards' distortion of price signals (Groenewald, 1985; Frank, 1986; van der Vyver and van Zyl, 1989; van der Merwe, 1990; Wright and Nieuwoudt, 1993; Willemse and van Zyl, 1995). The Kassier Commission and Agricultural Marketing Policy Evaluation Committee (AMPEC) reports to government advised market liberalisation. The Maize Board was finally disbanded in April 1997 after the passing of the Marketing of Agricultural Products Act of 1996 (Mielies/Maize, 1997a). The assets of the Maize Board have been taken over by the Maize Trust, details of which are given later in this document.

1.2 Characteristics of the South African maize market

Producers may now sell maize to whoever they can for whatever price they can get. This increased freedom in marketing has resulted in increased exposure to price risk but has also provided producers with new marketing opportunities. South African maize production is concentrated in the Northwest province, Free State and Mpumalanga which consistently produce over 80 percent of the country's crop (Figure 1.1).

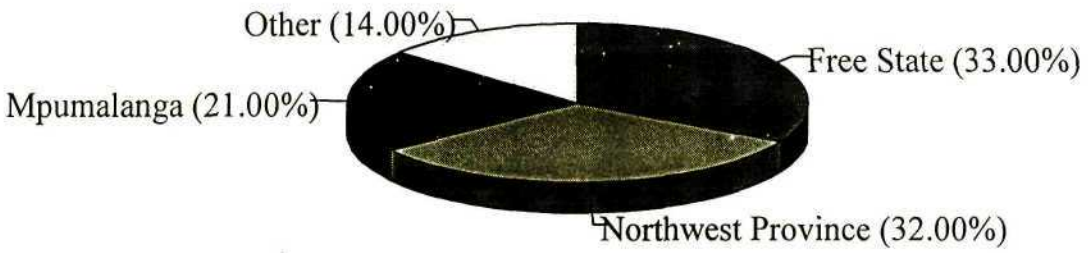

Figure 1.1 Regional contribution to SA maize production (1993/94-97/98)

Aggregate production, consumption, imports and exports of maize in South Africa over the period 1989/90 to 1995/96 are shown in Table 1.1 to illustrate the wide variation in local maize production and the more constant nature of local consumption. The market for maize in South Africa is characterised by price inelastic supply and demand (van Zyl, 1986). The aggregate supply of maize can be considered price inelastic in the short to medium-term because there are few established alternative crops to maize in many regions of South Africa. The quantity of maize produced in any year is largely a function of climatic conditions rather than price signals, leading to large shifts in the maize supply curve and there are relatively long adjustment lags associated with maize production. White and yellow maize can be considered perfect substitutes in production, although white usually commands a higher price than yellow (Frank, 1986).

Table 1.1 *Production, consumption, imports and exports of maize in South Africa (1989/90-1995/96)*

Marketing season	Total production (10^3t)	Total consumption (10^3t)	Imports (10^3t)	Exports (10^3t)
1989/90	11 552	6 425	3	4 909
1990/91	8 342	6 769	-	1 784
1991/92	7 826	7 022	342	1 370
1992/93	2 955	6 828	3 949	408
1993/94	9 077	6 773	-	1 447
1994/95	12 067	6 417	-	4 719
1995/96	4 406	6 842	1 119	887

Source: Maize Board (1996)

Demand for maize comprises mainly of human and animal demand, which together account for more than 95 percent of consumption. The remaining five percent comprises industrial demand. White maize is used mainly for human consumption and yellow maize for animal consumption.

Animal demand for maize has been steadily increasing due to the increased importance of maize as an animal feed, especially for poultry, whilst human demand for maize is relatively constant. Human demand for maize has been shown to be relatively less price elastic than animal demand but demand for both is considered price inelastic as few substitutes are available (van Zyl, 1986).

In the current freer market situation, the price-inelastic nature of maize demand and seasonal shifts in maize supply result in volatile maize prices. In some years domestic supply of maize exceeds domestic consumption resulting in an exportable surplus. In other years deficits occur, necessitating maize imports (eg. in 1992/93). South African maize prices may thus vary between the landed import and net export realisation prices (van der Vyver and van Zyl, 1989). The size of this price difference, and thus the degree of possible local maize price fluctuation, is dependent largely on transport costs to and from the rest of the world (Frank, 1992). Major world maize markets are situated far from South Africa and are themselves characterised by volatile prices, and international transport costs are considerable. Within South Africa, transport costs are also high, leading to large regional price differences between localities (Elliott, 1994). In addition, the supply of maize is strongly seasonal, being concentrated in the harvest period of approximately two months, whereas demand for maize is spread throughout the year. Seasonal maize price fluctuations thus also occur due to the costs associated with storage. The abolition of the Maize Board has increased individual producers' exposure to price risk but has also provided them with new marketing opportunities. The increased variability of maize spot prices since maize market deregulation is illustrated in Figure 1.2, where a Randfontein maize price is used.

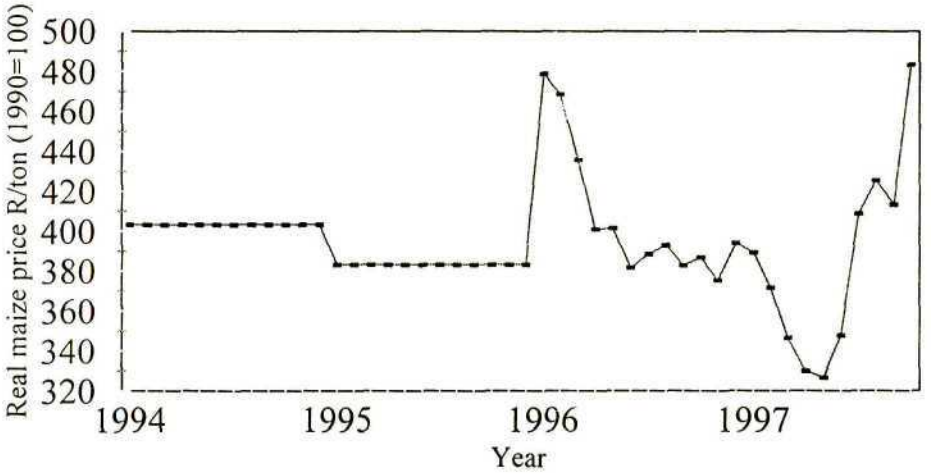

Figure 1.2 Maize spot price variability in S. Africa (1994-1998)

Sources: Directorate: Statistics and Management Information, 1997; SAFEX, 1998

Maize producers in South Africa face considerable price risk, this is evidenced by commercial farmers' perceptions of product price variability as a major source of risk in studies reported by Woodburn *et al.* (1995) and, to a lesser degree, Stockil and Ortmann (1997). This particular aversion to price risk is characteristic of many agricultural producers worldwide (Schroeder and Goodwin, 1994). Price risk, however, is only one of many different types of risk facing farmers in their overall risk portfolio. The concept of risk balancing behaviour applies (Ferrer, 1998). For example, farmers who have relatively low exposure to other sources of risk, such as higher than accepted debt levels, may be less concerned about price risk, since the relative impact of price risk on their businesses may be reduced by their low overall risk exposure.

1.3 Information Technology: its role and potential applications in South African maize marketing

Rapid advances have recently been made in the field of Information Technology. Computers have become more effective, more user-friendly and cheaper. Applications of Information Technology to maize marketing take two general forms, indirect applications (eg. the provision of marketing information), and direct applications, where actual trading systems are established using the technology.

Initially, computer applications to farm-level commodity marketing were restricted to *internal* information systems such as spreadsheet packages. More recently, *external* information systems have become available to farmers, whereby the farmer can access information from off the farm (eg. via the Internet). Satellite data services exist in the United States of America (US) whereby relevant information (eg. price and weather forecasts) is beamed to subscribers' houses via a satellite dish. These systems have met with success in the US but are not available in South Africa as yet (Lockhorst *et al.*, 1996). Locally, market information is available to subscribers in faxed form from a company called Agrimark Trends. Agrimark Trends also distributes market reports to subscribers via an Internet newsgroup service. The rapidly expanding Internet provides many opportunities to farmers. James (1996) identifies a number of Internet-based services that are likely to be useful to farmers: Management and marketing information is available through *newsgroups* (virtual bulletin boards on specific topics), *listservers* (electronic mailing lists that facilitate discussion on specific topics) and the *World Wide Web* (by "browsing" web pages).

E-mail allows for quick, cheap and easy communication with fellow farmers and experts, as well as with agribusiness firms. On-line banking is now available in South Africa and may provide both increased convenience and transaction cost savings to many farmers. Subscribers to such services may typically pay accounts, check balances, transfer funds, create or cancel stop-orders and arrange future dated payments around the clock without leaving the farm.

Direct applications of Information Technology have also been made to maize marketing, whereby maize trading systems were established. Various electronic and Internet-based marketing systems have been made available to South African maize farmers over the past few years (eg. AGMEX and Agrilink). Some of these marketing service-providers, however, have failed to gain acceptance and use by farmers. These services, along with the factors influencing their successes and failures, are examined more closely later.

1.3.1 Computer use by South African farmers

Previous studies have examined computer use by South African farmers but no published studies have yet measured Internet access and use by South African farmers. In the USA, Batte *et al.* (1990) found mixed grain/livestock farmers to be the most likely group of farmers to adopt computers. They also noted that farmers' computer adoption rates have lagged behind the rate of computer development. This assertion is also made for European farmers by Lockhorst *et al.* (1996).

Woodburn *et al.* (1995) investigated computer use and the factors affecting computer adoption among commercial farmers in Natal. Roughly half (48 percent) of respondents reported owning a computer. Computers were found to be used mainly for record keeping (financial and management records), financial planning (budgeting) and payroll purposes. Farmers considered computers *least* helpful for making marketing and price analysis decisions. The authors attributed this to the prevailing lack of freedom in agricultural marketing (at that time over 85 percent of the value of agricultural marketing fell under government regulation or control). As described in Chapter 1, the maize marketing environment has changed dramatically since then. Ortmann (1997:15) considers marketing to be "a farm process with considerable scope for improvement"; computers and information technologies provide farmers with some useful tools with which to

improve their marketing. Woodburn *et al.* (1995) found that only 39 percent of survey respondents considered themselves highly skilled in marketing management, versus 65 percent, 60 percent and 65 percent for production management, financial management and overall management respectively. Reasons given for not adopting computers included high costs, lack of confidence in operating a computer and insufficient time to operate a computer. Factors found to be positively related to computer adoption included farmers' education, gross farm income, proportion of farm land rented, financial management skills and off-farm employment. A negative relationship was evident between computer adoption and farmer's age and the presence of a beef enterprise on the farm.

Stockil (1997) reports that 64 percent of survey respondents in KwaZulu-Natal owned a computer for use on the farm. This represents a large increase in computer use since the earlier study by Woodburn *et al.* (1995). Computer adoption was found to be positively related to farmer's education, farm size (gross sales) and the number of information sources used in decision-making. The factors influencing farmers' decisions to adopt computer technology are well documented in the studies by Woodburn *et al.* (1995) and Stockil and Ortmann (1997). Computer adoption is an obvious prerequisite for Internet adoption, as is access to a reliable, direct telephone line. Thereafter, "a farmer will normally only consider additional information (in this case Internet access) if the perceived benefits are greater than the costs of time, effort and cash outlays" (Ortmann, 1997:24).

1.3.2 Marketing-related applications of Information Technology

A variety of innovative marketing-related applications of Information Technology have been made available to South African farmers in recent years.

1.3.2.1 Provision of market information

Agri-hub is an electronically based market information provider which supplies farmers with the latest produce prices, industry news, financial news and management advice. Agrimark Trends is a related company which provides market information for agricultural producers over the Internet and in written and faxed form. Subscribers are updated weekly with relevant agricultural

statistics as well as local and international market information. A monthly publication graphically illustrates market trends to subscribers.

1.3.2.2 Electronic marketing alternatives: AGMEX, A case study

Agri-marketing Exchange (Pty) Ltd (AGMEX) was established in 1995 to provide an electronic marketing alternative for maize producers. Initially introduced by the Vleissentraal cooperative for beef and, more recently, adapted for maize marketing, the AGMEX system failed and is no longer operating. It is, however, pertinent to consider the reasons for it's failure. AGMEX offered two services: weekly electronic grain sales and a daily bid and offer billboard on the Internet (http://www.primeresources.co.za/agmex). The Internet bid and offer system operated as a newsgroup where sellers posted their offers and buyers their bids. A major problem with this system was that it was not interactive; bids and offers were posted and thereafter it was complicated for buyers and sellers to revise these prices and negotiate the finer details of delivery (Dickson, 1998). In addition, trading was thin and continued twenty-four hours a day. This may have discouraged buyers who may have preferred to have specified trading hours, rather than having to monitor trading continuously. The bid and offer system also brought together potential buyers and sellers, who could then negotiate sales privately.

The AGMEX electronic auction system was independent of the Internet and utilised the same satellite-based electronic communication infrastructure that operates bank ATM networks and pager systems. Buyers first had to pass a credit test and were then allocated a credit limit. Sales were held on Thursday mornings and sellers participated in the sale via a registered broker. Over 1000 local and international buyers could simultaneously participate in the auction, which was coordinated by a systems manager at AGMEX. Participants remained anonymous but prices were visible to all. Commissions were paid by the seller. Participants required a basic personal computer, a modem, printer and a dedicated telephone line (Cornelius, 1997). The following advantages of the electronic auction system were identified by AGMEX: Transactions costs are reduced since, unlike traditional auctions, the product, buyer and seller need not be brought together at a specific place. Prices are transparent, while participants remain anonymous, prices are available to all. Greater competition is envisaged between buyers as many buyers may participate simultaneously. Market access is eased as the market is not at a physical location and

buyers and sellers from many regions may participate. APEX, a similar system to AGMEX, is used successfully as the *sole* milk marketing channel for the Irish Milk Board's sales to processors. The Irish Milk Board operates under a single-channel marketing system (Grega and Ray, 1992).

Bunting (1997) identified some drawbacks associated with AGMEX. Interviews with producers showed that *buyers* perceived the system to lack *credibility* and were reluctant to use the AGMEX system. In times of surplus, buyers did not support AGMEX and prices anticipated by buyers and sellers differed by R 20 to R 30 a ton. If it were perceived to be credible, most buyers said they would be prepared to source 10 percent to 30 percent of their requirements on this market. Buyers perceived that many sellers were using the system to discover values and withdrew lots after finding out the reserve price. They alleged that some sellers had bid on their own stocks in the past and that the system did not allow for negotiation of special terms. These constitute institutional deficiencies. Bunting (1997) recommended institutional improvements to arbitration procedures and facilities. Buyers' perceptions of price manipulation would also need to be addressed and the whole system would have to become more transparent and subject to a management board of stakeholders, as is the case with SAFEX. These changes were not effected and AGMEX no longer operates.

There is some controversy over the appropriateness of an auction system for maize marketing. Dickson (1998) reasons that large buyers such as Tiger Oats and Premier Milling all face similar cost structures and sales prices, implying that their profits are mainly made on their maize purchases. The electronic auction system is considered appropriate as it reduces transactions costs associated with buying. There is another point of view that auction sales are suitable "only for residual or bargain buying" since marketing margins are so slim that millers cannot afford to be unsure of the price of their inputs (Gravelet-Blondin, 1998). This explanation would explain the lack of buyer use in times of surplus. In addition, large mills need a constant, guaranteed throughput to be cost effective. The auction system cannot make such guarantees. The lack of buyer support for AGMEX in times of surplus may have been due to *agents* having a vested interest in avoiding price transparency since AGMEX may reduce the demand for their services and buyers may be wary of bidding prices up in an open auction (Dickson, 1998).

1.3.3 Internet-based marketing alternatives

Agrilink (http://www.agrilink.co.za) describes itself as a virtual agricultural trading and information centre. They provide a commodity exchange, a classified advertisements section, a useful address database and links to various sources of worldwide market information. A chat line is also provided to facilitate discussion on agricultural topics. The commodity exchange is divided into "field crops", "fodder crops" and "general" categories. A visit to the site showed that utilisation was low. As at 4 March 1999, the highest volume of bids and offers was in the field crops category with fourteen offers (only four involving maize) and one bid posted, some bids had been there for over three months.

The Stockowners Cooperative web page (http://www.agriserve.co.za) hosted a grain bid and offer system on the Internet. Lots on offer were described in terms of their grade and location. A variety of goods could be traded through the system. However, the system is no longer operational and the site is now used to advertise upcoming cattle sales.

The National Maize Producers' Organisation (NAMPO) is investigating the possibility of starting its own Internet-based maize trading system, posting bids and offers on a local basis (Grobler, 1998). They believe that a well-used bid and offer system will aid price discovery, especially for farmers in remote areas, and will promote price transparency in the spot market. They would do well to note the performance of similar services already in existence and try to address the problems associated with them. Millers interviewed revealed that they would be reluctant to publish bids for particular locations as their identities would be revealed with such bids since the ownership and locations of the various mills are well known. A lack of rural Internet access may also hamper such schemes. Other marketing alternatives have also become available to local maize producers since the demise of the Maize Board. The alternatives discussed in the next chapter have helped to broaden the range of marketing services available to South African farmers.

CHAPTER 2

MARKETING ALTERNATIVES AVAILABLE TO SOUTH AFRICAN MAIZE FARMERS

Farmers were faced with greater individual responsibility for marketing their maize after the deregulation of the local market in May 1995. The removal of the floor-price supports that accompanied the dissolution of the Maize Board in 1997 further increased farmers' exposure to price risk, making marketing all the more important. A number of new marketing alternatives have since become available to maize farmers. Broadly speaking, three markets have emerged, namely the spot (cash), forward contract and derivatives markets. The prices formed by these markets are interrelated as similar forces of demand and supply affect them. Other alternatives available to producers include value adding through vertical integration (eg. on-farm milling) and storage of product for later sale.

2.1 The spot market

The spot (cash) market is an important market for maize as it allows for the immediate disposal of maize. The demise of single-channel marketing has led to the development of a number of new spot marketing channels for maize. The spot market serves both as an avenue for the sale of physical product and as a generator of price information. Supply and demand perceptions have a great influence on prices. However, the unavailability and unreliability of local information regarding holding stocks for maize hinders maize price discovery in South Africa (Grobler, 1998). The unhindered dissemination of market and price information is an important feature of a free market. Price transparency is critical. Price discovery for the individual producer has become more difficult since market deregulation due to the dispersal, unreliability and unavailability of market and price information in the maize spot market.

Different role players hold differing views as to the competitiveness of the maize spot market in South Africa. NAMPO perceive a mutual distrust between various role players in the industry whereby parties believe that it is not in their interests to share information (Mielies/Maize, 1997a). Buyers of maize are seen as reluctant to reveal prices for fear of bidding prices up. Bunting (1997:1) noted "a perception that the maize spot market is being manipulated".Cornelius

(1997:21) points out, "the buyer who is able to control price discovery and the dissemination of market information, inevitably controls the producer and the marketplace". Simple government withdrawal from, and deregulation of, a market does not necessarily imply that such a market will automatically become a competitive market (Fourie and Venter, 1994). Grobler (1998) believes that there is a need for appropriate institutions to be developed so as to establish the "rules of the game" and to avoid market manipulation.

There is another point of view, held by certain millers and traders, that the maize spot market is competitive because milling margins are small and large users must compete with each other, just to maintain throughput at their mills. Millers and other large buyers freely admit that they do offer uncompetitive prices to farmers once their plant throughput requirements have been met, in order to try and get bargains. They argue that farmers simply need to phone the various buyers, traders and agents in their area to find the best price available.

2.1.1 Maize spot marketing channels

The maize spot market in South Africa is diffuse, local prices differ between regions and are determined by local supply and demand forces. Transportation of maize may occur between markets, according to price differences existing between them. If the price differential between two regions exceeds the cost of transport, there is scope for profitable transportation. Maize may be sold through a number of channels in local spot markets.

Grain elevators (silo operators), many of whom were formerly cooperatives acting as agents of the Maize Board under single-channel marketing, continue to play an important role in maize marketing. Some elevators still operate as cooperatives, others have restructured themselves as public companies. For the sake of simplicity, these two types of entity will be referred to as 'elevators' in this study . Elevators act as traders, storers and brokers of maize. Maize may be sold to some elevators outright for their own use (elevators acting as traders), delivered to their silos and exchanged for a tradable silo certificate (elevators acting as storers) or sold through elevators to third parties (elevators acting as brokers).

Many processors and end-users of maize, such as millers, animal feed companies and feedlotters,

buy a proportion of their requirements directly from farmers on the spot market. Larger farmers and those situated close to such points of use (eg mills) may get premium prices due to reduced transaction and transport costs. The prices offered at these points of use may or may not be competitive, depending on the stock situation at the relevant facility.

Maize may also be sold to small traders and brokers who do not own elevator/silo facilities. Here sales would occur on a "ring and sell" basis for a price negotiated over the telephone. Traders may be operating on behalf of large buyers or acting as arbitrageurs. Arbitrageurs aim to profit from simultaneous price differentials existing between markets. These markets may be separated by time or distance. Large international grain trading companies such as Cargill and Louis Dreyfus also buy maize direct from larger farmers, as well as acting as importers/exporters and speculators.

2.1.2 Managing price risk in the cash (spot) market

Farmers may manage the price risk they face in the spot market in a number of ways. Seasonal variations in product price may be managed if sales are spread out over the season and a single sale of maize is avoided. This comprises a 'sequential' marketing strategy (Musser *et al.*, 1996). Farmers would then receive an average of the various ruling prices, weighted by the proportions sold each time. Farmers also use flexible marketing strategies and alter their plans by considering new market information which may subsequently arise. King and Lybecker (1983:125) define a flexible marketing strategy as one that "continually reevaluates market information to determine future actions". An alternative to the immediate sale of maize would be on-farm milling (for farmers with their own mills or serviced by local contract millers, "bosmeulens"). Maize may also be used on-farm (eg. fed in a feedlot).The demise of the Maize Board in South Africa has enabled the private sector to provide alternative price risk management tools to maize farmers to manage maize spot price volatility. The main alternatives which have developed include forward contracting and Futures and Options hedging on SAFEX.

2.2 *The forward contracting market*

An obvious way for both sellers and buyers to avoid price risk is for the two parties to agree on a mutually acceptable price or price formula for physical delivery of product on a specified future date. Forward contracts have become a widely-used marketing tool in the maize industry. Forward contracts hold a number of benefits for end-users and processors of maize; they guarantee delivery, they can be tailor made to allow negotiation of terms and provide price risk insurance. Van der Merwe (1998) observes that the maize industry has developed a number of innovative forward contracting arrangements:

- *Fixed price contracts* whereby the maize price payable on delivery is specified in the contract and is not negotiable. The producer is guaranteed that price and the only price risk he faces arises if the spot price at delivery exceeds the price stipulated in the contract. An "escape clause" against "acts of God" may or may not be included in these contracts; such clauses are increasingly being excluded.
- *Minimum price contracts* whereby the producer is guaranteed a minimum price for his crop but, should the spot price exceed this minimum, a higher price is paid. This arrangement allows producers to benefit from positive spot price movements whilst guaranteeing them a floor price. Minimum price contracts are a common form of forward contracting. Bunting (1997) notes one miller, for example, offered a premium price for 50 percent of the contracted crop and then negotiated a price for the balance later in the season. Large millers often negotiate such forward contracts with both large individual farmers and with elevators. These elevators may then use these contracts to guarantee prices to farmers (back-to-back contracting). Under various "pool-price" or "agterskot" schemes, producers may sell maize to certain elevators for a stipulated base price. The cooperative then markets the maize and, at the end of the season, redistributes any profits it made by selling in excess of this price. The cooperative may hedge on the South African Futures Exchange (SAFEX) or use forward contracts with millers to guarantee base prices to farmers.
- *Forward contracts that include production financing.* Here producers are provided with production finance in return for ensuring delivery according to a pricing structure stipulated in the contract. Verris Farms offer a variety of such contracts to producers. Farmers using these contracts need not seek finance from banks and cooperatives but

should be aware that interest charges on finance provided are often hidden in maize prices that are not market-related.

One possible drawback of forward contracting is that no formal market yet exists for such contracts in South Africa. This gives rise to counterparty risk whereby enforcement of contracts is not guaranteed (SAFEX, 1998). The major role-players in the maize industry have drawn up a standardised contract which can be used on a voluntary basis to reduce counterparty risk. Refinements and modifications to this document are on-going.

2.3 The derivatives market

A derivative is a security whose price is determined by, or "derived from", the price of another security (SAFEX, 1998). The derivatives market includes trading in Futures and Options contracts.

2.3.1 Futures trading

Futures trading is an evolution of forward contracting whereby physical delivery of the product is avoided but prices are still guaranteed. The system facilitates hedging against price risk by trading-off similar profits and losses in two related markets, the cash and Futures markets. The Futures market trades in contracts to buy or sell a specific quantity of a specific quality of a particular commodity at some point in time in the future. The Futures price is likely to be highly correlated with the cash price and the difference between the two is known as the basis. Theoretically, this includes the cost of storage and, as the contract nears expiration, the basis decreases until on the due date the cash and Futures prices are equal.

Many different permutations are available to hedgers in the Futures market, an example of one of these hedging alternatives follows: A producer wanting to hedge against price risk may sell a Futures contract (go short) whilst a trader wishing to hedge against possible price increases may buy a contract (go long). Prior to the due date, traders can "close out" their positions by taking an equal, but opposite position. Traders who are short can buy back contracts and those who are long can sell back contracts. Few contracts actually result in physical delivery of the product.

Traders may then sell and source their product on the cash market. If the final cash price is lower than expected, producers who sold contracts early (went short) then closed out just prior to delivery would have made a profit on the Futures market that should compensate for their loss on the cash (spot) market. The corresponding "long" trader would have made a profit on the spot market to compensate for the loss made on the Futures market. If the final price ends up higher than expected, the corollary holds. Down-side risk is thus transferred from hedgers at the cost of potential favourable moves in the market. Risk still faces the hedger as basis risk, risk from possible changes in the basis, but this risk is much less serious than price risk (Frank, 1992).

Speculators in the market aim to benefit from anticipating price movements. Speculators are required in the market to provide liquidity, that is to act as buyers and sellers so as to allow market participants to close out their positions at any point in time. Important as they are, it must be remembered that the market could perform equally well without speculators if it had sufficient liquidity. The often-quoted statement that Futures markets transfer risk from hedgers to speculators is thus not entirely true (Frank, 1992).

Arbitrageurs attempt to make profits by trading between two markets in which prices are temporarily unsynchronised. The actions of arbitrageurs thus ensure that Futures prices equal spot prices at contract expiration dates.

When traders take a position, they need not pay the full contract sum but are required to place a deposit of between 5 and 14 percent of the contract value. This deposit is called "margin money" and is sufficient to allow the exchange to close out a trader at any time, protecting the integrity of the market. Traders may be asked to "top up" this margin if price movements are larger than expected. The result of the small deposit requirement is that a trader or speculator can gain control over an asset for a small fraction of its underlying value. This high leverage means that the percentage loss or profit on an investment is usually high. The only other money that changes hands is the participants' net profit or loss on closing out (Frank, 1992).

2.3.2 Options trading

Options trading provides producers with an alternative tool with which to manage price risk. A commodity Futures Option is a contract which conveys to its holder the right, but not the obligation, to buy or sell an underlying Futures contract in a specific commodity for a fixed (strike) price at any time prior to the expiration date (CBOE, 1998). This right is guaranteed by the seller of the option and, in return for shouldering this obligation, he receives a once-off, non-refundable payment known as a premium (SAFEX, 1998). "Call" Options convey to holders the right to buy, and "put" Options, the right to sell Futures contracts. The premium which sellers receive is determined by market forces of supply and demand. Factors known to influence the size of the premium include (van der Vyver and van Zyl, 1989):

- *Price expectations* - premiums will be higher if prices (of Futures) are expected to rise;
- *Price stability* - higher premiums prevail for commodities whose prices are volatile;
- *Time* - the longer the Option is valid for, the higher is the premium;
- *Intrinsic value* - that amount by which the fixed strike price is less than the current market price of the Futures contract.

Options can exist in three states (SAFEX, 1998):

- *"At-the-money"*, when the strike price is the same as the current market price;
- *"Out-of-the-money"*, when an Option has no intrinsic value (ie. for a call Option, when the strike price is above the market price, or vice versa for a put Option);
- *"In-the-money"*, when a call Option has an strike price below the market price of the underlying asset, or a put Option which has a strike price above the asset price.

A variety of complicated hedging scenarios are available when dealing with Options trading, only a few, very simple ones will be dealt with here. A maize producer wanting to plant his crop and who is worried about price risk may buy a call option "at-the-money" on maize Futures. This effectively guarantees a floor price to the farmer but does not limit his potential benefit from upward price movements. If the spot price at any stage is higher than the strike price, the Option is "out-of-the money". The producer should then not exercise his option. In this event losses to profit potential have been minimised to the level of the premium. If the option is "in-the-money"

at any time prior to expiration, the seller may exercise his option to buy the underlying maize future at the strike price and close out his position. This guarantees him the price stipulated in the Futures contract. Since the Option premium is non-refundable, profits would be fixed and lower than the equivalent Futures hedging alternative at spot price levels below the strike price. Producers may also hedge by buying an "out-of-the money" put Option if a price fall is considered highly unlikely. This Option will have a much lower premium and provides a floor price at a low level whilst allowing the producer to take greater advantage of possible price rises (van der Vyver and van Zyl, 1989).

The trading of agricultural commodity Futures began on SAFEX through its Agricultural Markets Division (AMD) in early 1995. At present, Futures may be traded in both white and yellow maize, beef and wheat. Trading of both Futures and Options is currently restricted largely to maize and a large percentage of Futures contracts (roughly 20-30 percent) are not closed-out and result in delivery. Trading in maize Options has just started and few Options have been traded so far. The volume of maize traded on SAFEX is increasing but high volumes do not imply high liquidity if these contracts are traded by a few large market players. There appears to be a relatively small number of large traders operating on SAFEX. It is speculators who often provide liquidity in Futures markets, acting as buyers and sellers and allowing hedgers to close out their positions. In May 1996, SAFEX introduced an electronic, screen-based trading system that has made it one of the more technologically advanced exchanges in the world. The financial instruments available through SAFEX provide for a range of risk management strategies from low risk, limited return Futures hedging to higher risk, higher possible return "out-of-the-money" Options trading. Since derivatives trading does not necessarily involve physical delivery of product, lower grades of maize may be hedged with contracts specified in top grades. Maize hedging on the international Futures markets is also now possible, as is foreign participation in SAFEX. Prices prevailing on the Chicago Board of Trade (CBOT) have a significant leading effect on the local Futures price.

2.4 Information provision and maize marketing agents

The assets of the previous Maize Board have been taken over by the Maize Trust. The trust funds an article 21 company which aims to provide information to the industry, the South African Grain Information Service (SAGIS). This organisation collects information from compulsory returns

from millers and provides minimum market information such as opening stocks, imports and exports (Mielies/Maize, 1997b).

The proliferation of market alternatives has resulted in increased marketing choices for many producers. Trading in many of these marketing channels is often thin and price and other market information is not visible to other market participants. Price determination can be problematic for individual market participants. Inappropriate use of the derivatives market may actually increase producers' exposure to risk. If, for example, a farmer hedged his whole expected production on the derivatives market, he would still be exposed to risk on any amount by which his actual production exceeds or falls short of the target. The use of a mix of alternatives could be beneficial. Much work has been done to determine the optimal hedging ratio for producers. The optimal percentage of production hedged is dependent on factors such as the decision-maker's attitude towards risk and the degree of production risk and price risk facing the producer (Bond and Thompson, 1985; Kahl, 1983). Empirical studies have shown producers' use of derivatives to usually be below those levels recommended by optimal hedging literature. A number of marketing agents exist who can advise producers on marketing and provide them with a portfolio of maize marketing tools.

Since it is now a voluntary association of producers, NAMPO has restructured itself to act as a maize broker acting on behalf of its members. Another role it hopes to play is that of a confidential market information source to subscribing members. NAMPO aims to use a variety of methods to convey this information, such as e-mail, faxes, a phone-in service and a TV programme (Mielies/Maize, 1997a). SA Feed and Grain Marketing is a company that provides clients with access to a portfolio of marketing alternatives including Options and Futures trading via a seat on SAFEX, spot market trading and exports. Cooperatives often help and advise producers with the marketing of their maize, providing their members with production and marketing advice.

CHAPTER 3

REVIEW OF PREVIOUS STUDIES ON PRODUCER USE OF MAIZE MARKETING CHANNELS

Previous research relevant to the topic of this research can broadly be divided into two groups: studies examining farmers' use of forward pricing methods and studies examining farm-level use of a range of marketing alternatives. This Chapter summarises the findings of these studies relevant to the topic of this study.

3.1 Use of forward pricing methods

A number of surveys in the United States of America (US) have investigated farmers' use of forward pricing methods. One common point mentioned in this research is that, despite the seriousness of price risk and the overwhelming theoretical evidence that forward-pricing methods are effective in managing price risk, very few farmers actually use forward pricing and Futures hedging. Hill (as cited by Goodwin and Schroeder, 1994) surveyed Kansas grain farmers and found that only four percent of respondents had ever hedged and only 12 percent had ever forward contracted. Berck (1981) noted that only five percent of farmers surveyed participated in the Futures market and as many as a third did not know how the derivatives markets could benefit them. Asplund, Forster and Stout (as cited by Goodwin and Schroeder, 1994) in a 1986 survey of Ohio farmers found that seven percent had hedged and 42 percent had forward contracted. A survey of Indiana farmers by Shapiro and Brorsen (1988) revealed that 63 percent had hedged some of their crop in the previous five years. The average percentage of total acreage hedged per year was 11.5 percent whilst that forward contracted was 20.5 percent. This indicates a general trend of increasing producer use of forward-pricing methods by US farmers. The reduction in government support and liberalisation of produce marketing in the US since 1980 may be partly responsible for this. It should be noted that producers may often be benefiting from Futures trading indirectly since many traders and elevators guarantee their cash purchases and forward contracts by hedging themselves on the Futures market (van der Vyver and van Zyl, 1989). This may be an important factor reducing farmers' visible use of the derivatives market in South Africa.

Shapiro and Brorsen (1988) used the results of a survey of top Indiana maize and soyabean farmers to identify factors influencing farmers' participation in Futures markets. They treated the use of Futures as a technology adoption decision. Tobit regression was used to account for both the discrete adoption decision and the continuous decision as to the proportion of the total crop to hedge. Farmers' perceptions of the ability of Futures to stabilise incomes was found to be the most significant factor affecting adoption (+), followed by the farm's debt position (-). Other significant determinants of adoption included the number of years experience managing a farm (-), number of years of formal education (+), perceived positive change in income from hedging (+), self-rating of management ability (+), number of acres farmed (+) and presence of off-farm income (+). Since the sample size was small (41) and only "top" farmers were interviewed, the apparently strange result that more experienced farmers hedged less could thus not be extrapolated to all farmers. Hedging was used less than other risk management strategies. The authors anticipated problems with the measurement of risk aversion and used three measures of this variable, none of which were significant in the analysis. Seventy-one percent of respondents knew of someone who had previously had a bad experience with hedging but this was not found to significantly affect adoption.

Goodwin and Schroeder (1994) examined farmers' adoption of forward pricing methods. The focus of this study was on the effectiveness of marketing and risk management seminars in facilitating adoption. Survey data from 509 Kansas producers were compared with their farm records. Respondents included wheat, corn, sorghum, soybean, cattle and pork producers. The mix of marketing practices that farmers used was also examined. Cash marketing was found to dominate the marketing of all the commodities examined. Over 98 percent of producers used the cash market to some degree (Schroeder and Goodwin, 1994). Differences were discovered between crops in terms of utilisation of cash marketing, Futures hedging, Options and forward pricing. Maize and cattle were the two commodities most frequently hedged. Differences were also seen between crops in terms of the proportion of each crop marketed by a given marketing channel. Factors significantly affecting forward pricing adoption included (in order of significance); experience (-), area managed (+), proportion of total land cropped (+), debt/asset ratio (+), input intensity (+) and seminar attendance (+). Factors affecting marketing seminar attendance included experience (-), area managed (+), distance to nearest town (-), time spent reading agricultural literature (+), education (+), proportion of total land cropped (+), debt/asset

ratio (+) and risk preference (+). A Tobit model (similar to that of Shapiro and Brorsen, 1988) was used to account for both the discrete adoption decision and the continuous level-of-utilisation decision.

Makus *et al.* (1990) studied factors influencing farmers' use of Futures and Options contracts for a large (595 useable observations) sample of participants in an educational Futures and Options pilot program covering 22 US states. A Probit model of use of Futures and Options, treated as a discrete adoption decision found a number of significant determinants of participation at the 1 percent and 5 percent levels of probability; previous use of *forward contracting* arrangements (+), membership of a marketing club (+), education to or beyond bachelors' degree level (+), farm size (gross farm sales) (+) and the siting of the farm with respect to region (+,-). Age was not found to significantly affect adoption at the 5 percent level of probability, but the estimated parameter for age was negative. This agrees with the findings of Goodwin and Schroeder (1994), and Shapiro and Brorsen (1988) that experience, a proxy for age, was negatively related to adoption of Futures and Options hedging.

Turvey (1989) studied the relationship between Futures hedging and the farm financing function. He noted that hedging with Futures provides farmers with a source of equity capital from the Futures market as well as increased leverage, since lenders often favour hedgers. Hedging can also provide producers with a timely source of liquidity. The payoffs from a short hedge are greatest when prices are low, and this is often when fixed cash obligations are most difficult to meet. Authors dealing with optimal hedging strategies often focus on business risk (specifically price risk) without taking into account the financial risk implications of derivatives trading. Turvey (1989) developed a theoretical optimal hedging model that explicitly takes into account the farms' capital structure as well as risk aversion. This model hypothesised that hedging activity increases with indebtedness since the consequences of price variability become more serious and lenders start to insist on use of hedging instruments before they extend more credit to indebted farmers. The model predicted that financial risk decreases with hedging, and that hedging provides liquidity.

Turvey and Baker (1990) investigated the relationships between farm programmes and finance, and farmers' use of derivatives. They cite government programmes, farm portfolio diversification,

transaction costs and cash flow restrictions as reasons why use of Futures and Options amongst farmers is often below that level predicted by optimal hedging literature. The authors emphasise the stabilising effect that hedging can have on cash flows and the ability of hedging to partially substitute for other forms of liquidity such as credit reserves. Lenders are also usually more willing to supply credit to hedgers. Indebted farmers are considered more likely to hedge since hedging can increase returns and reduce risk. Government price support is expected to reduce the need for farmers to hedge. An expected-utility maximising model of an Indiana maize-soyabean farm was used to predict the effects of different levels of risk aversion and debt-to-asset ratios on the optimal hedging ratio. The results showed that hedging should increase as the debt-to-asset ratio increases and credit reserves and liquidity decrease in the absence of farm programmes. Options were the predominant hedging instrument used and can be expected to provide highly indebted farmers with more liquidity than Futures by minimising losses to profit potential when prices are increasing. With government support (farm programmes), hedging activity was reduced.

Berck (1981) derived the demand for cotton Futures in California as a function of the price of a hedge and the available crop choice set. He noted that use of derivatives may not always be in the farmers' best interests. Crop diversification was shown to drastically reduce the variance in income (risk) associated with a given level of income and can be a more appropriate risk management tool in some cases.

No published South African studies specifically examining the factors influencing producers' use of the Futures and Options available through SAFEX were found. Such information would be useful in helping SAFEX to promote their products amongst farmers. The identification of the characteristics of adopters may help SAFEX focus their promotional efforts on those market segments that are most likely to use derivatives. Barriers preventing producers' use of SAFEX could also be identified, allowing appropriate policy recommendations to be made.

3.2 Use of marketing channels

A number of studies have analysed farmers' use of various marketing channels which did not focus exclusively on derivatives. Turner *et al.* (1983) examined Georgia producers' attitudes

towards electronic marketing for a range of commodities. Some 57 percent of respondents believed electronic marketing had some potential in their businesses. Producers' attitudes were found to be significantly influenced by their perceptions of the fairness of output prices (-); intentions to expand their operations (+), age (-) and degree of independent information sourcing (+) (as opposed to reliance on other farmers for information by less innovative farmers). It should be noted that this study was conducted before most farmers interviewed had yet had any experience of electronic marketing.

In their survey of 677 Iowa farmers, Edelman *et al.* (1990) surveyed the use of four alternative marketing strategies: forward contracting, Futures, Options and the cash market. In terms of utilisation of the various marketing channels, grain producers generally preferred forward contracting and livestock producers Futures hedging as forward pricing methods. A Logit regression model showed that larger farms were more likely to use forward pricing alternatives (+). For grain producers, gross sales (+) were significantly related to forward pricing methods, as were cash sales (-). Crop sales as a percentage of gross sales (+) were significantly related to forward contracting but significantly (-) related to derivatives hedging. As the percentage of land rented increased, the use of forward pricing methods increased, with less cash marketing being utilised. The use of forward pricing methods was significantly related to all three financial measures included in the model: Cash market use declined as farmers' indebtedness and financial stress increased and return on assets decreased. The use of one forward pricing method was significantly positively correlated to use of other forward pricing methods, supporting the findings of Makus *et al.* (1990) that previous users of forward contracts are more likely to hedge. Use of crop insurance was significantly related (-) only to use of Options - these may act as substitutes for each other as they both limit risk exposure through paid premiums. For fed cattle, factors found to significantly influence use of Futures included gross sales (+), beef revenues as a percentage of total gross sales (+), and use of other forward pricing methods (+). Cattle sales as a percentage of total gross sales (+) and the use of other forward pricing tools (+) significantly influenced commodity Options use. Gross sales (-) and degree of specialisation (-) were the only variables significantly influencing use of cash marketing. The survey also examined farmers' use of marketing information in the form of price information, production cost information and written marketing plan targets. Use of marketing information was found to be limited. The most frequently used component was cost of production, the other two categories were used

infrequently. Attitudinal constraints to marketing were examined, farmers' perceptions of a lack of integrity in forward pricing markets was found to limit the use of such markets. The next most limiting perception was that conditions favoured use of other risk-management tools in preference to the examined marketing alternatives. The point that there are a number of alternatives to forward pricing which may be more appropriate to certain farmers in certain circumstances is forcefully made by Berck (1981).

In South Africa, Bunting (1997) interviewed the major role players in the deregulated maize market. Buyers surveyed sourced an average of 20.7 percent of their supplies by forward contracts with groups of producers and 10 to 30 percent from cooperatives. Roughly 20 percent of buyers' supplies came from producers and 2 to 20 percent from other agents. Buyers' use of SAFEX was limited and that of AGMEX minimal.

Having reviewed previous studies related to farm-level use of marketing alternatives, it is evident that there is a lack of published South African literature on the topic. Previous international studies tended to focus on farmers' use of one price risk management tool in isolation of others, ignoring the fact that different price risk management tools may be substituted for each other. Many of the factors examined by these previous studies into farmers' use of individual marketing alternatives may influence use of price risk management tools generally. This study should also make a valuable addition to the study on electronic grain marketing by Bunting (1997) and previous South African studies related to computer adoption amongst farmers (Woodburn, 1993; Stockil, 1997).

CHAPTER 4

THE POSTAL SURVEY AND GENERAL CHARACTERISTICS OF RESPONDENTS

A questionnaire was compiled (see Appendix 1) to measure variables identified by the review of previous studies in Chapter 3 which were considered relevant to this study. Some important variables measured by the questionnaire are discussed in more detail in section 6.1. Besides questions related to the measurement of personal and business characteristics and farmers' use of various maize marketing alternatives, the questionnaire included additional questions on, for example, farmers' perceptions of the importance of various risk and information sources. These were included to allow for comparison of results to similar questions asked in previous surveys by Woodburn *et al.* (1995) and Stockil and Ortmann (1998). Additional questions deal with Internet usage, factors restricting farmers' use of Futures contracts, use of marketing agents, farmers' information needs and farmers' perceptions as to the competitiveness of the local maize market.

4.1 The postal survey

A preliminary survey was carried out to ensure that survey questions were clear to farmers and that key questions had not been omitted. Besides the questionnaire being shown to organisations such as NAMPO, SAFEX, Stockowners Cooperative and AGMEX, five mixed maize and beef farmers in the Winterton area of the KwaZulu-Natal Midlands were interviewed personally. Relevant changes were made to the questionnaire based on these consultations. The questionnaire was translated into Afrikaans for use in the survey regions, since Afrikaans is the most widely-spoken language there.

4.1.1 Sample selection

The main aim of this study was to investigate the marketing practices of commercial maize producers in the predominantly maize-producing areas of South Africa. The commercial maize farmers of these areas thus constitute the study target population. The 1988 Census of Agriculture estimated there were a total of 62 427 farming units in South Africa. Of these, 13 544 grew

predominantly field crops[1] (Central Statistical Services, 1988). Maize is consistently planted on more than 40 percent of South Africa's arable land annually (Directorate: Statistical Information, 1999). The geographical distribution of maize producers in South Africa is not even. The Northwest Province, Free State and Mpumalanga consistently produce more than 85 percent of South Africa's total maize production, as shown in Figure 1.1 (Maize Board, 1996). The total number of commercial farming units in these three provinces is estimated at 25 515 (Central Statistical Services, 1988). A postal survey of a sample of 800 National Maize Producers' Organisation (NAMPO) members, drawn from the target population, was administered due to cost considerations and the large population size (Barnett, 1991).

NAMPO maintains a mailing list of over 7 000 members nationwide. This membership list is divided into magisterial district and members are assigned to magisterial districts according to their postal addresses. Average annual maize production has exceeded 100 000 tons in each of the top 24 magisterial districts. Members in these districts accounted for an average of 61 percent of total South African commercial maize production over the previous ten years. An index score was created to quantify average tonnage of maize produced per NAMPO member in each of these magisterial districts. The ten magisterial districts scoring highest in this index score were drawn from this list and farmers were sampled randomly, according to the districts' average contribution to maize production over the previous ten years. The resulting sample is summarised in Table 4.1 and comprised some 301 farmers from the Northwest province, 273 from Mpumalanga and 226 from the Free State.

[1] An enterprise was considered dominant if it contributed more that 50 percent of total farm gross income.

Table 4.1 *Regional composition of the sample of maize farmers*

Province *Magisterial district*	Average maize production 1988-1998* 10^3 t (Percent of sample total)	Number of 1998 NAMPO members (Percent of sample total)	Number of questionnaires sent out (Percent of sample total)
Northwest Province	1040 (37.6%)	595 (38.8%)	301 (37.6%)
Schweizer Reneke	*330*	*177*	*96*
Coligny	*177*	*118*	*51*
Lichtenburg	*533*	*300*	*154*
Mpumalanga	944 (34.1%)	498 (37.6%)	273 (34.1%)
Middelburg	*400*	*214*	*116*
Bethal	*160*	*138*	*46*
Witbank	*212*	*58*	*61*
Delmas	*172*	*88*	*50*
Free State	784 (28.3%)	434 (28.6%)	226 (28.3%)
Wesselsbron	*179*	*108*	*52*
Viljoenskroon	*260*	*140*	*75*
Bothaville	*345*	*186*	*99*
Total	**2768**	**1527**	**800**

Source: Le Clus, 1998

* Tonnage of maize produced in each region as estimated by the National Crop Estimates Committee.

Of the 800 questionnaires sent out in June 1998, a total of 107 were returned by the end of August, yielding an overall response rate of 13.4 percent. Response rates were similar between regions, ranging from 12.1 percent in Mpumalanga to 15.9 percent in the Free State. Some 26 returned questionnaires were initially deemed unusable because important marketing responses were incomplete. The relevant questions of 20 of these incomplete questionnaires were mailed back to respondents who had provided their addresses in an effort to increase the number of useable responses. Ten of these were returned, leaving the total number of unusable responses at sixteen. Thus, 91 responses were useable in terms of the maize marketing statistics, giving an 11.4 percent useable response rate, although a 13.4 percent useable response rate (all 107 respondents) was recorded for certain business and farmer characteristics.

Survey data, such as these, which rely on voluntary provision of information are subject to many sources of error. Error may arise due to failure to properly recall events, deliberate distortion of the truth or refusal to participate in the study (Norušis, 1993:167). In addition, if certain respondents refuse to participate or answer certain questions, further bias will arise. Since the focus of this study is on maize marketing and the sample is drawn from the main maize-producing regions of South Africa, the sample is expected to be biased towards large, specialist maize producers.

4.2 General characteristics of sample respondents relevant to maize marketing

Farmers' responses to a number of marketing-oriented questions are summarised in this section, which quantifies the importance producers ascribe to various risk sources and measures the level of understanding they have of various price risk management tools.

4.2.1 Importance ascribed to various risk sources

Respondents were asked to rate the importance of a number of sources of risk on a Lickert-type scale ranging from 1 (not important) to 5 (very important). The mean scores attributed to various sources of risk are compared to those of previous studies of commercial farmers conducted in KwaZulu-Natal by Stockil (1997) and Woodburn (1993), and to a US study of leading Cornbelt farmers by Ortmann *et al.* (1992) in Table 4.2. Maize yield variability was rated the most important source of risk in this study. This factor was rated second in two previous studies (Woodburn, 1993; Ortmann *et al.*, 1992). Changes in input costs attained the next highest mean score, followed by changes in the Rand exchange rate. In contrast to the study by Woodburn (1993) where it was ranked third, and US studies, where it was consistently ranked first (Ortmann *et al.*, 1992, Patrick *et al.*, 1985), *variability in the maize price* was ranked as joint fourth most important source of risk facing producers in this study. This may reflect farmers' increased concerns about the effects of further devaluation of the Rand on their input costs, financial instability, and labour market inflexibility. The actual importance of maize price variability may be understated as aspects of maize price variability are also captured in other variables such as variability in the Rand exchange rate, as well as crop yield variability. The apparently low ranking of maize price variability might even be ascribed to the increased availability of, and farmers' awareness and use of price risk management tools such as forward pricing since the deregulation of maize marketing in 1997. If farmers are able to effectively manage price risk, they may be less concerned about its effects on their business performance.

Table 4.2 *Comparison of mean ratings of risk sources with results of previous studies*

Sources of risk	Mean rating of importance*			
Study	**This study -3 Major SA maize regions (1998) (n = 97)**	**Stockil - KZN commercial farmers (1997) (n = 112)**	**Woodburn - KZN commercial farmers (1993) (n = 199)**	**Ortmann *et al.* -US Cornbelt grain farmers (1992) (n = 80)**
Maize/crop yield variability	4.37 [1]	3.82 [8]	4.23 [2]	4.21 [2]
Changes in input costs	4.20 [2]	4.01 [1]	4.53 [1]	3.70 [6]
Variability in the Rand exchange rate	4.09 [3]	3.87 [5]	-	-
Variability in interest rates	3.94 [4]	3.63	3.99	3.48 [9]
Changes in labour legislation	3.94 [4]	3.96	3.59	-
Maize/crop price variability	3.94 [4]	3.85 [7]	4.20 [3]	4.31 [1]
Theft	3.90	-	-	-
Further reduction in import tariffs	3.87	3.68	-	-
Further land redistribution by the South African government	3.83	3.86 [6]	-	-
Labour problems	3.23	-	-	-

*On Lickert-type scale ranging from 1 (low) to 5 (high). Rankings appear in superscript. Mean ratings give an overall rating of the perceived importance of each risk source, due to the ordinal nature of the data.

4.2.2 Sources of marketing information

Respondents spent an average of 3.2 hours per week reviewing maize market information. Farmers were asked to rate the importance of various sources of maize market information on a Lickert-type scale ranging from 1 (low importance) to 5 (high importance). Results are summarised in Table 4.3. Weekly agricultural magazines were the most important sources of maize price information (mean score = 3.707). Publications such as "Farmer's Weekly" have sections dealing with commodity prices and related news. Specialised, subscription-based information providers (mean score = 3.677) and SAFEX (mean score = 3.613) were rated the second and third most important sources of maize price information and these three top-ranked information sources had very similar scores. SAFEX prices are routinely quoted both in weekly agricultural magazines and by subscription-based information providers in addition to being available directly from SAFEX. The importance of SAFEX as an information source is thus probably *understated* by these results. Farmers' days were rated as relatively important sources of marketing information (mean score = 2.943) and these may be useful places for educational programmes on maize marketing to be focused. The South African Grain Information Service

(SAGIS) had one of the lowest ratings of usefulness (mean score = 2.435) and many respondents noted the perceived unreliability of SAGIS information. Other farmers (mean score = 2.707), sales representatives (mean score = 2.558) and extension officers (mean score = 2.432) were also generally perceived as unreliable marketing information sources. This is in contrast to expectations that an informal network of people in rural communities effectively perform price reporting functions and shows the importance respondents attach to formal information sources.

Table 4.3 *Importance attached to various sources of maize market information by sample maize producers in Northwest Province, Mpumalanga and the Free State (1998)*

Source of maize price information	Mean rating of importance*	Rank	Percentage of respondents rating source 4 or 5 (high)
Weekly agricultural magazines	3.707 (99)	1	62.7
Specialised, subscription-based information providers	3.677 (93)	2	67.6
SAFEX	3.613 (93)	3	62.9
Agricultural newsletters	3.398 (98)	4	53.4
Farmers' days	2.943 (87)	5	45.3
Marketing agents	2.937 (95)	6	44.4
TV/ radio reports	2.920 (100)	7	32.9
Newspapers	2.710 (93)	8	29.0
Other farmers	2.707 (99)	9	31.6
Sales representatives	2.558 (95)	10	24.3
Internet	2.475 (80)	11	36.1
SAGIS	2.435 (85)	12	10.1
Extension officers	2.432 (88)	13	22.4

*On Lickert-type scale ranging from 1 (low importance) to 5 (high importance). Number of respondents is given in parentheses. Mean ratings give an overall rating of the perceived importance of each information source, due to the ordinal nature of the data.

When asked to identify their needs for additional information and services for the management of their maize marketing, the three most commonly requested services were for the provision of information on trends in international markets (81.6 percent), and more accurate weather forecasts (80.6 percent) and price forecasts (79.6 percent). This indicates that sample farmers are aware of the impact of international maize markets on local maize prices since the abolition of the Maize Board removed maize price, import and export controls. Some 67 percent of respondents requested more education on Futures and Options trading on SAFEX, and 52 percent saw a need for the services of marketing agents to arrange their maize marketing.

4.2.3 Respondents' management skills

When asked to rate the standard of their management relative to other farmers in their districts on a Lickert-type scale ranging from 1 (poor) to 5 (excellent), sample farmers' mean scores were lowest for marketing management. This is consistent with the findings of Woodburn (1993) and Stockil (1997), and indicates a concern amongst farmers that they lack marketing skills. The percentage of respondents rating their management skills in the range 1-3 for marketing management (62 percent) was well above those levels for other aspects of management, which ranged from 29 to 41 percent. Respondents generally rated their skills highest in production management (mean score=3.83), followed by financial management (mean score = 3.72). Overall management scored a mean rating of 3.69 and marketing management 3.18 over the sample.

4.2.4 Farmers' understanding and perceptions of various marketing alternatives

Although the majority of respondents considered maize marketing in South Africa to be competitive, a significant proportion of respondents (43 percent) did not. Respondents who viewed maize marketing as uncompetitive felt that large buyers were manipulating the maize price to the detriment of many small producers. The annual turnover of maize trading for 1998 for the Agricultural Marketing Division (AMD) of SAFEX was estimated at R 2.5 billion (Sturgess, 1999). Much of this trade was due to the hedging activities of large maize buyers and cooperatives. In comparison, the total gross value of maize production in 1996/97 was only R 4.7 billion. If local maize prices are being manipulated, farmers have a relatively liquid, accessible hedging alternative in SAFEX to manage price risk. Farmers may also use SAFEX maize Futures prices to predict future maize spot prices since SAFEX prices reflect all known maize market information. A recent study by Wiseman (1999) has found SAFEX (AMD) maize futures prices to reflect future spot prices with increasing accuracy, the implication is that SAFEX (AMD) is becoming increasingly efficient. Farmers should use SAFEX (AMD) Futures prices as guidelines in the negotiation of their cash maize sales. Producers should also monitor their local basis (the difference between the local spot price and the nearby Futures price) to identify opportunities for transportation or storage of maize.

Farmers' concerns about the competitiveness of the maize market in South Africa may arise from

their perceived lack of marketing management skills. Three questions in the survey dealt with farmers' attitudes towards, and understanding of, forward pricing tools. Results in Table 4.4 show a trend of decreasing understanding of forward pricing tools from the more familiar concept of forward contracting to the more complex concept of Options trading. Most sample farmers indicated at least some degree of understanding of the three types of forward pricing examined, with 99.1 percent, 94.3 percent and 86.8 percent of respondents replying 'well' or 'little' to questions designed to gauge their understanding of forward contracting, Futures and Options trading, respectively. Absolute values of these figures are high, indicating some bias in the sample towards farmers with more knowledge of these marketing alternatives. The differences between farmers' perceived levels of understanding of forward contracting, Futures hedging and Options hedging indicate that there is scope for more educational programmes targeting farmers and aimed at explaining how agricultural commodity Futures and Options contracts can be used as additional tools to manage price risk.

Table 4.4 *Sample producers' understanding and perceptions of forward pricing tools* (Northwest Province, Mpumalanga and the Free State)*

	Percent of farmers responding as follows:		
Response	**Well**	**Little**	**Not at all**
How well do you understand the concept of forward contracting ?	78.3 (83)	20.8 (22)	0.9 (1)
How well do you understand the concept of Futures marketing ?	58.5 (62)	35.8 (38)	5.7 (6)
How well do you understand the concept of Options trading ?	39.6 (42)	47.2 (50)	13.2 (14)

* Number of respondents appears in parentheses

Some 44 percent of respondents believed that derivatives trading would increase their average income, 10 percent disagreed with this statement, and 46 percent were unsure. When asked if they believed that derivatives trading would reduce product price variability, 50.9 percent of respondents replied yes, 10.4 percent replied no, and 38.9 percent were undecided. These results indicate a general positive perception of SAFEX, even though derivatives hedging is aimed at *insuring* rather than necessarily *increasing* farmers' incomes. The relatively high percentage of undecided answers to the two questions indicates that sample farmers lack understanding of how the tools available from SAFEX can effectively be used to manage price risk.

4.3 Farmers' use of different maize marketing channels

Respondents were asked what percentage of the total value of their annual maize crop was marketed through, or they anticipated marketing through, the three major markets (cash (spot), forward contracting and derivatives) in the previous (1997/98), current (1998/99) and forthcoming (1999/2000) *marketing* seasons. The relevant intermediaries and buyers involved in the maize supply chain were also identified. Table 4.5 shows the percentage of respondents using each marketing alternative (in parentheses) and the mean percentage of the maize crop that was (or is planned to be) marketed through each alternative for the previous, current and forthcoming marketing years. The final row of Table 4.5 shows the mean percentage of the maize crop marketed through the cash (spot), forward contracting and derivatives markets for the sample farms in each year. Annual figures may sum to over 100 percent due to the fact that maize hedged on SAFEX is physically sold in other markets. In the first column of Table 4.5, next to the names of the intermediaries, are the percentages of the total maize crop marketed by that intermediary each year. Projections for the future marketing plans of producers should be interpreted with care, since farmers are expected to have flexible marketing strategies and their plans may change if new, pertinent market information becomes available.

Farmers tended to use a portfolio of maize marketing channels for their crop in preference to relying on any single channel, indicating their use of sequential and flexible marketing strategies. Seventy-three percent of respondents utilised more than one marketing channel for their maize in 1998/99. The mean number of marketing channels used by farmers increased over the period under review from 3.136 in 1997/98 to 3.219 in 1998/99 and a projected 3.316 in 1999/2000, showing further diversification of marketing portfolios by sample farmers. Modal numbers of marketing channels used also increased from two to three over the same period.

Table 4.5 *Use of various marketing channels by sample maize producers for the 1997/98, 1998/99 and 1999/2000 [1] marketing seasons*

Intermediaries/buyers	Mean percentage of value of maize crop marketed by intermediary[2]			Mean percentage of crop sold and percentage of respondents selling (in parentheses) in the *Cash (spot) market*[2]			Mean percentage of crop sold and percentage of respondents selling (in parentheses) in the *Forward Contract market*[2]			Mean percentage of crop hedged and percentage of respondents hedging (in parentheses) in the *Derivatives market* (SAFEX)[2]		
	97/98	98/99	99/00	97/98	98/99	99/00	97/98	98/99	99/00	97/98	98/99	99/00
On-farm use (not traded)	4.8	5.6	6.6									
Fed on-farm				4.3 (62)	4.9 (61)	5.7 (61)	-	-	-	-	-	-
Milled on-farm for sale/rations				0.5 (16)	0.7 (16)	0.9 (16)	-	-	-	-	-	-
Private users	3.5	3.7	1.2	3.5 (15)	3.7 (11)	1.2 (8)	-	-	-	-	-	-
Elevators (including Cooperatives)	52.9	51.4	50.6	10.2 (26)	9.7 (23)	10.0 (23)	22.1 (42)	23.4 (51)	24.5 (32)	-	-	-
Agterskot/pool price	-	-	-	20.6 (44)	18.3 (34)	16.1 (52)	-	-	-	-	-	-
Commercial users / millers	16.4	14.8	14.8	5.4 (22)	5.0 (18)	4.1 (17)	11.0 (22)	9.8 (23)	10.7 (27)	-	-	-
Large traders	7.1	8.4	8.9	3.2 (8)	3.4 (10)	3.3 (9)	3.9 (12)	5.0 (15)	5.6 (16)	-	-	-
Small agents / traders	12.4	11.0	10.5	9.4 (17)	7.4 (16)	8.5 (19)	3.0 (8)	3.6 (11)	2.0 (9)	-	-	-
SAFEX												
Delivered on Futures contracts	2.6	5.3	6.8	-	-	-	2.9 (9)	5.3 (18)	6.8 (19)	-	-	-
Hedged on Futures contracts	1.1	2.9	4.1	-	-	-	-	-	-	1.1 (5)	2.9 (9)	4.1 (12)
Hedged on Options contracts	0.0	2.3	4.5	-	-	-	-	-	-	0.0 (0)	2.3 (6)	4.5 (15)
Internet marketing	0.0	0.0	0.0	0.0 (0)	0.0 (0)	0.0 (0)	-	-	-	-	-	-
Electronic marketing	0.0	0.0	0.0	0.0 (0)	0.0 (0)	0.0 (0)	-	-	-	-	-	-
Mean percentage of total value of the crop moving through each market (excluding on-farm use)	-	-	-	52.3	47.5	43.2	42.9	47.1	49.6	1.1	5.2	8.6

[1] Anticipated.
[2] Number of respondents (n); 1997/98 = 86; 1998/99 = 84; 1999/2000 = 75.

The mean percentage of the crop sold in the cash (spot) market declines steadily over the three-year period due to an increase in on-farm use of maize and forward contracting. The mean percentage of the crop hedged on SAFEX increases from 1.1 percent in 1997/98 to 5.2 percent in 1998/99 and to a projected 8.6 percent in 1999/2000. The percentage of sample farmers also increases over the three-year period. This shows rapid increase in the use of the derivatives market, considering that similar studies in the USA, where such tools have been available for over a century, have found hedging rates ranging from five percent (Berck, 1981) to seven percent in 1986 (Asplund, Foster & Stout: as cited by Goodwin & Schroeder, 1994) and 11.5 percent in 1988 (Shapiro & Brorsen, 1988). The average hedging ratio, defined as ratio of the individual's hedged position to the cash position (Kahl, 1983), amongst sample SAFEX users increased from 27 percent in 1997/98 to 49 percent in 1998/99 and an estimated 50 percent in 1999/2000. Recommended hedging ratios for US crop farmers lie in the range of 53 - 75 percent, depending on individuals' risk preferences (Lapan & Moschini, 1994). In the computation of these ratios, the assumption was made that Futures hedging was the only price risk management tool available to farmers. The fact that other price risk management tools such as forward contracting and sequential marketing may substitute for Futures hedging, may explain why the hedging ratio was below those levels suggested in optimal hedging literature. Maize yield and price variability differ between South Africa and the USA. Further research into optimal hedging ratios appropriate for South African maize farmers would indicate whether local maize farmers are using hedging to it's full potential and provide useful guidelines to local maize farmers in their hedging activities.

Figures in the main body of Table 4.5 give the average percentage of the total value of maize marketed through each channel (users as a percentage of respondents appear in parentheses). There is an increase in the proportion of maize used on-farm, either as animal feed, or for milling and further processing. Expressed as a percentage of respondents, the number of on-farm users remains roughly constant over the three years at about 61 percent for on-farm feeding and 16 percent for on-farm milling. This implies a slight increase in the degree of vertical integration on farms that are already using some of their own maize, without an increase in the number of farmers using maize on-farm.

Elevators (silo operators including cooperatives and former cooperatives) have historically been, and seem set to remain, the largest intermediaries in the maize market, marketing roughly 50 percent of the value of the maize crop in the study areas. A slight decrease in the value of maize marketed by elevators is, however, evident with a drop from 52.9 percent of the 1997/98 crop to an anticipated 50.6 percent of the crop in 1999/2000. Commercial users such as millers directly buy about 15 percent of sample farmers' maize annually in the study regions. Approximately 60 percent of this requirement is sourced in the forward contract market and the remainder in the cash (spot) market.

The share of total maize marketed by the large traders (eg. Louis Dreyfus) increases from 7.1 percent in 1997/98 to 8.4 percent in 1998/99 and a projected 8.9 percent in 1999/2000. The percentage of farmers dealing with large traders also rose from 20 percent in 1997/98 to 25 percent in 1998/99. Large international grain traders are currently expanding their local operations and setting up regional offices in South Africa (Le Clus, 1998).

Small marketing agents and traders marketed roughly 11 percent of the value of the maize crop of sample farmers. No respondents reported ever having used the Internet or electronic marketing for maize trading and it is no surprise that most of these systems are now defunct as they lacked buyer support and had some serious institutional shortcomings (Bunting, 1997).

In the 1998/99 marketing year, 83 percent of respondents utilised some form of forward pricing arrangement, be it forward contracting or derivatives hedging. Thus, only 17 percent of respondents sold their entire crops through the cash market. This may be attributed to the increased variability observed in maize spot prices since maize market deregulation, as shown in Figure 1.2.

CHAPTER 5

FACTORS INFLUENCING RESPONDENTS' USE OF PRICE RISK MANAGEMENT TOOLS

5.1 An index of price risk management

Few observations of Futures hedging were recorded (nine percent of cases), whilst only 17 percent of respondents utilised cash (spot) marketing exclusively, the remainder used a portfolio of marketing alternatives. Previous studies have focused purely on the forward-pricing aspects of price risk management and ignored farmers' use of flexible and sequential marketing strategies. Due to the low number of observations of both hedging and exclusive cash (spot) marketing activities and a wish to measure other aspects of price risk management behaviour, a continuous index of price risk management was composed. This is in contrast to previous studies where discrete adoption of derivatives use, and proportions of crop hedged were used as dependent variables (Makus *et al.*, 1990; Shapiro & Brorsen, 1988; Goodwin & Schroeder, 1994). An index was thus created to measure the degree to which respondents made use of price risk management tools and to serve as the dependent variable in a regression model. The index (I_i) was calculated according to the following formula (Lyne, 1998):

$$I_i = \left(\sum_{k=1}^{ns} z\alpha_i \times zD_0\right) \times \left(\sum_{l=1}^{nf} z\beta_i \times zD_1\right) \times zu_i$$

Where:

$z\alpha_i$ = The standardised proportions of the i th farmer's crop marketed through cash (spot) market channels, plus a constant term (5).

$z\beta_i$ = The standardised proportions of the i th farmer's crop protected by forward, Futures and Options contracting mechanisms, plus a constant term (5).

ns+nf = n = The total number of cash (spot) (ns) and Forward-pricing (nf) marketing channels used by the i th farmer.

zD = The standardised value of a dummy variable scoring 0 for cash market and 1 otherwise, plus a constant term (5).

zu_i = The standardised value of the total number of marketing channels used by the i th respondent, plus a constant term (5).

The computed values of this index were then standardised so that the final index was derived as:

$$J_i = zI_i$$

The index J_i is an index of price risk management for the i th farmer. It takes into account three aspects of price risk management behaviour exhibited by sample respondents: the use of forward pricing mechanisms (using a dummy variable), the number of different marketing channels used, and the relative proportions of the producer's crop passing through each channel. Higher index scores imply greater use of price risk management tools such as forward pricing and sequential marketing. Due to the standardisation procedure, the scale effects of the different units of measure of the index components on the resultant index are eliminated. The constant added to each standardised variable (5) simply ensures that all values used in the construction of the index are positive. The index accounts for three aspects of price risk management behaviour without applying subjective weightings to the different components.

Computed values of J_i for the 1998/99 marketing season lie in the range - 1.21 to 3.56 and had a mean value of 0.00. Thirty-two of the 80 respondents recorded index values above the mean (higher-level users of price risk management tools) and 48 below the mean (lower-level users of price risk management tools).

5.2 Higher- versus lower-level users of price risk management

Having reviewed respondents' marketing arrangements, this section considers the business and personal characteristics of the respondents measured in the survey instrument, and how they differ between higher- and lower-level users of price risk management tools, as defined by the index developed in section 5.1. A table summarising the differences between the two groups is presented in Appendix 2.

5.2.1 Personal characteristics of respondents

Table 5.1 shows that the mean age of respondents did not differ significantly between the groups at the 10 percent level, but was lower amongst higher-level users than lower-level users. This concurs with *a priori* expectations that younger farmers would be more likely to use forward

pricing tools and be quicker to adopt such methods. As expected, more experienced farmers, who were used to the previous controlled maize marketing environment, were less likely to adopt newer marketing techniques such as hedging and forward contracting. A similar negative relationship between years of experience and adoption of forward pricing mechanisms was reported by Shapiro and Brorsen (1988), Goodwin and Schroeder (1994) and Makus *et al.* (1990). Experience may thus be used as a proxy for age. Higher-level users of price risk management tools had more years of formal education (mean = 15 years) than lower-level users (mean = 13 years). These differences were also statistically significant for the respondents' spouses who are often involved in marketing management decisions. This may be partly a reflection of the small differences in mean respondent age between the two groups, but also supports *a priori* expectations and previous studies (Makus *et al.*, 1990; Goodwin & Schroeder, 1994; Shapiro and Brorsen, 1988) which found that more educated farmers have lower transaction costs of adopting relatively more complicated forward pricing strategies.

Table 5.1 *Summary of respondents' general characteristics* (n=80)

	Mean age of respondents (years)	Mean years experience (years)	Mean years formal education (years)			
			Respondent		Spouse	
Higher-level users	46	23	15	***	14	***
Lower-level users	47	25	13		11	
Overall	47	24	14		12	

*** Denotes significant difference between mean values for higher- and lower-level users of price risk management tools at the 1 percent level of probability.

5.2.2 Characteristics of the sample maize farm businesses

5.2.2.1 Farm business ownership structure

Overall, 71 respondents (66.4 percent) described their farms as individual ownerships, which was the predominant form of business structure amongst both lower- and higher-level users of price risk management tools. However, higher-level users tended to have more alternative forms of business structure to individual ownership, such as companies, close corporations and trusts (only

59 percent indicated individual ownership) compared to lower-level users, 71 percent of whom reported individual ownerships. The negative relationship between individual ownership and degree of use of forward pricing may be due to co-variance between farm size and ownership structure. Larger farms, which are postulated to be more likely to use forward pricing mechanisms as fixed transaction and information costs and scale-dependent benefits can be spread over a larger volume of output, are also less likely to be individually owned.

5.2.2.2 Farm sizes and enterprise mixes

The survey included both physical (area and animal measures) and financial (annual turnover) measures of farm size. Enterprise mixes were similarly measured with physical and financial breakdowns. The mean size of sample farms was 2 480 ha, of which 1105 ha was arable, and average annual turnover was R 2 699 301.The average size of farms differed significantly between lower and higher-level users of price risk management tools for the 1998/99 marketing season. Table 5.2 shows that higher-level users had significantly larger farm sizes (at the 10 percent level of probability) than lower-level users, both in terms of total area and total arable area. Mean annual turnover for higher-level users was much higher than that of lower-level users (mean difference was statistically significant at the 5 percent level of probability). This confirms *a priori* expectations that larger farms are more likely to use price risk management mechanisms, especially forward pricing mechanisms, than smaller farms, since they are able to spread both the fixed information and transaction costs and scale-dependent returns of using such mechanisms over a larger volume of output than are smaller farms.

Table 5.2 *Comparison between mean farm size measures of lower and higher-level users of price risk management tools, 1998/99* (n=80).

	Mean total farm area (ha)	**Mean arable area (ha)**	**Mean annual farm turnover (Rm)**
Higher-level users	3 364*	1 500*	4.093**
Lower-level users	2 195	978	1.995
Overall	2 480	1 105	2.699

* Denotes significant difference between mean values at 10 percent level of probability

** Denotes significant difference between mean values at 5 percent level of probability

Details on the most common enterprises of the sample farms by region are given in Table 5.3. All respondents grew maize, with higher-level users of forward pricing having significantly larger hectarages of white maize on average. However, these differences are not reflected in the mean proportional contributions of either white or yellow maize to gross farm income. This implies that the differences in proportional turnover contributions of maize are due to a farm size effect, rather than to differences in the intensiveness of maize production between lower and higher-level users. Proportional contributions to turnover made by off-farm income did not differ between lower and higher-level users of price-risk management mechanisms, in contrast to the results reported by Goodwin and Schroeder (1994). The low number of respondents for most other enterprises makes it difficult to compare means between user groups on a valid basis.

Table 5.3 *Enterprises making the largest contribution to gross income amongst sample maize producers, 1998*

Enterprise	Mean enterprise size[2]			Mean enterprise percentage contribution to gross income[2]	
	Higher-level users	Lower-level users		Higher-level users	Lower-level users
Maize -White (ha)	820 (29)	455 (45)	***	51 (29)	53 (41)
-Yellow (ha)	469 (30)	263 (47)		25 (22)	26 (30)
-Total (ha)	1262 (30)	699 (47)	***	67 (30)	68 (43)
Soyabeans (ha)	283 (8)	250 (11)		8 (7)	11 (10)
Sunflowers (ha)	229 (14)	203 (16)		22 (14)	19 (14)
Wheat (ha)	153 (4)	167 (7)		11 (4)	11 (4)
Dairy (cows)	44 (5)	48 (5)		14 (5)	16(5)
Sheep (ewes)	174 (7)	330 (13)		2 (7)	4 (9)
Off-farm income	-	-		12 (6)	12 (7)

[1] Only those enterprises reported by over 10 respondents (in total) are included in this table

[2] Mean values stated as percentage contribution to gross income on the farms on which that enterprise occurs. Number of respondents reporting each enterprise is given in parentheses

*** Denotes significant differences between mean values at the 1 percent level of probability

The degree of enterprise diversification affects the overall risk of farmers' enterprise and asset investments, and is thus an important factor influencing marketing decisions. An inverse index of diversification (Nieuwoudt, 1984) was estimated by the sum of each enterprise's squared proportional contributions to turnover for each farm. An index value of one implies complete specialisation in one enterprise, whilst that approaching zero implies high diversification. The scale is not linear. The mean score for this index was 0.44 across both user groups.

5.2.2.3 Financial characteristics of farms

At the time of this study, South Africa was experiencing a period of financial instability, with interest rates being held relatively high (upwards of 22 percent) in an attempt to reverse a decline in the value of the Rand. The Reserve Bank base rate was 17 percent in July 1998 and the predominant rate on fixed-rate installment sales agreements from commercial banks averaged 22.62 percent for that month (South African Reserve Bank, 1998). The Rand/US $ exchange rate rose from an average of R 4.94/$ in January 1998 to average R 6.24/$ in July 1998, constituting a devaluation of more than 25 percent. Higher nominal interest rates were likely to create financial stress for those sample farmers with relatively high short-term debt commitments. The mean value of farming assets (as at 28 February 1998) amongst higher-level users of forward pricing tools was significantly higher (R 7.62 million) than that amongst lower-level users (R 3.89 million). Similar significant differences were found in debt levels, with mean total debt among higher-level users being R 2.1 million compared to R 1.0 million among lower-level users. These differences probably reflect differences in farm size between the two groups, as shown by the analysis of farm debt:asset ratios below.

The debt:asset ratio is a useful measure of farm solvency. As this ratio increases, pressure on farm cash flows increases, as debt rises relative to assets. Most respondents (over 86 percent) had debt:asset ratios below the 0.5 threshold that is generally considered 'safe' (Barry *et al.*, 1995). However, with prime interest rates on bank overdraft at the time of this study exceeding 22 percent, and assuming a 5.1 percent real rate of return on the value of farm land which is the maize farmers' major asset (Nieuwoudt, 1980), farms with debt:asset ratios exceeding 0.23 would become susceptible to cash flow problems. Only 42.9 percent of respondents' debt:asset ratios were below this level, implying that many sample farms were likely to be under some degree of financial stress at the time of the study, unless they had access to outside capital. This would be expected to have a large impact on their marketing strategies. No statistically significant difference was found between the mean debt:asset ratio values for lower (0.32) and higher-level (0.29) users of price risk management tools. This implies that the differences existing in mean asset values and mean debt levels between user groups are a reflection of differences in farm size between the two groups and not relative degrees of financial stress.

5.2.2.4 Communication infrastructures, adoption of personal computers and Internet use

Seventy-five respondents (72.1 percent) reported owning a personal computer for use in the farm business. This figure indicates a general increase in computer adoption from previous South African studies investigating the use of computers in farming. Woodburn (1993) found a computer adoption rate of 48 percent amongst a sample of commercial farmers in Natal, while Stockil (1997) reported an increase in the adoption rate to 64 percent for a similar sample of farmers some three years later. The computer adoption rate differed between groups, generally being higher amongst higher-level users of price risk management tools (81 percent) than amongst lower-level users (69 percent). Woodburn (1993) found operator's age to be negatively related to computer adoption, and both Woodburn (1993) and Stockil (1997) found a positive relationship between farm size (gross turnover) and computer adoption. As expected and reported earlier, higher-level users had larger mean turnover levels than lower-level users, but they tended to be of similar age (46 years versus 47 years respectively). Lower-level users also have a slightly larger number of years farming experience (25 years) than higher-level users (23 years).

Of the 75 percent of respondents who owned a computer for use on the farm, 38 percent had Internet access. Amongst lower-level users of price risk management, 35 percent of computer owners had Internet access, whilst amongst higher-level users this figure was considerably higher, at 46 percent. The Internet was most commonly used for personal e-mail correspondence (82 percent), and to access maize price (79 percent) and management (68 percent) information which is available over the Internet from subscription-based services such as Agrimark Trends. Internet banking for personal (53 percent) and business (50 percent) uses was the next most used Internet application. Some 46 percent of respondents used e-mail for business correspondence.

Access to computers and sufficient communication infrastructure is a prerequisite for Internet adoption. A reliable communication infrastructure is also needed to effectively manage derivatives trading. Of the 107 respondents, 15 percent had party-line telephones, 82.5 percent had direct telephone lines, 80.0 percent had cellular phones and 63.8 percent had fax facilities. Comparisons between lower-level and higher-level users of price risk management tools in Table

5.4 show little evidence to suggest that higher-level users had access to more advanced communication infrastructure.

Table 5.4 *Comparison of communication infrastructures between lower and higher-level users of price risk management mechanisms* (n=80)

	Percentage of respondents with access to:			
	Party line	**Direct line**	**Cell phone**	**Fax**
Higher-level users	16	81	78	66
Lower-level users	14	83	81	62
Overall	15	83	80	64

5.2.2.5 Storage of maize

Use of maize storage facilities is expected to affect respondents' marketing strategies. The use of some price risk management tools such as sequential marketing often requires that maize be stored prior to sale. Eighty-eight percent of higher-level users of price risk management tools reported making use of commercial silos for maize storage, as opposed to 60 percent of lower-level users (difference significant at the 5 percent level of probability). Nineteen percent of higher-level users had on-farm storage facilities for maize; on average, these were sufficient to store 11 percent of their annual production. Only eight percent of lower-level users had such facilities, with an average capacity of seven percent of their annual crops.

CHAPTER 6
THE REGRESSION MODEL

Ordinary Least Squares (OLS) regression was used to examine relationships between relevant explanatory variables and the index of price risk management score (dependent variable). Probit and Tobit models were used by Goodwin and Schroeder (1994), Makus *et al.* (1990) and Shapiro and Brorsen (1988), who all examined US grain farmers' use of forward pricing, treating it as a technology adoption decision using proportions of crop hedged as dependent variables. Edelman *et al.* (1990) used logistic regression to model the discrete (0/1/2) adoption of cash marketing, forward contract marketing, Futures hedging and Options hedging by US grain producers. The OLS method is preferred for the analysis of local price risk management tools because the J_i index score is continuous.

6.1 Variables hypothesised to affect respondents' use of price risk management tools

Adapting economic theory on technology adoption, and the US studies previously outlined in Chapter 3, the following factors are postulated to affect sample South African maize farmers' adoption and degree of use of price risk management tools:

- *Farm size* is expected to be positively related to the use of both forward contracting and derivatives. The scale-dependent potential gains of price risk management tools increase, and fixed (information and transaction) costs associated with their use can be spread over a larger volume of output, as farm size increases. The 'lumpy' nature of some marketing contracts due to specified unit contract and order volumes, also favours larger producers. The size of the maize enterprise is particularly important, and various measures of farm size were considered, including turnover (Rands) and area (hectare) indicators.
- *Education* is expected to have a positive effect on the adoption of price risk management tools. More educated farmers would probably have lower transaction costs associated with adopting the "new technology" of more complicated marketing tools. It should take less time and effort for more educated individuals to better understand and use such tools. Education was measured by the respondents' number of years of formal education (eg. 12 years represents matric level, and 15 years a three-year degree or diploma).
- *Financially stressed* farmers would more likely use price risk management tools due to

their being relatively less able to bear risk. Hedging can be a source of liquidity and lenders are expected to favour those who 'lock-in' forward prices (Turvey, 1989). Relative indebtedness among respondents was proxied by comparing sample farmers' debt:asset ratios.

- *Farming experience* is expected to have a negative effect on the adoption of price risk management tools. More experienced farmers, who were used to the previous regulated maize marketing environment, may be slower to adopt novel marketing techniques such as hedging. Previous studies in the US (Goodwin and Schroeder, 1994; Shapiro and Brorsen, 1988) found that experience was negatively related to commercial grain farmers' use of derivatives. The experience variable is likely to be positively correlated to farmers' age and can be used as a proxy for farmer's age. Experience was measured as the number of years of employment on a farm since the age of 18.
- *Risk aversion* should positively influence the use of price risk management tools, *ceteris paribus*. In reality, all other things are not equal. Economic theory recognises two forms of risk facing farmers: financial risk is incurred due to the fixed, contractual obligations associated with debt financing, while business risk is incurred independently of the way the business is financed and includes price and yield variability (Barry *et al.*, 1995). Forward pricing tools can be used to manage price risk which is an important source of business risk. However, there are many other business and financial risks that comprise the total risk facing the farmer. There are a variety of alternative methods which may substitute for, or complement forward pricing tools in managing risk. Measurement of risk aversion *per se* is difficult because farmers' use of alternative risk management measures will affect their exposure to risk and thus their attitude towards it. Consequently, few studies have found any measure of risk aversion to be significantly related to forward pricing use (Edelman *et al.*, 1990; Shapiro and Brorsen, 1988; Makus *et al.*, 1990; Turner *et al.*, 1983). Goodwin and Schroeder (1994:943) report, contrary to their expectations, that 'respondents with a stated preference for risk were more likely to adopt forward pricing than risk averse producers'. This suggested that commercial US grain farmers viewed forward pricing as riskier than other marketing techniques. The findings of optimal hedging literature that optimal hedging ratios are less than one implies that 'forward pricing reduces income risk at low levels, but increases risk as the

proportion forward priced increases' (Musser *et al.* (1996:66). This evidence, and the popularity of sequential and flexible marketing strategies with producers (Patrick et al., 1980; King & Lybecker, 1983) -which implies that a combination of cash and forward pricing reduces income risk - led Musser *et al.* (1996) to conclude that the effect of the full range of forward pricing on risk reduction is unclear. A *self-rating of risk aversion* relative to other farmers in the region was included in an attempt to measure risk aversion in this study. The range of alternative risk management tools discussed below were analysed as separate explanatory variables:

- *Enterprise diversification* should be negatively related to the use of price risk management tools as it is a means to reduce risk, and so may be a substitute for price risk management. Diversification was measured by an index composed of the sum of the squared proportional contributions of each individual enterprise on the farm to total income. This index ranged in value from 0 (highly diversified) to 1 (completely specialised in one enterprise), so that a positive sign on this variable would indicate a risk management substitution effect.
- *The proportion of total income derived from maize* is expected to be positively related to sample farmers' use of price risk management tools. The more reliant the farm business is on maize for it's income, the more likely it will be for any risk averse producer to use maize price risk management tools.
- *Crop insurance* . The use of crop insurance implies that the respondent is averse to yield risk and thus should be more likely to use price risk management tools to insure his income. Crop insurance is complementary to the use of many price risk management tools which require the physical delivery of maize.
- *Maize storage facilities*, either on-farm or at a cooperative/elevator company, allow producers to store crops to take advantage of seasonal price movements. Producers using these alternatives would be more exposed to price risk and thus more likely to use price risk management tools. Respondents' use of maize storage facilities, either on or off-farm, was measured by a dummy variable (1=use, 0= no use).
- *The proportion of farm land rented* reflects arrangements that may incur fixed annual rental charges which must be met regardless of yields and prices (except

for share-cropping arrangements). Producers who incur these costs may be more likely to use price risk management tools to guard against price risk which may reduce their ability to meet these fixed charges.

- *Marketing management rating* is expected to negatively influence use of price risk management tools. Respondents who lack confidence in their own marketing skills may be more likely to utilise brokers and marketing agents. These agents and brokers may be more likely to use forward pricing tools to ensure prices prior to delivery. A self-rating of management skills relative to other farmers was included to measure the respondents' level of confidence in various areas of management.
- *Producers' perceptions* of the usefulness of price risk management tools will probably affect the degree to which they adopt these tools. The following measures of producer attitudes were considered in the model as dummy variables (1=agree, 0=otherwise):
  - *Expected income effects* - Producers who believe their expected income will be increased by forward-pricing (1) are more likely to hedge and forward contract.
  - *Price stability effects* - Producers who perceive that forward-pricing will stabilise prices (1) are more likely to use forward pricing tools.
  - *Free market preferences* - Producers in favour of the freer marketing of agricultural produce (1) are expected to be more likely to use more novel marketing channels.
  - *Bad experiences* - Farmers who have had, or know someone who has had, a bad experience (1) with a particular marketing alternative may be less likely to use that alternative.
  - *Off-farm income* (1) may have a positive or negative effect on the use of price risk management tools. The higher the level of off-farm income, the less dependent the farmer will be on farm income. Price risk might thus not concern him as much as it would a farmer without off-farm income. Conversely, a farmer with significant off-farm income might be more acquainted with business and financial matters and be more likely to use price risk management tools.
- *Time spent reading publications* of an agricultural or financial nature is expected to positively influence use of price risk management tools. Producers who spend relatively more reading these sources may be more likely to be "early-adopters" due to the

additional insight and knowledge gained. The average number of hours spent reading agricultural and financial publications was used as the proxy for this variable.

- *Communication infrastructure* would directly influence the ability to use certain marketing channels. Farmers with access to reliable communications/media are more able to monitor and manage price risk management tools. An inverse index of communications infrastructure was created to measure this variable, this index was created in a similar manner to the enterprise diversification index mentioned earlier.
- *Market information.* The importance which producers attach to market information, and how they source this information, are expected to influence their use of price risk management tools. Those who use subscription-based information sources are expected to be more concerned about price risk and more able to make informed decisions. Sample farmers' ratings of various information sources were considered in the model.
- *Regional effects* on the use of price risk management were considered. Two dummy variables were used to define the three regions.

6.2 Regression model results

Table 6.1 shows the model estimated after the elimination of variables with statistically insignificant t statistics. The R^2 statistic of the model was 35.7 percent, while the adjusted R^2 was 29.6 percent. This implies that 35.7 percent of the variation in the price risk management index score was accounted for by the explanatory variables included in the model. The adjusted R^2 statistic takes account of distortions in the data which can be caused by the loss of degrees of freedom accompanying the addition of more explanatory variables and is considered more reliable than R^2 (Mirer, 1983) .

6.2.1 Goodness of fit

The F statistic of the regression model was highly significant (sig. F = 0.0001) and all t-statistics were significant at least at the 10 percent level of probability. The adjusted R^2 statistic of 29.6 percent is relatively low, but as Gujarati (1988:186) notes, "it does not mean the model is necessarily bad". Measures of goodness of fit must be viewed in the context of previous US

studies. Goodwin and Schroeder (1994) achieved a 72 percent correct classification of users in their Probit model of adoption of forward pricing methods. Shapiro and Brorsen (1988) achieved an equivalent R^2 statistic of 84 percent in their Tobit model of Futures hedging adoption, whilst Makus *et al.* (1990) correctly predicted 71.8 percent of cases in their Probit model. Goodness of fit, as measured by percentage correct classification, is not directly comparable to R^2 measures and Logit models with correct classification percentages as high as 92 percent may have R^2 equivalents as low as 24.2 percent (Stockil, 1997). This model correctly classified 72 percent of 'higher-level users' of price risk management tools (farmers with marketing index scores above the sample mean) and 69 percent of 'lower-level users'. Overall, 70 percent of cases were correctly classified. Edelman *et al.* (1990) achieved model R statistics (analogous to R^2 in OLS) ranging from 18.9 percent to a maximum of 26.4 percent in four logistic regression models of discrete adoption of cash, forward contract, Futures-hedged and Options-hedged marketing alternatives for Iowa grain farmers.

One reason for the low adjusted R^2 statistic in the South African study may be that there was little variation in the data since the sample was biased towards large, specialist maize farmers who face similar price situations and marketing decisions. The index may also understate the use of risk price management tools because of the major marketing role played by cooperatives to whom farmers may sell maize knowing that prices are guaranteed by the *cooperative's use of price risk management tools*. The marketing of maize in South Africa has only recently been liberalised, whereas many of the price risk management tools measured in the index have been available to US farmers for over a century. This may have contributed to a large random component in the adoption of price risk management tools, due to the actions of local sample producers still experimenting with the new marketing alternatives available to them. The relatively small sample size (n=84) may have further enhanced this random component. Similar low measures of goodness of fit were obtained by Makus *et al.* (1990) for a Tobit model of adoption of forward pricing for corn and soyabeans in a sample of large-scale Midwestern US farmers. This was attributed to "a large random component (effect) on forward pricing, or some non-economic explanation" (Makus *et al.*, 1990:76). A referee of that study suggested that an alternative non-economic explanation may be that "some farmers use forward pricing because it makes them feel good".

Table 6.1 *Summary of OLS Regression Results.*

Variable name	Variable definition	b	SE(b)	t	Sig t
STORAGE	Respondent uses maize storage facilities (1) or not (0)	0.762	0.258	2.957	0.004
OFEMP	Respondent has off-farm employment (1) or not (0)	1.113	0.379	2.938	0.005
INSURE	Respondent covered by formal crop insurance (1) or not (0)	0.632	0.225	2.802	0.007
EDUCATION	Respondent's number of years of formal education	0.132	0.049	2.690	0.009
LNMAIZE	Natural logarithm of the proportion of annual turnover arising from maize (both yellow and white)	0.778	0.301	2.585	0.012
MKTGM	Self-rating of marketing management ability (on Lickert-type scale of 1(low)-5(high))	-0.220	0.124	-1.779	0.080
CONSTANT		-0.457	1.600	-0.285	0.776

R^2 Statistic	0.357
Adjusted R^2 Statistic	0.296
Standard Error	0.870
F Statistic	5.831
Significance of F	0.0001

Specification error may also have played a role in reducing the R^2. Although all those variables included in previously discussed models were considered in this model, some variables particularly relevant to South African maize marketing may have been excluded. The dominant role still being played by cooperatives (and former cooperatives now operating as public companies) in local maize marketing may be masking direct producer use of price risk management tools. The lack of a reliable explicit measure of risk aversion, and the risk-balancing behaviour that producers are expected to employ, may also have created specification error. These aspects could be considered in future research work related to this topic.

6.2.2 Variables included in the model

Some inferences drawn from the theory outlined in section 4.1 and the variables included in the estimated regression model presented in Table 6.1 are considered below.

STORAGE

STORAGE is a dummy variable indicating whether or not the respondent used maize storage facilities, either on-farm or at commercial silos. The positive regression coefficient implies that the use of some price risk management tools, such as forward contracting and sequential marketing, is complementary with storage activities. Farmers who are both physically and financially able to utilize maize storage facilities both on or off the farm may have a longer planning horizon for maize marketing. They may be aiming to benefit from seasonal trends in the maize price associated with the one-time supply shock and steady spread of demand over time that characterise the South African maize market. Storing maize for any length of time exposes the maize inventory to increased price risk and is thus likely to increase the need to use price risk management tools. If the storer is aiming to benefit from anticipated positive price movements, hedging on Futures markets would obviously not be appropriate since prices will be more or less 'locked-in' apart from unexpected changes in the basis. However, sequential marketing strategies and Options hedging may be used as they can capture potential benefits from positive price movements, and it is likely that these are the components of the index of price risk management affected by storage activities.

OFEMP

A priori expectations as to the effect of off-farm employment on farmers' use of maize marketing alternatives were unclear. On the one hand, employment off the farm provides an additional, often reliable source of income to respondents, reducing the seriousness of the effects of price risk on farmers, and reducing use of price risk management tools. On the other hand, farmers with off-farm employment may be more acquainted with business and financial matters and be more likely to use these tools. Access to such tools may also be easier for farmers with off-farm employment. Given that the sample is biased towards larger, specialist maize farms, the income provided by off-farm employment was probably small compared to the possible variation in income brought about by variations in the maize price. The second effect would thus outweigh the first, which is borne out by the positive sign on the regression coefficient.

INSURE

The positive coefficient of INSURE, a dummy variable indicating respondents' use (or otherwise) of crop insurance, was statistically significant at the 1 percent level of probability. The use of crop (production) insurance - mainly in the form of hail insurance - indicates risk averse behaviour with regard to income risk, which comprises both production and price risk. Respondents using crop insurance may then be considered more likely to also use price risk management tools. Crop insurance could theoretically substitute for price risk management tools, resulting in a negative relationship between crop insurance and the use of these tools. However, the use of forward pricing tools often requires that physical delivery be ensured (to some degree) and crop insurance would then complement the use of price risk management tools.

EDUCATION

Respondents' number of years of formal education (EDUCATION) was positively related to use of price risk management tools. This supports *a priori* expectations and previous studies in the US (Goodwin & Schroeder, 1994; Shapiro and Brorsen, 1988; Makus *et al.*, 1990*)*.More educated farmers probably have lower transaction costs associated with the adoption of relatively complicated forward pricing strategies.

Table 6.2 *Correlation matrix for age, experience and education*

	AGE	EXPERIENCE	EDUCATION
AGE	1	0.91	-0.28
EXPERIENCE	0.91	1	-0.42
EDUCATION	-0.28	-0.42	1

Table 6.2 shows that the EDUCATION variable is negatively correlated with respondents' age and experience. Younger farmers would be expected to have relatively more years of formal education. Age was expected to be negatively related to respondents' use of price risk management tools and so the age component of EDUCATION would enhance it's positive effect on the use of price risk management tools. Younger, less experienced, more educated respondents who tend to make more use of these tools may also tend to be less established farmers who are more susceptible to price risk and thus have more need to manage price risk. Various (exponential, cubic and quadratic) transformations of EDUCATION were tested in the study as it was thought that use of price risk management tools should increase with the respondents' number of years of formal education at an increasing rate - the best fit, however, was linear.

LNMAIZE

The natural logarithm of the percentage contribution of maize to gross income, LNMAIZE, was positively related to the use of price risk management tools. Specialised maize farmers are more prone to maize price risk than farmers with a more diversified enterprise mix and would be more likely to utilise, and devote more time to, maize price risk management tools. The LNMAIZE measure may capture aspects of farm size as well; the focus of the sample is biased towards large, specialised maize farms, thus specialist maize producers in the sample regions are more likely to have larger farm sizes. Both the scale-dependent benefits and fixed transaction costs associated with the use of certain price risk management tools may be spread over a larger amount of output as the volume of maize marketed increases. The 'lumpy' nature of contracts (minimum volume specifications) associated with Futures and Options hedging excludes farmers who market only small volumes of maize. The larger the proportional contribution of maize to gross income, the larger the volume of maize likely to be marketed by the producer and the more likely that he will

use price risk management tools. The logarithmic transformation implies that the use of maize price risk management tools increases at a decreasing rate as the maize share of gross income increases. Decreasing returns to size may be experienced by larger-volume maize producers or management marketing time may be limited for very large producers.

MKTGM

MKTGM represents respondents' self-rating of marketing management ability relative to other farmers in their district, measured on a Lickert-type scale ranging from 1 (low) to 5 (high). This variable was negatively related to J_i, and the estimated coefficient was statistically significant at the 10 percent level of probability. *A priori* expectations were that MKTGM would measure respondents' level of confidence in the use of price risk management tools and would thus be positively related to J_i. However, respondents who rated their marketing management skills highly were less likely to use price risk management tools. The explanation may be that those rating their marketing skills highly have less need for Futures as they are inherently better able to manage spot price risk via other marketing methods. In addition, such farmers may be using price risk management tools indirectly via intermediaries such as cooperatives which may guarantee spot prices to farmers by using price risk management tools such as hedging. Respondents generally rated their skills in marketing management lowest compared to other aspects of management such as production and financial management, indicating concern about their inadequate marketing skills.

6.3 Comparison of Results with Previous Studies.

Table 6.3 compares the results of this study with those of previous US studies. The sample size (n=84) was small compared to those used by Goodwin and Schroeder (1994) and Makus *et al.* (1990), but larger than that of Shapiro and Brorsen (1988). Although the focus of, and the statistical methods employed in this study differed from those of previous studies, the models share a number of similar variables.

Table 6.3 *Comparison of Results of this Study with Previous Studies*

Particulars	This study (1998, n=84)	Shapiro and Brorsen (1988, n=41)	Goodwin & Schroeder (1994, n=509)	Makus *et al.* (1990, n=595)
Focus	Factors influencing producers' use of price risk management tools	Factors influencing producers' participation in Futures markets	Factors affecting producers' adoption of forward pricing methods	Factors influencing producers' use of Futures and Options contracts
Target population	SA commercial maize producers	Indiana maize and soyabean producers	Kansas corn, wheat, soyabean cattle and pork producers	Participants of a pilot program covering 22 US states
Statistical methods employed	Ordinary Least Squares regression (OLS)	Tobit regression	Tobit regression	Probit regression
Definition of significant variables:	Off-farm employment + Use of maize storage facilities + Self-rating of marketing management ability - Crop insurance cover + Proportion of annual turnover arising from maize + Years of formal education +	Off-farm income + Self-rating of marketing management ability + Producers' debt position - Years of farming experience - Area farmed + Years of formal education + Perception as to the ability of Futures to stabilise income +	Years of farming experience - Percent of land cropped + Debt/asset ratio + Input intensity + Marketing seminar attendance +	Previous use of forward contracts + Marketing club membership + Higher education + Turnover (farm size) + Siting of farm (region) +-

Measures of enterprise size were included in all four models. This study used the proportion of turnover arising from maize, which is related to size (correlation coefficient between proportion of turnover arising from maize and gross income = 0.277). Shapiro and Brorsen (1988) used area farmed. Goodwin and Schroeder (1994) used percentage of land cropped and Makus *et al.* (1990) used gross income as size measures. In all cases, size was positively related to the dependent variable.

This study and the Shapiro and Brorsen (1988) study both found that off-farm employment/income had a positive affect on farmers' use of price risk management tools/Futures hedging. The two studies, however, differed in their estimation of the effect of self-rated marketing management ability on the respective dependent variables. Shapiro and Brorsen (1988) found a positive relationship and interpreted the rating as one of self-confidence in management ability. This study found a negative relationship, with the rating interpreted as an inverse measure of ability to handle price risk. These differences in the interpretation of this variable may be justified on the basis that South African maize producers have only carried full responsibility for the marketing of their crop since 1997, whilst US producers have long had access to price risk management tools.

In common with Shapiro and Brorsen (1988), this study found that use of price risk management tools/Futures was positively related to producers' level of education. The negative relationship between the dependent variable and years of farming experience was supported by Shapiro and Brorsen (1988) and by Makus *et al.* (1990). Both the education and experience variables are expected to be influenced by operators' age (all three variables were highly correlated).

The primary objective of using forward pricing methods is to manage price risk. Previous studies reviewed did not explicitly account for risk aversion although some aspects of risk aversion are incorporated in other variables (Shapiro and Brorsen , 1988; Goodwin and Schroeder, 1994). One measure of risk aversion incorporated in this model was the presence or absence of formal crop insurance. It was difficult to isolate absolute price risk aversion due to the risk-balancing behaviour of producers. INSURE may be considered a rather poor measure of risk aversion and future studies should carefully consider ways to objectively measure price risk aversion and

account for risk-balancing effects.

Certain factors that significantly influenced adoption of various forward pricing tools in previous studies did not significantly influence the use of price risk management tools in this model. Shapiro and Brorsen (1988) reported that positive perceptions about the effectiveness of hedging had a positive influence on the adoption of hedging. Goodwin and Schroeder (1994) identified marketing seminar attendance and input intensiveness as further factors positively related to use of forward pricing. Makus *et al.* (1990) found siting of the farm with respect to region, marketing club membership and previous use of forward contracts to further influence hedging activity in addition to farm size and operator's age. Use of maize storage facilities was the only variable in the local model that did not occur in any of the previous US models. This again emphasises the strong role still played by elevators (cooperatives and former cooperatives) in SA maize marketing.

CONCLUSIONS

Maize is a key agricultural commodity in South Africa, both as the staple diet of many South Africans, and as an animal feed. The maize price is volatile, driven mainly by the price-inelastic nature of maize demand, and large, climatically-induced shifts in maize supply. The limits on maize price fluctuations imposed by net import and export parity are wide because major maize markets are far from South Africa and transport costs are high. Price risk in unregulated maize marketing has long been of concern to maize producers, and price volatility led to government intervention in maize marketing in the 1930's. The Maize Board's single-channel marketing strategy came at a high net cost to society. The passing of the Marketing of Agricultural Products Act in October 1996 led to the dissolution of the Maize Board, with the result that maize marketing in South Africa is now almost completely free of government price support.

Maize spot (cash) prices now fluctuate, vary between localities and are difficult to monitor since individual transactions are not observed by other market participants. Maize farmers now face considerable price risk. Farmers may manage price variability using a variety of price risk management tools, ranging from sequential marketing, to forward contracting to hedging with Futures and Options. The use of these price risk management tools cannot be considered in isolation, since they may be substitutes for one another.

Most sample farmers used a portfolio of different maize price risk management tools. Further diversification of this marketing portfolio is foreseen, as farmers have tended to, and intend to use, more maize marketing channels, reflecting increased use of sequential marketing strategies to manage price risk. The percentage of the maize crop forward-contracted and used on-farm is increasing, at the expense of using the spot market in the study areas. Direct maize farmer participation in derivatives trading on SAFEX has increased markedly from 1.1 percent of the value of study farmers' maize in 1997/98 to 5.2 percent in 1998/99 and an intended 8.6 percent in 1999/2000. This is a high level of producer utilisation of derivatives when it is considered that hedging rates found in US studies, where these tools have been available for over a century increased from roughly 6 percent in 1986 to 11.5 percent in 1988. Observed hedging ratios were below the ranges suggested in the literature on optimal hedging strategies. This identifies a need

for further research to establish appropriate recommended hedging ratios suitable for South African commercial maize farmers.

Amongst maize marketing intermediaries, elevators (eg. cooperatives and former cooperatives) handle approximately half of the value of the annual maize crop in the study areas. Commercial users (eg. millers) directly bought 15 percent of study farmers' annual maize output. Small traders/agents handled roughly 10 percent, and large traders (eg. Louis Dreyfus) another 10 percent of study farmers' annual maize crops. Study trends suggest that the maize marketing role of large traders in South Africa seems set to increase. Those Internet-based maize trading systems still operating did not account for a significant proportion of the maize traded in the study areas, probably due to some of the previously discussed institutional problems associated with such systems, rather than a lack of Internet access amongst farmers.

Study trends showing continuing change in, and increases in the number of, maize marketing alternatives chosen by sample farmers over the last, current and forthcoming marketing seasons, indicate that these farmers are adapting over time to the unregulated marketing environment that they now face. As local commercial farmers gain experience in the new marketing environment, their range of maize marketing strategies will likely become more stable, and further research into the level of, and reasons for, producers' use of different marketing channels will be needed.

Although most sample respondents considered that maize marketing in South Africa was competitive, a significant proportion of respondents (43 percent) disagreed with this view. The majority of these farmers felt that maize prices were being manipulated by buyers to the detriment of farmers. Local commercial maize farmers may use SAFEX maize Futures prices to predict future maize spot prices for planning and budgeting purposes, since SAFEX prices reflect (almost) all publicly available information in the maize market. Recent research by Wiseman *et al (1998)* shows that the SAFEX (AMD) futures market is becoming increasingly efficient. Farmers should use SAFEX (AMD) Futures prices as guidelines in "discovering" maize cash prices during negotiations with grain handlers and millers. Producers should also monitor their local basis (the difference between the local spot price and the nearby Futures price) to identify profitable opportunities for the transportation and/or storage of maize. Farmers' concerns

regarding maize price manipulation may arise from their perceived lack of marketing management skills. This indicates that maize producers require further education on the use, costs and benefits of available marketing alternatives. Maize marketing seminars and programmes, and articles in weekly agricultural magazines may be the most effective means of educating maize farmers. Various institutions such as SAFEX and certain elevators are already actively involved in producer education and may be persuaded to combine their efforts to provide a forum for the discussion of the merits of various maize marketing alternatives. Contributors to such extension efforts could include marketing service providers (eg. SAFEX), elevators (eg. Cooperatives), producers' organisations (eg. NAMPO), private consultants and millers. Costs of seminars and programmes could be shared between institutions wishing to promote themselves and seminar participants, whereas magazines would likely publish quality contributions free of charge .

Factors associated with higher- and lower-level use of price risk management tools were estimated by Ordinary Least Squares (OLS) regression. Higher-level users, as defined by an index of price risk management score, tended to operate larger farms, and be younger, less experienced, but more educated operators who were less likely to individually own their operations. Due to their relative size, these larger-scale maize farmers are able to spread both the benefits and fixed costs of seeking information about, and using forward pricing tools over a larger volume of production. The rate of computer adoption over the sample was higher than in previous (KwaZulu-Natal) commercial farm studies and was greater amongst higher-level users of price risk management tools. However, lower-level users of price risk management mechanisms were also more likely to individually own their farms.

Factors found to positively influence maize producers' use of price risk management tools in the OLS regression model included use of maize storage facilities, off-farm employment, use of formal crop insurance, operators' number of years of formal education and the proportion of farm turnover arising from maize. Operators self-rated score of marketing management ability was negatively related to their use of price risk management tools.

Farmers who are able, both physically and financially, to use maize storage facilities are more likely to use sequential marketing. Maize storage activities incur price risk and are thus positively

related to use of price risk management tools such as hedging. Most respondents (70 percent) are storing at least a portion of their maize (either on-farm or with elevators), implying that storage can be a profitable activity for sample commercial maize farmers. Off-farm employment tends to give farmers greater exposure and access to price risk management tools.

Crop insurance cover implies aversion to yield risk, and producers with such formal crop insurance are thus likely to be concerned about income risk. Crop insurance is also complementary to the use of forward-pricing tools which require that physical delivery of maize be guaranteed. Producers contemplating using forward-pricing tools should consider that these tools may increase their exposure to yield risk if applied to too high a percentage of the crop, re-iterating the need to establish some guidelines on appropriate hedging ratios for South African maize farmers.

The use of price risk management tools is expected to increase with operators' education since the transaction costs associated with adoption will be lower for such producers. More specialised maize producers may allocate a greater amount of management time to, and reap greater benefits from price risk management.

Many producers perceive the maize cash (spot) market to be subject to buyer manipulation because of a lack of price transparency. Some would advocate state intervention in the provision of local price information. It would be a very difficult and expensive exercise to continually monitor maize transactions in various regions, maize trading in many areas is illiquid and spread over time. Farmers should rather compare the spot prices they are offered by buyers locally, with the nearby Futures price and determine the basis, they may use this as a proxy for the cost of transport and storage in their negotiations with buyers. Information-provision opportunities for consultants and NAMPO lie in the estimation of actual transport and storage costs to compare with the calculated basis.

SUMMARY

Maize is a very important crop in South Africa, both as a human staple diet and animal feed (especially in the poultry industry). The market for maize in South Africa is characterised by volatile prices, due mainly to the price-inelastic nature of maize demand and large shifts in the local supply curve, caused by the vagaries of the weather. The limits on maize price fluctuations imposed by net import and export parity are wide because major maize markets are far from South Africa and transport costs are high. Government intervention in maize marketing started in the 1930's with the aim of stabilising prices. The single-channel maize marketing policy used to pursue this objective incurred high social costs and the Maize Board was abolished by the Marketing of Agricultural Products Act of October 1996. Producers must once again manage maize marketing and associated price risk themselves since maize marketing in South Africa is now almost completely free of government price support. Maize cash (spot) prices are now volatile, vary between localities and are difficult to monitor since individual transactions are invisible to other market participants.

Recent, rapid advances in the field of Information Technology have had applications to maize marketing. The applications available to South African maize producers range from maize marketing information provision, analysis and communication, to electronic and Internet-based maize trading systems. Direct applications of Information Technology to maize marketing, for example in Internet trading systems, appear to be limited less by a lack of farmer access to the technology, but by institutional problems with these systems, which mostly affect buyers. The more successful applications of Information Technology to maize marketing have been made in the analysis and communication of marketing information to farmers.

In the absence of the Maize Board, a variety of price risk management mechanisms have evolved to serve maize farmers; these range from sequential marketing, to forward contracting to derivatives hedging with Futures and Options. These price risk management tools may be substituted for each other and it would be unwise to consider any of them in isolation. Various previous studies have considered adoption of a single marketing alternative, such as Futures hedging, but no studies were found which considered farmers' use of a range of substitutable

price risk management tools.

Many of the same factors examined by these previous studies into farmers' use of individual marketing alternatives were postulated to influence use of price risk management. A questionnaire was developed in order to measure these personal and business characteristics of farmers as well as their marketing behaviour. This questionnaire was used in a 1998 postal survey of a sample of 800 NAMPO members drawn from the major maize producing regions of South Africa. A useable response rate of 11.4 percent was achieved in this survey.

Respondents tended to comprise large, specialist maize producers. Mean annual maize production was 918 ha per farm and mean turnover was R 2.9 million, of which 68 percent was derived from maize. Respondents rated maize price variability as only the joint fourth most important source of risk they faced, in contrast to previous studies, where it was generally rated second after maize yield variability. This reflects farmers' increased concerns about financial instability and labour market inflexibility. Respondents rated their marketing management ability lowest relative to other aspects of management and a trend of decreasing levels of understanding was discovered as complexity of price risk management tools increased from forward contracting through Futures hedging to Options hedging. This indicates that scope does exist for educational programmes explaining how various price risk management tools can be used by farmers. Weekly agricultural magazines, farmers' days and maize marketing seminars may be effective mediums for farmer education.

The majority of respondents utilised a portfolio of marketing channels. Sample farmers were making increased use of the forward contracting market relative to the spot market. On-farm use of maize is increasing. Farmers' direct use of SAFEX for Futures and Options contract trading has also increased markedly and looks set to rise further as farmers adjust their maize marketing strategies to the present unregulated marketing environment. Futures hedging ratios were below those levels suggested in optimal hedging literature. This may be due to farmers' use of other risk management tools as substitutes for hedging. There is a need for further research to estimate recommended hedging ratios for South African maize farmers. Elevators (including cooperatives and former cooperatives) continue to handle the highest proportion of the maize crops in the

study regions, while the role of large traders looks set to increase further. There is also limited evidence that on-farm use of maize (vertical integration) will likely grow.

An index was created to quantify the degree of use of price risk management tools amongst sample farmers. Respondents were divided into lower- and higher-level users of price risk management mechanisms based on their index scores. Higher-level users of forward pricing tools tended to have larger, slightly more diversified farms, and be younger, less experienced, more educated operators and who made more use of maize storage facilities and were less likely to own their own farms. Due to their relative size, these larger-scale maize farmers are able to spread both the benefits and fixed transaction and information costs associated with price risk management tools over a larger volume of production. The rate of computer adoption over the sample was higher than in previous (KwaZulu-Natal) commercial farm studies and was greater amongst higher-level users of price risk management tools. Lower-level users of price risk management mechanisms were also more likely to individually own their farms. Farm size measures were found to be positively related to the use of price risk management tools because, as farm size increases, both the fixed costs and the scale dependent benefits of hedging may be spread over a larger volume of output.

Younger, less experienced, but more educated farmers may be more likely to be early adopters of price risk management because they are less used to the previous, regulated maize marketing environment. Such operators may also be less established farmers who are more vulnerable to price risk.

The negative relationship between individual ownership and degree of use of forward pricing may be due to co-variance between farm size and ownership structure; larger farms, which are postulated to be more likely to use forward pricing mechanisms as fixed transaction and information costs and scale-dependent benefits can be spread over a larger volume of output, are also less likely to be individually owned. In addition, the results may indicate that alternative business structures to individual ownerships may demand a higher degree of price risk management than individual ownerships as the implications of price risk are often not limited to a single individual.

Ordinary Least Squares (OLS) regression was used to examine the effects of business and personal characteristics on the maize price risk management activities of the sample of South African maize producers. Results indicate that use of maize storage facilities, off-farm employment, use of formal crop insurance, operators' number of years of formal education and the proportion of farm turnover arising from maize all positively influence producers' use of price risk management tools. Operators' self-rated score of marketing management ability was found to be negatively related to use of price risk management tools, in contrast to previous studies.

Farmers who are able, both physically and financially, to make use of maize storage facilities are more likely to use sequential marketing. Maize storage activities incur price risk and are thus positively related to use of price risk management tools such as hedging. The fact that most respondents (70 percent) are storing at least portion of their maize (either on-farm or with elevators) implies that storage can be a profitable activity for farmers who are both physically and financially able to use it. Off-farm employment tends to provide farmers with greater exposure and access to price risk management tools.

Crop insurance cover implies aversion to income risk, and producers with such formal crop insurance are thus likely to also be concerned with price risk. Crop insurance is also complementary to the use of forward-pricing tools which require that physical delivery of maize be guaranteed. Producers contemplating use of forward-pricing tools should consider that these tools may increase their exposure to yield risk if applied to too high a percentage of the crop. Use of price risk management tools is expected to increase with operators' education since the transaction costs associated with adoption will be lower for such producers. More specialised maize producers may allocate a greater amount of management time to, and reap greater benefits from using price risk management tools.

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APPENDIX 1
THE QUESTIONNAIRE

DEPARTMENT OF AGRICULTURAL ECONOMICS
UNIVERSITY OF NATAL
PIETERMARITZBURG

FARMER QUESTIONNAIRE: 1998

TO BE COMPLETED BY THE **PRINCIPAL** FARM DECISION-MAKER

Preliminary notes:

This survey aims to investigate your use of, and attitudes towards, various marketing alternatives for maize. The study will help providers of marketing services to identify how they can IMPROVE these services to farmers. Please answer every question. **Your responses will be kept strictly confidential**.

1. Name*: _____ Years

2. Postal adress*: _____

_____

* **Should you not wish to recieve a copy of the results of this study, please do not include this information.**

The following questions deal with general charicteristics of you and your farm business:

3. What is your **age**? _____ Years

4. How many **years of farming experience** (since age 18) do you have? _____ Years

5. How many **years of formal education** (eg. Matric = 12 years, 3-year degree/diploma = 15 years)
   do you have? _____ Years
   does your spouse have? _____ Years

6.1 Are you the owner or shareholder of the farmbusiness? (Please tick yes or no)

YES	NO

6.2 Are you a manager of the farm business? (Please tick yes or no)

YES	NO

7. Which of the following phrases best describes your **farm business**.
(Please tick the appropriate block)

Individual ownership	
Partnership	
Company	
Trust	
Close Corporation	
Other (please specify)	

8. This question deals with **off-farm income** earned by yourself and your spouse in 1997.
(Please tick the appropriate block)

	Yourself		**Your spouse**	
Did you or your spouse have off-farm employment in 1997?	YES	NO	YES	NO
If so, was it part-time (P) or full-time (F)?	P	F	P	F
Do you or your spouse have off-farm investments?	YES	NO	YES	NO

9. How many **hectares** of arable and veld land does the farm business:

	Arable land	**Veld**
Own		
Cash rent		
Share lease in		
Rent out		
Rent out		

10. What is the **distance** from your farm to the nearest:

Maize depot/silo _____ km

Large town _____ km

11. Please provide details on your **main enterprises** in the 1997/98 production season. For size, please use the measure given in brackets after the enterprise. For gross income, indicate Rand **and** percentage of total income arising from each enterprise.

Enterprise	**Size**	**Enterprise gross income in a normal year (R)**	**Enterprise income as a percentage of total income (%)**
White maize (Ha)			
Yellow maize (Ha)			
Soyabeans (Ha)			
Sunflowers (Ha)			
Groundnuts (Ha)			
Sorghum (Ha)			
Wheat (Ha)			
Vegetables (Ha)			
Beef - grazing (animals)			
Beef - feedlot (animals)			
Dairy (milking cows)			
Sheep (number)			
Pigs (number)			
Poultry (broilers)			
Poultry (layers)			
Off-farm income (Rand)	-		
Other (please specify)			
TOTAL			**100%**

12. Approximately what proportion of your annual maize hectarage is under **irrigation**?

_____ %

13. Did you have **crop insurance** on your **maize** in 1997/98? (Please tick yes or no)

Comprehensive	YES	NO
Hail only	YES	NO

14. Please rate your **management ability** (relative to other farmers in your district) in the following areas of management: (Please circle the relevant number, where 1= poor manager and 5 = excellent manager)

Area of management	**Management ability**				
	Poor				**Excellent**
Production management	1	2	3	4	5
Financial management	1	2	3	4	5
Marketing management	1	2	3	4	5
Overall management	1	2	3	4	5

15. Please rate your **willingness to take risks** (relative to other farmers in your district) on the following 5-point scale, where 1 = risk avoider (highly risk averse), 3 = risk neutral and 5 = risk lover (highly risk preferring): (Please circle the relevant number)

Willingness to take risks				
1	2	3	4	5

16. Do you utilise **maize storage facilities** at a Cooperative? (Please tick yes or no)

YES ☐ NO ☐

17. Do you have **maize storage facilities** on your **farm**? (Please tick yes or no)

YES ☐ NO ☐

18. If you do have maize storage facilities on your farm, approximately what **percentage** of your annual crop can you store on-farm?

_____ %

19. Do you plan to **expand** your **on-farm maize storage facilities** in the future? (Please tick yes or no)

YES ☐ NO ☐

20. Please rate the importance of the following **sources of risk** facing your farm business on a scale of 1 to 5, where 1 = not important and 5 = very important (where a risk source is not applicable, tick the N/A box):

Source of risk	**N/A**	**Importance**				
		Low				**High**
Variability in crop yields		1	2	3	4	5
Variability in crop prices		1	2	3	4	5
Changes in input costs (eg. fertiliser, chemicals, feed)		1	2	3	4	5
Changes in interest rates		1	2	3	4	5
Changes in the Rand exchange rate		1	2	3	4	5
Changes in labour legislation		1	2	3	4	5
Further reduction in import tariffs		1	2	3	4	5
Further government land redistribution		1	2	3	4	5
Theft		1	2	3	4	5
Other (please specify)		1	2	3	4	5
		1	2	3	4	5

21. What is the total value of your farm **assets** (ie. realistic market value of land, fixed improvements, machinery, livestock, etc.) as at your most recent financial year-end?

R _____

Financial year-end (date): _____

22. Please indicate the levels of your **farm debt** in the classes below as at your most recent financial year-end.

Short term debt [1] R _____

Medium-term debt [2] R _____

Long-term debt [3] R _____

[1] To be repaid within a year (eg. bank overdraft, current installments on medium and long-term debt)

[2] To be repaid within two to five years (eg. hire-purchase principal)

[3] To be repaid over more than five years (eg. mortgage bond principal)

23. What was your farm business' **gross income** (turnover) for the most recent financial year (eg. 1997/98)?

R _____

24. With regards to **telephone and fax** facilities, please indicate whether you have access to the following: (Please tick the appropriate block)

PARTY-LINE		DIRECT LINE		CELL PHONE		FAX	

25. Do you own a **computer** for use in the farm business? (Please circle yes or no)

YES	NO

26. Do you have access to the **Internet**? (Please circle yes or no)

YES	NO

27. If you do have access to the **Internet**, please indicate whether you use it for the following purposes: (Please tick the appropriate block)

Internet use	
Management information	
On-line discussion groups	
Maize price information	
E-mail (personal)	
E-mail (business correspondence)	
Internet banking (personal)	
Internet banking (business)	
Other (please specify)	

The following questions deal with the marketing of your maize.

28. Are you in favour of **more or less government intervention** in agricultural marketing? (Please tick less, more or unsure)

LESS	MORE	UNSURE

29. How well do you understand the concept of **FORWARD CONTRACTING**? (Please tick the appropriate box)

WELL	LITTLE	NOT AT ALL

30. How well do you understand the concept of **FUTURES CONTRACT TRADING** through **SAFEX**?(Please tick the appropriate box)

WELL	LITTLE	NOT AT ALL

31. How well do you understand the concept of **OPTIONS TRADING** through **SAFEX**? (Please tick the appropriate box)

WELL	LITTLE	NOT AT ALL

32. Do you believe that trading in **futures and options** contracts on SAFEX will increase your **expected income**?(Please tick the appropriate box)

YES	NO	UNSURE

33. Do you believe that trading in **futures and options** contracts on SAFEX will reduce product **price variability**?(Please tick the appropriate box)

YES	NO	UNSURE

34. To what degree do you use, and are you aware of, the following **marketing channels** for your maize? Please indicate what **percentage** of your 1997/98, 1998/99 and 1999/2000 (anticipated) crop you sold, or anticipate marketing through the following marketing channels

Marketing channels for maize	**Were you previously aware of the existence of this marketing channel? (Please tick yes or no)**		**Percentage of production marketed through this channel in the following marketing seasons:**		
			1997/ 1998	**1998/ 1999**	**1999/ 2000***
Used on-farm (eg. fed in feedlot)	YES	NO			
Milled on-farm for sale or rations	YES	NO			
Sold to private users	YES	NO			
Sales to elevators co-operatives/ex-cooperatives					
Back-to-back	YES	NO			
Forward Contracted	YES	NO			
'Agterskot' or pool price system	YES	NO			
Sales direct to commercial users					
Spot market (Silo certificate)	YES	NO			
Forward contract	YES	NO			
Sales to large traders (eg Dreyfus)					
Spot market (Silo certificate)	YES	NO			
Forward contract	YES	NO			
Sales to/via traders and small traders					
Spot market (Silo certificate)	YES	NO			
Forward contract	YES	NO			
Hedged on SAFEX					
Futures contract closed out prior to delivery	YES	NO			
Delivered on Futures contract	YES	NO			
Hedged on Options market	YES	NO			
Sold through Internet marketing system (eg. Agrilink)	YES	NO			
Sold through electronic marketing system (eg. Agmex)	YES	NO			
Other (please specify)					

*Please estimate how much you anticipate using these marketing channels in the 1999/2000 marketing season.

35. Have you had, or do you know anyone who has had a **bad experience** with the following marketing channels? (Please tick yes or no)

Cash marketing	YES	NO
Forward contracting	YES	NO
Trading on SAFEX	YES	NO
Electronic trading	YES	NO

Please feel free to describe some of these experiences if you wish_____

_____

_____

36. Please identify the importance of the following factors restricting your use of **futures contracts** for hedging on SAFEX: (Please tick the relevant category)

Factor limiting use of SAFEX	**Not applicable**	**Important**	**Very important**
Lack of knowledge			
Not enough time to investigate			
Too much speculation and manipulation			
Morally wrong to use such tools			
Waiting to see if it works for others			
Adequate alternative marketing strategies already exist			

37. Did you use a marketing agent and/or private consultant to advise on the marketing of your **maize** during the most recent marketing year? (Please tick yes or no)

YES	NO

38. Please **rate the importance** of the following **sources of market price information** to the marketing of your maize in 1997, using a scale of 1 to 5, where 1 = limited value and 5 = very useful. If no use is made of a particular source, leave the space blank.

Source of information	**Importance (1 to 5)**				
	Low				**High**
Other farmers	1	2	3	4	5
Sales representatives (reps)	1	2	3	4	5
Television and radio reports	1	2	3	4	5
SAGIS (previous Maize Board)	1	2	3	4	5
Specialised, subscription-based information providers (eg. Agrimark Trends/NAMPO TV)	1	2	3	4	5
Weekly agricultural magazines (eg. Farmer's Weekly, Landbou Weekblad)	1	2	3	4	5
Agricultural newsletters	1	2	3	4	5
The Internet (eg. Agrilink home page)	1	2	3	4	5
SAFEX	1	2	3	4	5
Newspapers	1	2	3	4	5
Consultants	1	2	3	4	5
Marketing agents	1	2	3	4	5
Farmers' days	1	2	3	4	5
Extension officers	1	2	3	4	5
Others (please specify)	1	2	3	4	5
	1	2	3	4	5

39. On average, how many **hours per week** do you spend reviewing maize marketing information.

_____ Hours

40. What **additional information and services** do you require for the management of price risk in the marketing of your maize? (Please tick relevant boxes)

Information or service required	
Education on futures and options trading (SAFEX)	
Price forecasts	
Accurate long-term weather forecasts	
Information on trends in international markets	
Marketing agents to arrange your marketing for you	
Other (Please specify)	

_____

_____

41. Do you consider maize marketing in South Africa to be **competitive?**
(Please tick yes or no)

YES	NO

42. Briefly justify your answers to the previous question.

_____

_____

THANK-YOU FOR PARTICIPATING IN THIS STUDY

Please return the completed questionnaire to me as soon as possible, but not later than 31 July 1998.

APPENDIX 2

COMPARISON OF CHARACTERISTICS OF HIGHER- AND LOWER-LEVEL USERS OF PRICE RISK MANAGEMENT

Characteristic	**Higher-level users**	**Lower-level users**	**Level of Statistical Significance**	**Overall**
Farm size and enterprise mix measures:				
Mean total farm area (ha)	3 364	2 195	*	2 480
Mean farm arable area (ha)	1 500	978	*	1 105
Mean area under - Maize (ha)	1 262	699	***	918
White maize (ha)	820	455	*	575
Yellow maize (ha)	469	263	***	343
Mean annual farm turnover (Rm)	4.1	2	**	2.7
Farm business characteristics:				
Individual ownerships (% of respondents)	71%	59%		66%
Debt:asset ratio	0.29	0.32		0.31
Make use of maize storage facilities (% of respondents)	88%	60%	**	75%
Enterprise diversification index (1-0)	0.44	0.44		0.44
Operator characteristics:				
Mean age (years)	46	47		47
Experience (years)	23	25		
Education (years)	15	13	***	14
Technology adoption:				
Computer adoption (% of respondents)	81%	69%		72%
Internet access (% of computer adopters)	38%	27%		31%

* ** *** Denote statistically significant differences between mean values at 10, 5 and 1 percent levels of probability respectively.