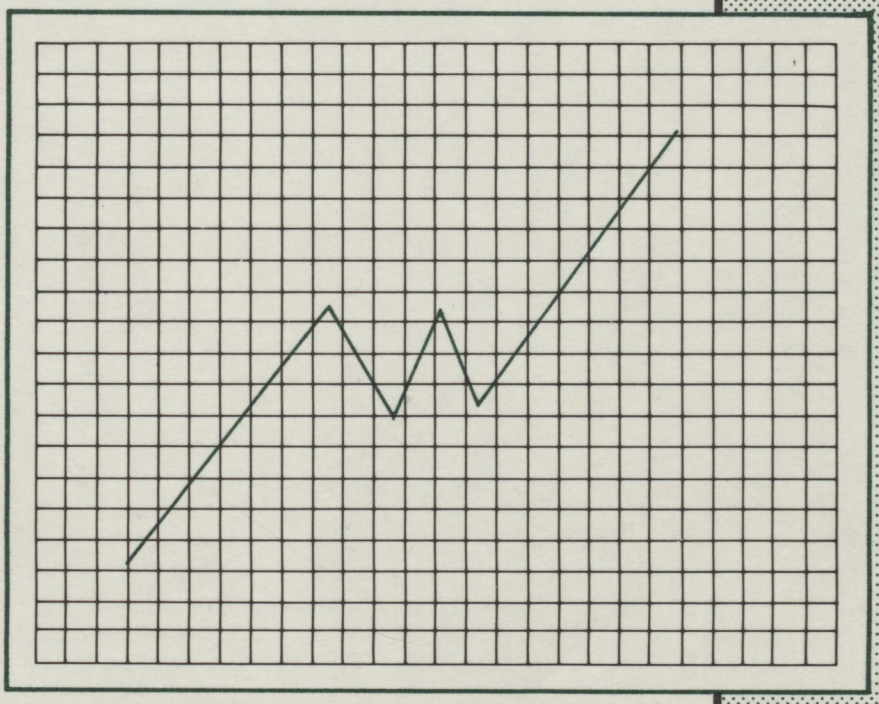


AGREKON

FOUR-MONTHLY JOURNAL
ON AGRICULTURAL ECONOMICS

Vol. 28 No. 1
FEBRUARIE 1989

Prys R5,00
(plus AVB)

A FUTURES MARKET FOR MAIZE IN SOUTH AFRICA

by A. VAN DER VYVER and J. VAN ZYL*

ABSTRACT

A futures market can potentially alleviate some of the existing marketing problems in respect of maize, particularly with regard to price risks. The futures market does not function separately from the price-fixing system. The cash price, forward contract price and future price are interdependent. In theory little fault can be found with the operation of a futures market. An option scheme may increase the potential benefits of a futures market. However, before a futures market can be implemented, certain requirements must be met, *inter alia*, a freer market, sufficient liquidity, the training of the parties concerned and an efficient information system.

INTRODUCTION

Problems in the maize market have given rise to allegations that the production of producers is not market-oriented and that they are therefore producing more than there is a profitable market for (Maize Board, 1985). However, a fixed producer price has traditionally been the most important price signal for the maize farmer. An important criterion in this price-fixing process for maize was the production costs (Maize Board, 1985). The result was that since 1970 the net producer price of maize has never been lower than in the previous year (Directorate of Agricultural Economic Trends, 1988). Furthermore, the producer price was announced only shortly before harvesting. It is therefore true to say that the problem lies not so much with market-oriented production as with the marketing system itself, or signals from the marketing system to which the producer reacts.

In order to deal with this problem, the price-fixing criteria were changed in 1986 (Maize Board, 1986). Market conditions are at present the decisive factor in the announcement of producer price scenarios at the beginning of every season. At present, therefore, the maize marketing scheme functions as a single-channel pool scheme, rather than a fixed price scheme (Willemse, 1988). This results in price risk for the producer, since prices are dependent on the full supply to the Maize Board. However, the size of the harvest cannot be predicted with any certainty at planting. Although it is true that with regard to the industry as a whole high prices accompany low supply, this is not necessarily the case with the individual farmer. Therefore a producer may have a potentially small harvest and receive a low price for it, which will necessarily have a detrimental effect on the profitability of his undertaking and its ability to survive.

In the search for an alternative marketing system for maize, the above should be thoroughly taken into consideration. However, the objectives of general agricultural policy cannot be disregarded. Although it is well-known that no country has an entirely free market system, the current trend is still towards a freer market (White Paper, 1984). The advantages of a freer market and the question whether steps taken towards the creation of a freer market are economically justified have been dealt with by various authors including Groenewald (1985; 1986), Nieuwoudt (1985; 1986) and Kassier (1988). Frank (1986), for example, maintains that "A free market for the South African maize industry is the *only* policy which reduces *overall* social costs significantly".

The operation of a futures market for maize is dealt with against this background of price risk and a freer market approach. The origins, aims and functioning of a futures market, its role in the price-fixing system and an option market are discussed. Next, the operation of a futures market and an option market for maize in South Africa is described. The article is not aimed at addressing and evaluating the Marketing Act and existing problems in the maize industry. Its aim is simply to discuss the technical operation of a futures market in the price-fixing process without evaluating a futures market on the basis of the criteria of an effective marketing system. Such an evaluation will require a separate study.

ORIGINS, AIMS AND OPERATION OF A FUTURES MARKET

In the 1800s the Chicago grain market was characterised by periods of surpluses and shortages. Climatic factors, a lack of storage facilities and poor communications were a few of the most important causes. The situation was untenable and as time went by some producers and dealers began to make use of forward contracts. This at least assured them of a buyer or a seller and resulted in the establishment of the Chicago Board of Trade in 1848. Futures contracts as we know them today came into being only in the 1860s when the problems of supply and demand were exacerbated by the American Civil War.

A futures contract is a legal agreement for the supply or receipt of a given quantity and quality of a commodity on a certain future date at a price agreed upon at an earlier stage in the trading pit or ring of

*The Department of Agricultural Economics and Marketing and the University of Pretoria, respectively
Article submitted: February 1988
Article received back from authors: July 1988

a commodities exchange (Board of Trade of the City of Chicago, 1982). It therefore differs from a contract transaction where the price is determined only when the product is offered. The difference between a futures contract and a forward contract lies essentially in their negotiability.

A forward contract is an agreement in which the buyer sells his products to a buyer in advance. The quantity is usually also stipulated. Depending on the type of contract, the price may be determined immediately, in the course of the contract, at delivery, or even afterwards. A forward contract is usually not negotiable. The most important drawback is that a breach of contract usually results in legal implications. In the case of a futures contract, a legal agreement is also entered into, but a person may, without much trouble (and legally), be relieved of his obligations by entering into a similar but opposite transaction.

The futures market makes provision for the producer to transfer the price risk attached to maize growing to a professional speculator. Nelson (1981) found that risk managers in the USA regularly made use of a futures market in order to eliminate price uncertainty. He also maintains that producers in the USA are being dishonest if they complain about price risk, but at the same time ignore forward contracts and futures markets.

Hedging can be defined as a process in which an expected transaction on the cash market is preceded by a similar transaction on the futures market. At the time at which the transaction is carried out on the cash market, the former transaction is "cancelled" on the futures market by a similar but opposite transaction. Price levels on the futures market are an indication of what dealers currently expect cash prices to be at a specific time in the future, taking into account all the available information.

Prices on both the futures market and the cash market are influenced by the same information and this is why prices tend to move more or less parallel to one another. Hedging therefore has the result that any loss on the futures market is accompanied by a simultaneous profit on the cash market, and vice versa. In reality this means that the hedger holds down his price. This prevents a producer from suffering losses if prices should suddenly drop, but he is also unable to earn additional profits if prices increase.

The difference between the cash price of a commodity at a specific *time* and *place* and the price of the same commodity on the futures market is known as the base, or base price (Chicago Board of Trade, 1985). In theory, the reasons for this price difference are the costs related to storage of the commodity for the relevant period and the transport costs between the two markets. Other factors such as the local supply and demand also influence the base.

A sales hedge on the part of a producer can be illustrated by the following simple example:

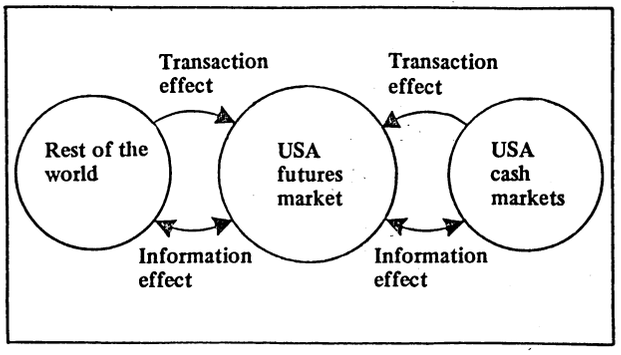
Suppose a producer calculates that it costs him R216 to produce one ton of maize under normal circumstances and that he would like to sell it at R270 per ton. The price on the futures market for supply in August is currently R270. The following will therefore occur:

Date	Cash market	Futures market
15 September 19X0 (planting time)	—	Sell x tons of maize for supply in August 19X1 at R270 per ton
15 July 19X1 (harvesting)	Sell x tons of maize at R240 per ton	Sell x tons of maize for supply in August at R240 per ton
Result (per ton)	Cash price received	R240+
	Profit futures market	R 30+
Total		**R270+**

Despite the fact that the cash price dropped during the season to a price below the producer's goal price, his goal price can still be realised. By hedging the producer fixes his price and profit margin. If the price drops, his margin will not shrink, but if the price were to increase he would not gain additional profits either. In practice the operation of a futures market is not so simple; base movements, the spread and other factors also play a role. Notwithstanding these factors, the producer can, to a large extent, eliminate price risk by entering into a futures contract.

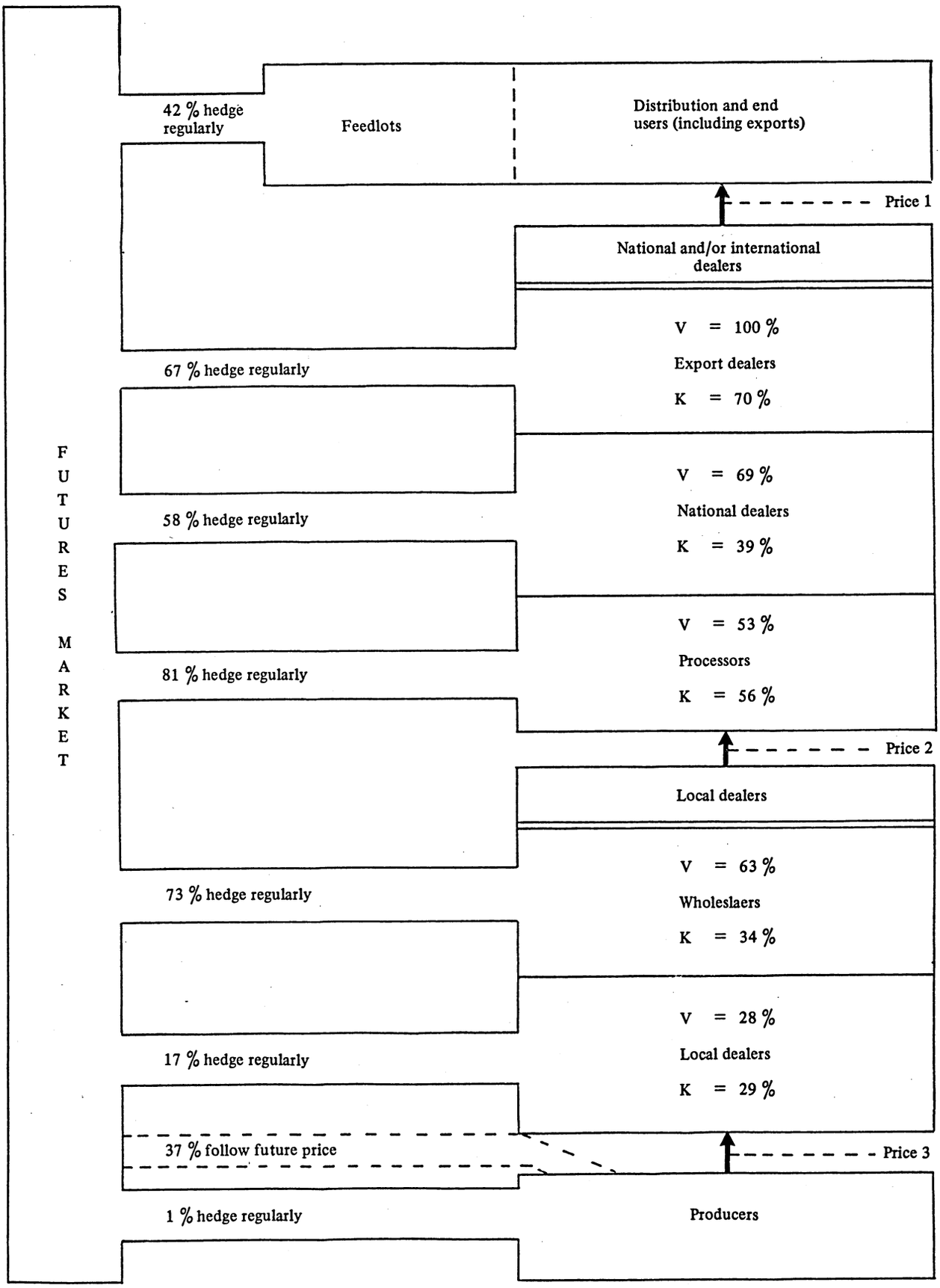
THE ROLE OF THE FUTURES MARKET IN THE PRICE-FIXING SYSTEM

The grain market is a world-wide market with a relatively homogeneous product. The price on one market cannot be fixed without taking the world-wide situation into consideration. It is practically impossible for every participant alone to remain fully informed of grain conditions throughout the world; this is why there is the tendency to use one market as the norm for the situation world-wide. In the case of grain, the Chicago Grain Exchange serves as the norm. Therefore the individual buyer or seller on a local market uses, on the one hand, the future price and, on the other, his own knowledge of local conditions and in this way fixes a price for his grain. The interaction between the futures market and the cash market is illustrated in Figure 1.



Source: Helmuth, 1977

FIG. 1. The transaction and information effect



*V, K = The percentage of dealers who use a base price when they sell and buy grain, respectively

Source: Helmuth, 1977

FIG. 2. The interplay between the futures market and the cash market

The supply and demand situation on the local market influences the future price in two ways:

- Any buyer or seller who hedges himself on the futures market, influences the future price as a result of the transaction effect; and
- any change in the base price[1] of a local market reflects a change in the supply and demand situation and is reflected in the future price by the information effect.

The importance of the future market in the price-fixing process of the USA grain industry is illustrated in Figure 2. Prices 1, 2 and 3 (Figure 2) are a function of the world-wide supply and demand situation as reflected, *inter alia*, on the futures market. Dealers use the future price after it has been adjusted by the base price as a yardstick in price negotiations. Regardless of what phase of the marketing chain a dealer operates in, it is essential that he is able to buy and sell at any time. Forward contracts are not always obtainable and he is taking a great risk if he enters into only one leg of a transaction. He therefore does not wish to buy (or sell) products without already having sold (or bought) them. However, a futures market provides the solution. The dealer can proceed without hesitation with the first leg of the transaction because he knows that he can immediately hedge himself on the futures market.

The most important benefit which producers derive (often unknowingly) from the existence of a futures market is in forward contracts. A local dealer can buy grain from producers by means of forward contracts, even if the producer, in his turn, does not already have a buyer for the grain. The reason for this is that as soon as he buys the grain he is hedging himself on the futures market. In this way he runs no price risk and he can also immediately quote the producer a market-oriented price.

The dealer, therefore, actually acts as a hedging agent because the producer is "hedged" by him. The following figures for the USA support these data (Helmuth, 1977).

Twenty-two percent of grain producers with a turnover greater than $100 000 (± R200 000) entered into forward contracts in a given year. Together with this 63 % of maize, 51 % of wheat and 60 % of soya beans purchased by dealers from producers were purchased by way of forward contracts. These percentages have increased considerably in the interim.

The futures market therefore serves as a barometer which takes into account the effect of all occurrences, great or small. The base price indicates how local conditions differ from world conditions. It is therefore true to say that in the USA the futures market takes the lead as a marketing instrument and as a price barometer during the price-fixing process. Furthermore, this creates a highly competitive industry with market-related prices wherever free competition exists. To a large extent a futures market eliminates the price risk present in the existing maize scheme.

THE OPTIONS MARKET

Option contracts in respect of a large variety of agricultural commodities were legalised in the USA in October 1984 (Paul, Heifner and Gordon, 1985). As in the case of futures contracts, option contracts are also dealt with in a trading pit by announcing the completed transaction aloud. Therefore, for every option contract entered into, there is a seller (the underwriter) and a buyer (the holder of the option). Kaufman (1984) defines an option as a contractual right to buy or to sell a specific asset or financial instrument at a fixed price within a set period of time. The holder of the option has the right to buy or sell, but is not obliged to do so. In exchange for this privilege the holder of the option pays a certain sum known as the premium or costs of the option, which is not reclaimable.

There are two types of options (Chicago Board of Trade, 1985). The first option is known as a call option and gives the holder the right to buy the underlying asset at a set price, irrespective of whether it is the physical commodity, a financial instrument or a futures contract. The second type of option is known as a put option. In this case the holder has the right to sell the underlying asset.

The premium at which options are traded is not fixed and is determined by normal market factors. Some of the best-known factors which determine the price of the premium (Kaufman, 1984; Chicago Board of Trade, 1985; Paul, *et al.*, 1985) are:

- price expectations - if prices are expected to increase, the premium of a call option will be higher than normal;
- stability - the premium of a commodity the price of which has a high coefficient of variation will be higher;
- time values - the longer the option right can be exercised, the higher is the price; and
- intrinsic value - in the case of a call option this is the amount by which the exercising price is lower than the current market price of the underlying asset. The exercising price is the fixed price at which the option can be exercised.

In cases where options are traded on a futures market, the futures contracts are the underlying assets. Options in respect of futures contracts have advantages over options in respect of physical commodities. Unless otherwise indicated, reference is always to options with futures contracts as the underlying assets.

The following example illustrates the differing results in respect of the use of a futures contract and an option contract (Kaufman, 1984 - adapted):

Let us suppose a producer wants to plant maize. His estimated running costs are R200 per ton and the current maize price is R240 per ton. For the sake of simplicity it is accepted that commission costs are negligibly small and that in the case of the futures contract the base price remains unchanged. It is also accepted that the option was entered into at an exercising price which is the same as the current market price, also known as an "at the money"

option. The exercising price is R240 per ton and the option premium R20 per ton.

Table 1 shows the effect of various price scenarios at the end of the production season on the profit/loss position of the producer in rand per ton.

TABLE 1. The influence of different price scenarios on the profit and loss position of the producer

Maize price	No hedging	Hedged on futures market	Hedged by buying put option
160	— 40	+ 40	+ 20 (— 5)
180	— 20	+ 40	+ 20 (— 5)
200	0	+ 40	+ 20 (— 5)
220	+ 20	+ 40	+ 20 (+ 15)
240	+ 40	+ 40	+ 20 (+ 35)
260	+ 60	+ 40	+ 40 (+ 55)
280	+ 80	+ 40	+ 60 (+ 75)
300	+ 100	+ 40	+ 80 (+ 95)

Source: Kaufman, 1984 - adapted

In the no-hedge approach profits and losses are not restricted. With hedging, with the help of a futures contract, profit is fixed irrespective of the price movement (in practice the base risk will have an influence). Where use is made of an option, the following is of importance:

By purchasing a put option "at-the-money" the producer has set a minimum price or floor price which includes a minimum profit of R20 per ton. However, there is no restriction on his maximum profit. But, the producer could also have purchased a put option with a "strike" price of R200, i.e. R40 lower than the market value. This is also known as an "out-of-the-money" option. This will take place if he does not expect prices to drop. The advantage of this is that the premium will be much lower, suppose R5 in total. The effect of this (figures in brackets illustrate this) is a lower floor price, but if the market price remains relatively constant or increases, he will show a higher profit.

THE OPERATION OF A FUTURES MARKET IN SOUTH AFRICA

Requirements for bringing an effective futures market into operation in South Africa

The basic requirements for a successful futures market remain the same irrespective of what contracts are entered into. The potential success of a maize contract is therefore inseparable from the general success requirements for a futures market. For this reason eight basic conditions, with specific reference to the maize industry, are discussed. It is important that the maize industry should be aware of these conditions so that its own role and contribution can be identified. This will ensure that the planning of the maize industry corresponds to the general planning for the establishment of a futures market.

The existing maize scheme

A futures market cannot function with fixed prices. The current maize scheme will therefore have to be amended to make provision for the freer movement of prices. The price scenarios that are used at present for the fixing of prices are a step in the right direction. The obligatory single-channel marketing will, however, have to be abolished. Under the existing price scenarios the producer is subject to price risk. This is because there is a poor correlation between the national harvest and that of the individual producer. In spite of a low yield, the producer can also receive a low price. In such a case this also gives rise to increased income instability. Although a futures market cannot establish adequate income stability, it does largely eliminate price risk.

Liquidity

The single most important factor which determines the success of a futures market is liquidity. There should at all times be enough market participants who are continually buying and selling. One of the strongest objections often voiced against a futures market in South Africa is that South Africa is too small. However, the success of a market is determined not so much by the physical volume of the commodity underlying the market, as by whether there is sufficient liquidity to sell the commodity again and again. The value of the volume of transactions traded on the Chicago Board of Trade is approximately four times the value of the USA maize harvest. This is not necessarily the minimum number of transactions/turnover necessary for the successful operation of the futures market, but it does give an indication of what is meant by liquidity.

It is unlikely that an independent futures market for maize and/or other agricultural commodities can function successfully in South Africa, since there is too little interest (Holcom Commodity Brokers, 1985). Most of the money and understandably most of the interest of investors and speculators both in South Africa and abroad is concentrated in and around the mining sector. Billions of rands flow annually through the sectors which are concerned with mining financing, the exportation and sale of minerals, foreign exchange transactions and the Johannesburg Stock Exchange (JSE).

Everything indicates that an independent futures market for maize and even for agricultural commodities is not the answer. The future of a futures market for maize therefore lies in a joint futures market where a maize contract is entered into among a whole series of contracts such as other commodities (metals as well as agricultural products), financial instruments such as treasury bills, treasury bonds, treasury notes and bank certificates, exchange rate contracts, index contracts, etc. Even with all potential futures contracts put together on one floor there might still be a lack of interest, particularly at first, and consequently also a lack of liquidity. For this reason it is recommended that initially there should be no futures market, but that it should be introduced in co-operation with the Johannesburg Stock Exchange, possibly as a third leg in addition to stocks and shares of the public sector. From a liquidity point of view this would

ensure the best chance of success. Another possibility is for this to take place in conjunction with the futures market for financial instruments, which is currently being investigated (Effective Farming, 1988).

Situation

In South Africa a futures market in Johannesburg will have the greatest potential chance of success particularly in view of the importance of liquidity.

The type of market

Futures contracts can be entered into in one of two ways, namely:

- on a central market floor similar to the JSE; and
- by means of computer terminals where every participant has his own terminal.

Although both possibilities have certain advantages and disadvantages, it is generally felt that a central market floor would create a lively atmosphere that would be likely to promote increased liquidity.

Training and liaison

Thorough training is a prerequisite for all potential participants before a futures market can be successfully implemented. A survey of the history and current circumstances affecting a futures market and an option market for South Africa shows that the potential of a futures market should not be underestimated. Views expressed by Dr Stals (1984, 1987), Chairman of the Stals Committee which is investigating the possibility of a financial futures and option market for South Africa, and other bodies and persons interested in the subject, confirm the above statement. However, if agriculture wants to exploit this potential, there will have to be active involvement in the development process by means of sustained co-operation with interested parties within and outside agriculture.

Clearing-house[2]

A consortium of, *inter alia*, banks would probably have to accept responsibility.

Legislation

A futures market in South Africa would require legislation to ensure that the integrity and standard of the industry is maintained.

Local and international markets

In order to have import and export transactions taking place without risk it is necessary for local and international dealers to be allowed to hedge themselves on the local and overseas futures markets. However, existing exchange regulations may present a problem.

Options

It may be deduced from the earlier discussion of options that, although the idea of an option scheme seems very favourable on paper, its success in practice will depend on the costs of the option. Although the costs of an option cannot be calculated according to an exact method because the price is determined on the free market according to supply and demand, the costs of the option are nevertheless subject to certain restrictions. It was therefore possible to develop a model on the basis of which the costs of an option can be calculated approximately (Kaufman, 1984). Comparison 1 shows the cost of an option.

$$P = -e^{-rt} [FN/(-d_1) - EN(-d_2)] \quad \ldots\ldots (1)$$

with: $d_1 = [Ln(F/E) + t\sigma^2/2]/\sigma\sqrt{t}$

$d_2 = d_1 - \sigma\sqrt{t}$

where p = put premium
r = short-term interest rate
t = life span of the option in years
F = underlying (existing) future price
E = the exercising price
N = the accumulative normal probability distribution
σ = coefficient of variation
d_1 & d_2 = independent variables

In an effort to calculate the possible costs of an option in South Africa the following figures were used:

r = 13%: The same interest rate was used throughout.

t = 0,75: a life span of nine months was used in order to enable the producer to take out an option over the full period of the production season.

F/E = 1.00, 1.09 and 1.23: a future price of R245 is used. This is about the average of the 1986/87 producer price and selling price of maize. In the case of the exercising price three hypothetical prices are used, namely R200, R225 and R245. As is clear from Comparison 1 the precise prices are not so important, but rather the ratio between the prices.

σ = 7%, 14%, 21% and 32%. Four different hypothetical figures are used here since it is difficult to predict to what extent the domestic maize price will vary under free market conditions.

In order to obtain an indication of the coefficient of variation various coefficients were calculated. The most probable variations were calculated from the c.i.f. SA harbour import price of maize in rand. These ranged from between 6,5% and 15,0%. It should also be emphasised that the absolute maximum coefficient of variation is 32% and this is obtained by accepting that the price elasticity of the overall demand for maize is unit elastic. Table 2 was compiled on the basis of these

figures. This table shows the costs of an option under various conditions.

TABLE 2. The costs of an option* (R/t)

Coefficient of variation \ Hypothetical ratios (F/E)	1,23	1,09	1,00
7%	0,002	0,76	5,33
14%	0,45	3,60	10,62
21%	2,79	7,90	15,96
32%	7,65	15,73	24,76

*Interest rate = 13%; life span = nine months

These results tie up more or less with those of Petzel (1984). According to him, the coefficient or variation for maize is 10 to 15% and an option contract for maize with a nine-month period has a premium of approximately 5% of the value of the contract ("at-the-money").

One possible way in which the Government can assist producers under free market conditions (with a futures market and an option market), without interfering directly in the market, is for example, to subsidise one third of the option costs by a previously set percentage. Such a scheme would also give the Government the opportunity to change its financial assistance in accordance with the state of the industry. The advantage of such a scheme is that the Government can assist the producer financially without the market price being directly influenced. The problem of price risk is therefore addressed and eliminated, but the industry as a whole is still largely subject to the market forces of supply and demand which determine the actual value of the product.

THE IMMEDIATE FUTURE

One of the greatest problems experienced when a freer market for maize is discussed is what the domestic maize price in South Africa will be. A study dealing with this subject ought therefore to create certain scenarios of what the maize price might possibly be.

South Africa's maize surpluses and shortages are small relative to world surpluses. This means that South Africa does not play a significant role in determining the world price; the country is therefore a price follower. Under free market conditions the domestic price would therefore move between two extreme price levels, namely the net export realisation price and the landed import price of maize. This price phenomenon, after adjustment for quality differences, is currently found in Australia (Foster & Geldard, 1985; Howard, 1984).

In years when consumption exceeds production a producer who is prepared to sell his maize at a price slightly lower than the import price will find a buyer relatively easily. Although the producer and the buyer both realise that the producer is dependent on the buyer because he cannot profitably export his maize himself, it is unlikely that the buyer will succeed in bringing down the market price to much lower than just below the import price. This is largely attributable to the fact that, if the producer were to refuse to sell at a lower price, the buyer would be forced to import. Therefore, if the import price of maize is not exceptionally high and is economically comparable with other commodities, the domestic price of maize in times of shortages will be just lower than the import price.

At present maize cannot be profitably exported (Maize Board, 1986); and this is why it is far more complicated to calculate the domestic free market price in years when production exceeds consumption than vice versa. Precisely how much maize will be consumed and at what price is difficult to determine accurately because price, income and cross-elasticity have to be adjusted as time goes on to changed circumstances. A supposition that is acceptable now, may later on be unacceptable. However, the objective is not to determine the consumption at a certain price level (this will be determined by market forces), but rather to determine the effect of an above-average harvest on the free market price. With the use of already calculated elasticities (Van Zyl, 1986), it is accepted that at a selling price of R240 per ton for white maize, the expected human consumption will be 2,656 million tons and at R225 per ton for yellow maize, the expected animal consumption will be 4,138 million tons, which brings the total to 6,794 million tons. Given the above figures, producers plan for a harvest of 6,794 tons (including reserves). Table 3 shows the gross and net incomes and profit in rand per ton which will be realised under various scenarios. In the calculations it was accepted that 70% of the planned harvest was previously hedged, either on a futures market or by means of forward contracts. The price was therefore fixed.

It will not be possible for local consumption to account for the whole of a harvest of 8,0 million tons or 18% above the planned harvest and a calculated 454 000 tons of white maize and 42 000 tons of yellow maize will have to be carried over to the following season (or exported). This will necessarily reduce the production demand for new maize for the next season. A lower future price and fewer forward contracts at lower prices will also

TABLE 3. The gross income and average income per ton for the maize industry under various free market scenarios

Supposition and item	Actual harvest as % of planned harvest				
	80%	100%	118%	130%	140%
Supposition 1*					
Gross income (R mil.)	1 332	1 568	1 709	1 803	1 880
Gross income (R/t)	245	231	213	204	198
Net profit (R mil.)	54	272	385	468	533
Net profit (R/t)	10	40	48	53	56
Supposition 2**					
Gross income (R mil.)	1 381	1 568	1 745	1 864	1 962
Gross income (R/t)	268	231	218	211	206
Net profit (R mil.)	179	272	425	530	609
Net profit (R/t)	33	40	53	60	64

*Supposition 1: Import price R250/t
Export realisation price R110/t
**Supposition 2: Import price R275/t
Export realisation price R140/t

lower the planned supply proportionally. However, it is important to note that even with a harvest greater than planned the net profit of producers increases, both in total and per ton of maize sold (Table 3).

CONCLUSION

Against the background of a price risk which the producer is experiencing under the existing marketing scheme for maize, and the stated policy of movement towards a freer market, a futures market for maize has distinct possibilities.

Therefore, as a result of the uniqueness and strategic value of agriculture, the Government has in this case a more complex and greater responsibility than in other sectors. However, this does not mean that there should be deviation from the above-mentioned points of departure, but that the market structure should meet the requirements of agriculture. And it is precisely for this reason that a futures market can be regarded as highly suitable.

A futures market for maize may largely eliminate the price risk which the producer experiences under the existing system. Although there can be no protection against base movements, they are to a large extent predictable. The fluctuations in the base are in any case considerably less (absolute terms) than the variations in the price. Options give the Government the opportunity to support producers without directly influencing the price mechanism.

Before a futures market can be successfully implemented, a series of requirements must be met. A futures market for maize will probably not be able to function separately as a result of a lack of liquidity. Other important requirements include a freer market, the training of the parties concerned and an effective information system.

NOTES

1 Base price = cash price - future price
2 Clearing-house guarantees all transactions

BIBLIOGRAPHY

BOARD OF TRADE OF THE CITY OF CHICAGO (1982). *Introduction to hedging* USA

CHICAGO BOARD OF TRADE (1980 and 1985). *Commodity Training Manual* Board of the City of Chicago, USA

DAVEL, J.A.H. (1987). Personal communication, 22 September 1987, Pretoria

DIRECTORATE OF AGRICULTURAL ECONOMIC TRENDS (1988). *Abstract of Agricultural Statistics* Department of Agricultural Economics and Marketing, Pretoria

EFFECTIVE FARMING (1988). Opinion ... from Mr Rod Holness. *Effective Farming* April 1988

FOSTER, M. & GELDARD, G. (1985). US and Australian price interrelationships for coarse grains. *Quarterly Preview of the Rural Economy* 7(3)

FRANK, D.B. (1986). *An economic analysis of various policy options for the South African maize industry* Unpublished MSc(Agric) thesis, University of Natal

GROENEWALD, J.A. (1985). The South African agriculture and inflation phenomena. *Agrekon* 24 (1): 30-37

GROENEWALD, J.A. (1986). The performance of past food, agricultural and trade policies: Implications for the future *Agrekon* 25(2) 54-59

HELMUTH, J.W. (1977). *Grain Pricing* Commodity Futures Trading Commission, Washington

HOLCOM COMMODITY BROKERS (1985). *International commodity futures markets and some ideas for a South African futures exchange.* Johannesburg Unpublished paper delivered for the Organisation for Livestock Producers

HOWARD, P. (1984). Relationships between domestic and international oilseeds prices. *Quarterly Review of the Rural Economy* 6(3)

KASSIER, W.E. (1988). Seminar delivered at the Malcomess Parliamentarian farmers day in Cape Town. *Farmer's Weekly* 27 May 1988

KAUFMAN, P.J. (1984). *Handbook of futures markets - commodity, financial, stock index and options* USA

MAIZE BOARD (1970 - 1985). Annual reports of the Maize Board, Pretoria

MAIZE BOARD (1986). Press release, 3 September 1986, Pretoria

NELSON, R.D. (1981). *Should commercial grain farmers use futures markets to hedge against price risk?* Unpublished Ph.D. dissertation, University of California

NIEUWOUDT, W.L. (1985). Analysis of agricultural commodity prices: Policy options for the future *Agrekon* 25(2): 38-42.

NIEUWOUDT, W.L. (1986). President's speech LEVSA. *Agrekon* 25(3): 2-4

PAUL, A.B.; HEIFNER, R.G. & GORDON, J. (1985) *Farmers' use of cash, forward contracts, futures contracts and commodity options* USDA, Washington

PETZEL, T.E. (1984). *Alternatives for managing agricultural price risk: Futures, options, and government programs* American Enterprise Institute, Washington

STALS, C.L. (1984). Financial futures - taking the first steps. *Financial Mail* 31 August 1984

STALS, C.L. (1987). Personal communication, 20 February 1987, Pretoria

VAN ZYL, J. (1986). A statistical analysis of the demand for maize in South Africa. *Agrekon* 25(3): 49-55.

VAN ZYL, J. (1987). South African maize policy. Unpublished research report Department of Agricultural Economics, University of Pretoria, Pretoria

WHITE PAPER ON THE AGRICULTURAL POLICY OF THE RSA (1984). Government Printer, Pretoria

WILLEMSE, B.J. (1988). Personal communication Pretoria