

Input cost monitor: The story of maize

November 2007

FOREWORD

Since 2002, when exchange rate depreciation resulted in rising prices for most agricultural commodities and inputs, as well as retail food prices, there has been increasing interest in the behaviour of agricultural prices. This, for example, led to the establishment of a Food Price Monitoring Initiative by the National Agricultural Marketing Council (NAMC), and the publication of quarterly reports on changes in food prices. It was however also realised that it is important to monitor and disseminate information on changes in agricultural input costs. In August 2006 a workshop was convened with stakeholders in the agricultural sector from which it emerged that input cost monitoring would be a welcome addition to on-going research on changes in agricultural related prices. At this workshop the NAMC was mandated to coordinate input cost monitoring on behalf of the whole agricultural industry. The NAMC has since taken up this activity in collaboration with various branches of the agricultural industry. Input cost monitoring, together with food price monitoring, now form part of two of the NAMC's key research themes namely, **agro-food chain analysis** and **market information systems**.

The purpose of input cost monitoring is to publish trends in farm input costs on a regular basis. This report provides broad trends in input costs for grains, more specifically the maize industry (note that trends in most input cost items are also applicable to other grains). Note should be taken that for the purpose of this report all the inputs that are regulated such as fuel prices and labour cost are largely excluded.

In this report the following issues are reported: (i) broad trends in input cost movements for the grain industry, (ii) the contribution of different variable input costs to total variable input cost of maize and (iii) trends in individual input cost items.

The purpose of input cost monitoring is to publish trends in farm input costs on a regular basis. This report focuses on grains and more specifically on maize.

Trends from 1990 to 2006:

PPI-Maize: ↑ 252.6%.

PPI-Field crops: ↑ 224%.

PPI-Total: ↑ 229.4%.

FRPI-Total: ↑ 255.7%.

A comparison of price indices (price movements of outputs and inputs)

Figure 1 shows trends for different input and output price indices from 1990 to 2006. From the graph it is noticeable that the Producer Price Index for Maize (PPI-Maize) showed much more variability since 2001 than the other indices.

The PPI-Maize increased with 252.6 percent from 1990 to 2006 whilst the price indices for All Field Crops (PPI Field crops) and All Agricultural Products (PPI-Total) increased with 224 and 229.4 percent, respectively. During the same period, the All Farming Requisites Index (FRPI-Total) increased with 255.7 percent.

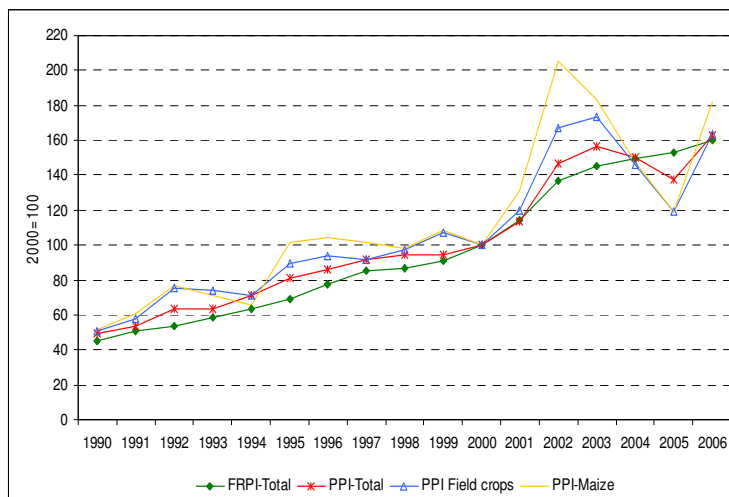


Figure 1: Comparison of various Price Indices, 1990 to 2006¹ (Source: DoA, 2007)

The PPI-Maize dropped significantly from 2002 to 2005 and recovered again during 2006, although not to the levels in 2002. FRPI-Total continued its upward trend during this period.

¹ See Appendix A for definitions of different price indices.

The trend in the PPI for output is much more variable than for input costs. The result is much more variability in farm profits.

Trends from 1990 to 2006:

PPI-Maize: ↑ 252.6%.

Fertiliser: ↑ 258.5%.

Fuel: ↑ 434.4%.

Animal health and crop protection: ↑ 169.3%.

Maintenance & repairs: ↑ 270.5%.

Farm Feed: ↑ 264%.

For the period 1999/00 to 2005/06 fertilizer and lime contributed more than 20 percent to total variable input costs (between 21 and 27 percent).

Figure 2 shows trends in the PPI-Maize and selected intermediate inputs from 1990 to 2006 (note intermediate inputs are part of the overall FRPI-Total). The intermediate inputs included are fertiliser, fuel, animal health and crop protection, maintenance and repairs and farm feed.

All the indices show an increasing trend over the depicted period. The PPI-Maize shows higher variability (particularly from 2002 onwards) compared to the other price indices depicted. The variability in the PPI-Maize was, amongst other things, due to exchange rate fluctuations and the demand and supply situation in the maize industry². Overall, the result was much more variability in farm profits.

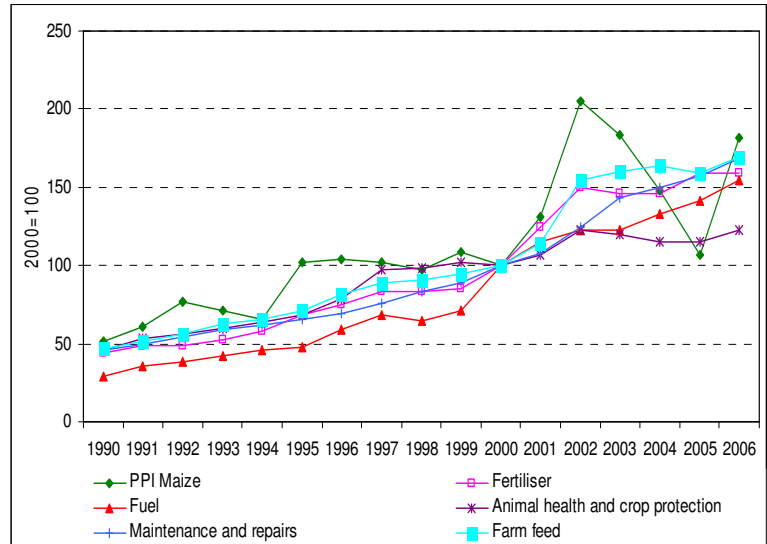


Figure 2: Trends in the PPI-Maize versus selected intermediate inputs (Source: DoA, 2007)

Contribution of different variable input cost items to total variable input cost of maize

The main focus of this section is on the variable costs for maize³ and specifically to express different variable input cost items as a percentage of total variable input costs (See Appendix B for the different input cost components included in a typical input cost budget for maize). Due to the many different input cost items included, their relative contribution to total variable cost and the format in which this information is generally available, it was necessary to aggregate certain variable inputs into an “All other” category (See Appendix C for existing “other cost” and “All other” cost items).

Figure 3 shows the average percentage contribution of selected variable input costs to total variable input cost in the maize production regions mentioned above. For the period under consideration fertilizer and lime contributed more than 20 percent to total variable input cost (between 21 and 27 percent).

Maintenance and repairs contributed just over 10 percent and showed a declining trend in terms of its contribution to total variable input cost. Seed cost

² The reader is referred to the Food Price Trend Reports at www.namc.co.za

³ For maize, variable input cost information was available for six summer production areas. These are North-West Province, North-Western and Eastern Free State, Northern KwaZulu-Natal, and Middelburg and Ermelo in Mpumalanga.

In terms of contribution to total variable cost over the last 7 years:

Maintenance and repairs downward trend.

Seed cost upward trend.

Herbicides remained more or less the same.

Fuel and labour contributed on average 24 percent to the total variable input cost.

In Middelburg (Mpumalanga) the largest expenditure is on fertilizers.

In Northern KwaZulu-Natal seed expenses are the highest.

Maintenance and repairs cost was the highest in the North West Province and the Eastern Free State.

showed an increase in its contribution to total variable input cost, while the cost for herbicides remained more or less five percent of total variable input cost.

Fuel and labour contributed on average 24 percent to the total variable input cost, but since these input cost items are regulated they are excluded from the rest of this report.

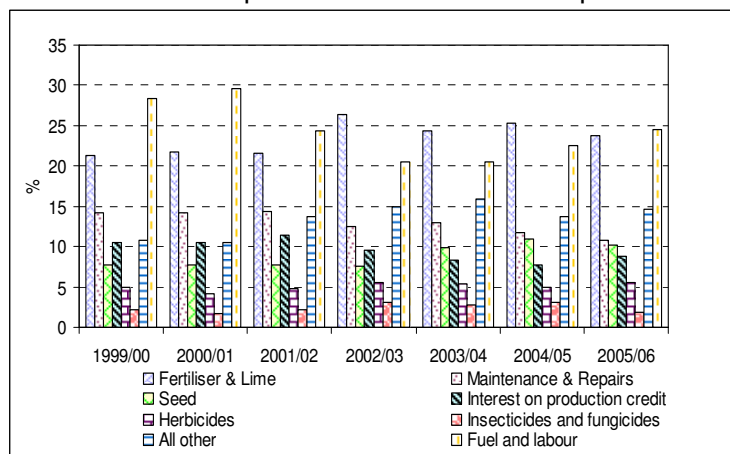


Figure 3: Average % contribution of individual variable cost items to total variable input cost⁴

When comparing the variable input cost items per production area for the 2005/2006 production season it can be seen from Figure 4 that producers in the Middelburg (Mpumalanga) region have the largest expenditure on fertilizers, i.e. fertilizers contributed 27.6 per cent to total variable input cost. In the North-West Province expenditure on fertilizers was the lowest; it contributed 19.3 percent to total variable input cost. In Northern KwaZulu-Natal seed expenses as percentage of total variable input cost was the highest, while in the North-Western Free State it was the lowest. Maintenance and repairs cost as percentage of total variable input cost was the highest in the North-West Province and the Eastern Free State, while it had almost the same contribution to total variable input cost in the other production areas.

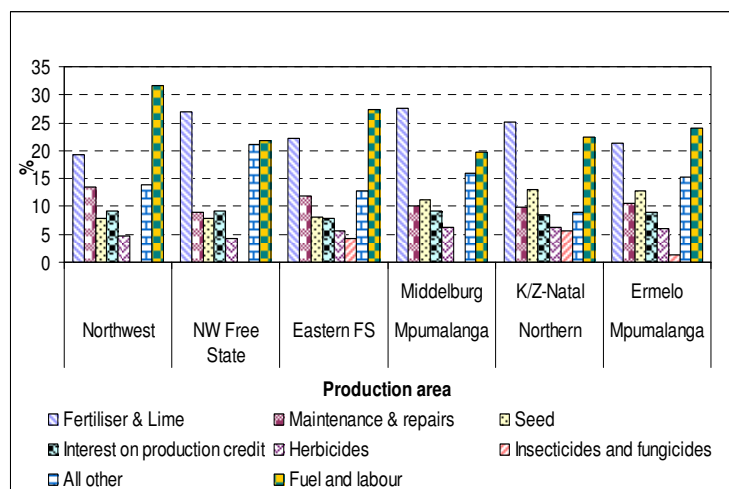


Figure 4: Comparison of the contribution of different variable input cost items to total variable input cost in different maize production regions (2005/06)

⁴ From 2003/04 six areas; In 2002/03 for five areas; In 2001/02 for four areas; In 1999/00 for three areas. The information for 2006/07 was not available during the preparation of this report.

Changes in fertilizer costs

During a panel discussion consisting of GSA officials, as well as producer representatives, a number of fertilizers were identified for inclusion in this report. The decision to include the identified fertilizers was based on the fact that it was relatively easy to source their price information, as well as their wide use. To ensure easy interpretation of the data presented, price movements of the identified fertilizers are presented in Figures 5a and 5b. The PPI for Summer Grains (PPI-Summergrain) and PPI-Maize are also included.

Figure 5a shows that the trends for the items represented are generally upwards. Price increases for the items depicted between 1997 and 2006 were as follows:

- MAP: 87.8% increase
- LAN (28): 122.4% increase
- Urea Prill: 108.5 % increase
- Potassium chloride granular: 120.4 % increase
- PPI-Summergrain: 82.6% increase
- PPI-Maize: 78.7% increase

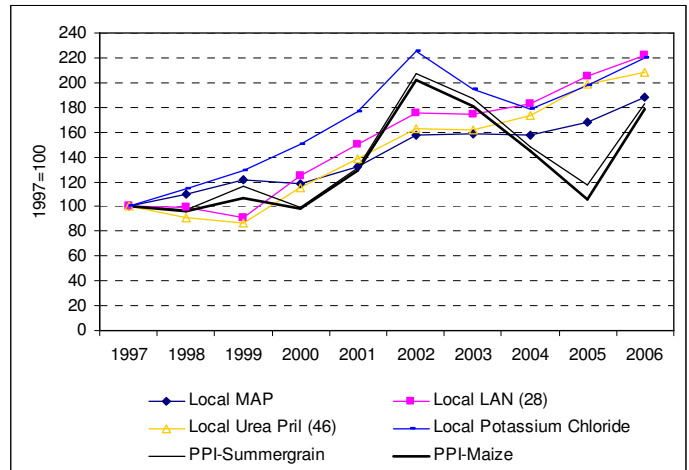


Figure 5a: Price indices for different fertilizer products compared to the PPI-Summergrain & PPI-Maize

(Source: DoA 2007 and own calculations from list prices)

The price indices for MAP, LAN(28), Urea Prill, Potassium chloride increased more than the price indices for summer grains and maize from 1997 to 2006.

The price indices for 3.1.0(28), 3.2.0(30), 3.1.0(28) and local supers(10.5) increased more than the PPI for outputs.

Figure 5b shows that the trends for the items represented are also generally upwards. Price increases for the items depicted between 1997 and 2006 were as follows:

- 3.2.1(25): 102.5% increase
- 2.1.0(30): 99.6 % increase
- 3.1.0(28): 99.4% increase
- Local Supers (10.5): 91.7% increase

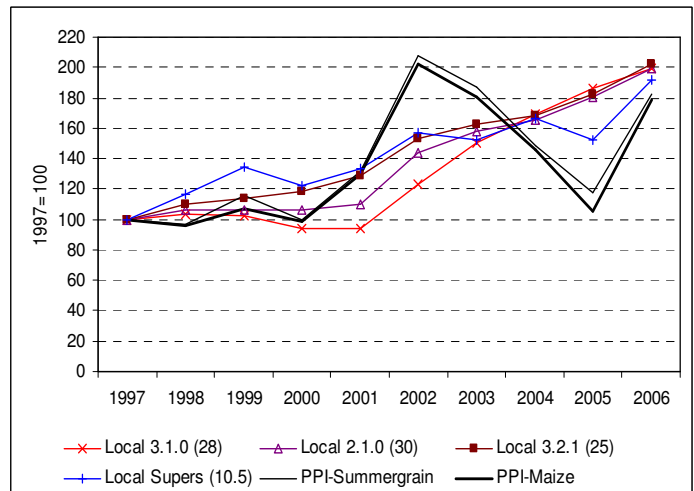


Figure 5b: Price indices for different fertilizer products compared to the PPI-Summergrain & PPI-Maize

(Source: DoA 2007 and own calculations from list prices)

South Africa's demand for fertilizer is in the region of 2 million tons. To supply in this demand almost half of the fertilizers are imported.

Most fertiliser prices remained firm after 2002 possibly due to the fact that local manufacturers buy against fixed prices and exchange rate options months ahead and thus carrying stocks for future delivery leading to slower price adjustments.

MAP prices remained firm after depreciation of the Rand.

The local demand for fertilizer is in the region of 2 million tons. To meet this demand almost half of the fertilizers have to be imported. Annual imports of Urea amounts to 450 000 tons, LAN between 20 000 and 60 000 tons, Ammonia Sulphate between 100 000 and 150 000 tons, Potassium around 250 000 tons and MAP and DAP between 30 000 and 50 000 tons. When considering the basic composition of fertilizer in terms of N:P:K (Nitrogen: Phosphorous: Potassium), it is important to note that South Africa produces no urea and as a result in the order of 50 percent of nitrogen is imported in the form of Urea, LAN and Ammonia Sulphate. For the P's, the amount of imports varies significantly between years and is in the order of 50 000 tons per year. Virtually all of Potassium is imported.⁵

Figures 6 to 8 compare domestic and international price trends for fertilizers. All the local prices are list prices, excluding VAT and transport to the farm. Note should be taken that the international prices were expressed in R/ton and \$/ton before converting them into an index. Also note that the international prices depicted are not at South African harbours, and hence exclude cost, insurance and freight to land the product in South Africa. Furthermore, international fob prices used differ from the usual port of origin for imports, but trends and general price levels are similar. The analysis shows that most local fertiliser prices remained firm after 2002, possibly due to the fact that local manufacturers buy against fixed prices and exchange rate options months ahead and thus carry stocks for future delivery leading to slower price adjustments. Firm prices in 2006 are set to continue mainly due to high demand from China and USA for production of grains for the bio-fuel industry.

In Figure 6 the price movement of the local MAP price is compared with the price movement of the international DAP price⁶.

Price increases for the items depicted between 1997 and 2006 were as follows:

- Local MAP 87.8% increase
- Int. DAP 89.3% increase

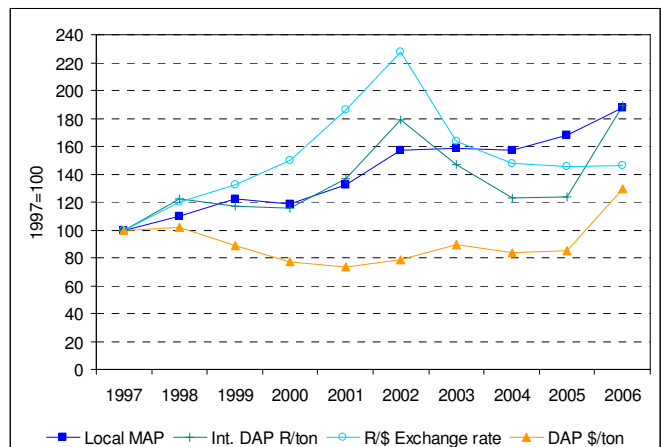


Figure 6: Local MAP compared with international DAP

Figure 6 shows that, on average, price movements were similar up to 2002 after which the international price expressed in R/ton dropped until 2005 (31%), mainly as a result of the appreciation of the Rand (Note that DAP \$/ton price increased by 8.1 percent from 2002 to 2005). The local MAP price continued its upward trend. From 2005 to 2006, the international DAP price (\$/ton) increased by 52.3 percent; if expressed in R/ton the increase was 53.3 percent.

⁵ Based on information obtain from interviews with industry role-players.

⁶ International DAP price is fob, US Gulf in bulk. This comparison is made because both are a source of phosphate although different compositions.

Local Urea price trends did not follow international Urea price trends after 2002.

Urea prices are also directly affected by the price of natural gas which is in turn influenced by the price of oil.

International MOP prices increased significantly from 2005 to 2006, after showing a notable drop from 2002 to 2005.

Figure 7 shows the price movements of local Urea in comparison with the price movements of international Urea⁷. Price increases for the items depicted between 1997 and 2006 were as follows:

- Local Urea: 108.5% increase
- International Urea: 187.1% increase

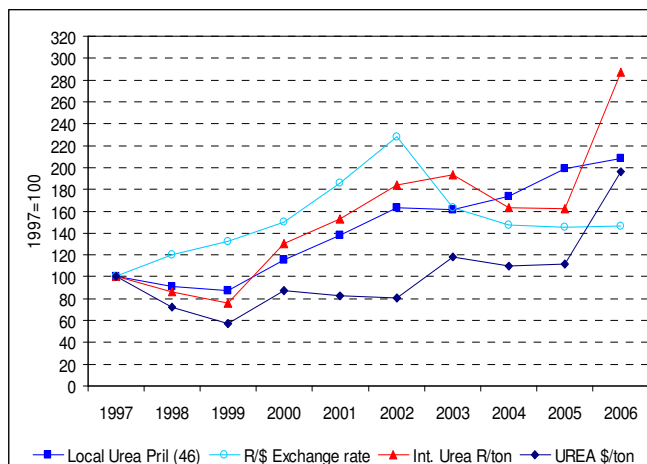


Figure 7: Local Urea compared with international Urea

Figure 7 shows that, on average, price movements were similar up to 2003 after which the international price expressed in R/ton dropped until 2005 (16.1%). The local Urea price continued its upward trend. From 2005 to 2006, the international Urea price (\$/ton) increased by 75.4 percent; if expressed in R/ton it increased by 76.5 percent.

Urea prices are also directly affected by the price of natural gas which is in turn influenced by the price of oil. Moreover these two variables affect both the price of the fertilizers as well as the cost of shipping⁸.

Figure 8 shows the price movements of local Potassium Chloride in comparison with price movements of international Muriate of Potash (MOP)⁹.

Price increases for the items depicted between 1997 and 2006 were as follows:

- Potassium chloride: 120.4% increase
- International MOP: 209.9% increase

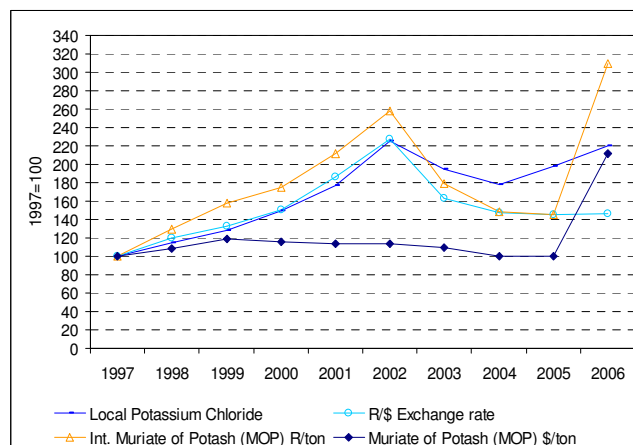


Figure 8: Local Potassium chloride compared with international Muriate of Potash (MOP)

⁷ International Urea price is fob, E.Europe in bulk. Although most Urea is imported from the Arab Gulf, prices show the same movement on slightly different levels.

⁸ Source: FSSA, 2007.

⁹ International Muriate of Potash (MOP) price is fob, CIS in bulk. Although most Muriate of Potash (MOP) is imported from Vancouver and Israel, prices show the same movement on slightly different levels.

From 2005 to 2006, the international MOP price (\$/ton) increased by 111.8 percent; if expressed in R/ton it increased by 113.2 percent.

Other factors that have an influence on the local market prices for fertilizers are the variability of local demand and stocks, oil prices and shipping fees.

According to the JE Hyde Freight Index freight cost increased with 154% from January 1999 to June 2006.

Figure 8 shows that, on average, price movements for the variables depicted were similar up to 2002. From 2002 to 2005 the international price expressed in R/ton dropped by 43.7 percent whilst the local price decreased by 12.2 percent. From 2005 to 2006, the international MOP price (\$/ton) increased by 111.8 percent; if expressed in R/ton it increased by 113.2 percent. All the potassium used in South Africa is imported.

It is interesting to note that, on average, local prices of the depicted fertilizers showed downward stickiness between 2002 and 2005, i.e. in many instances fertiliser prices did not follow the same downward trend seen for international prices expressed in R/ton. As mentioned, this is, amongst other things, due to forward cover on exchange rate options and order banking with fixed prices. Other factors that have an influence on the local market prices for fertilizers are the variability of local demand and stocks, oil prices and shipping fees. Developments in the bio-fuel markets also have a noticeable influence on fertilizer prices in that it influences the international demand for fertilizers, and hence the availability of base material.

Figure 9 takes a closer look at the JE Hyde Index, which is a general barometer for shipping costs associated with imports of fertilisers by South Africa, i.e. vessels with the capacity to transport 20 000 mt dry cargo out of various ports. According to the JE Hyde Freight Index freight cost increased with 154% from January 1999 to June 2006. The peak during February 2004 was 355.6% higher than in January 1999.

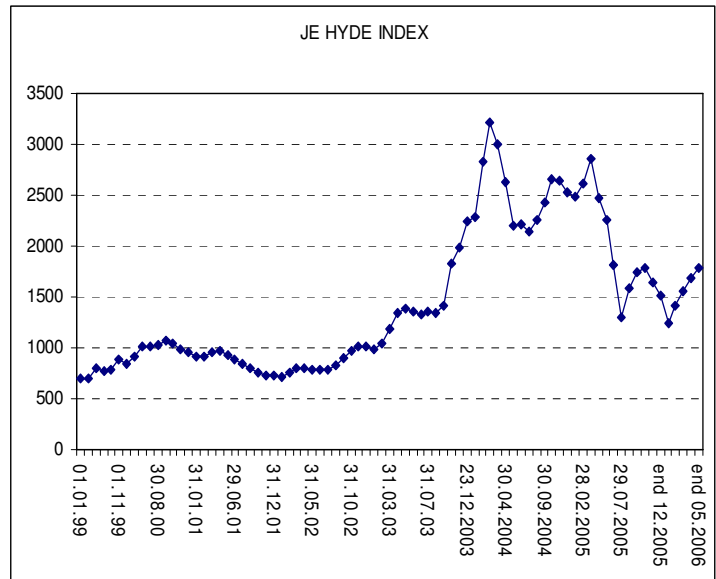


Figure 9: JE Hyde Freight Index
(Source: Burwil Unitor Ship service, 2007-11-01)

Changes in maize seed prices

The cost of seed is determined by, amongst others, the cost of technology development, parent seed development cost¹⁰, production cost of seed growers¹¹, drying and other factory cost. Cognisance should also be taken of

¹⁰ The development of parent seed and the cost thereof occur almost two years prior to the selling of the seed. During this period there is also the production cost of growers a year in advance. Another reason is the cost of carrying stocks and seed while it only have a shelf life of three years.

¹¹ Note that production of seed is highly labour intensive, while any labour availability problems can lead to crop losses. Also seed production is done under irrigation in areas that are dry and hot to limit the development of diseases on breeding material.

The cost of seed is determined by, amongst others, the cost of technology development, parent seed development cost, production cost of seed growers, drying and other factory cost.

Crop substitution decisions by farmers can affect the availability of seed.

The price index for maize seed increased with 120.7 percent from 1997 to 2006, compared to a 78.7 percent increase in the PPI-Maize.

the fact that overall returns (yield × price) from producing maize seed¹² versus producing maize or any other crop for commercial purposes impacts on the availability of maize seed; the result is that when margins increase between seed and commercial production seed companies have to compensate maize seed producers¹³. All these factors give rise to upward pressure on seed prices.

When monitoring seed prices it is important to take into account that seed cultivar development leads to continuous cultivar improvements. This causes difficulties with the monitoring of a “basket” of seed prices over time since new seeds enter the seed “basket” continuously. The differences between cultivars of the various seed companies create further difficulties to make comparisons and to construct a comparable seed “basket”. Hence, the information depicted in Figure 11 only provides a general trend.

Figure 11 shows the maize seed price index and the PPI-Maize. The price index for maize seed increased with 120.7 percent from 1997 to 2006, while the PPI-Maize increased with 78.7 percent. During this period, the PPI-Maize showed much more movement with a 56 percent increase during 2002 and a decrease of 42 percent from 2002 to 2005. The PPI-Maize increased again in 2006 by 52.7 percent.

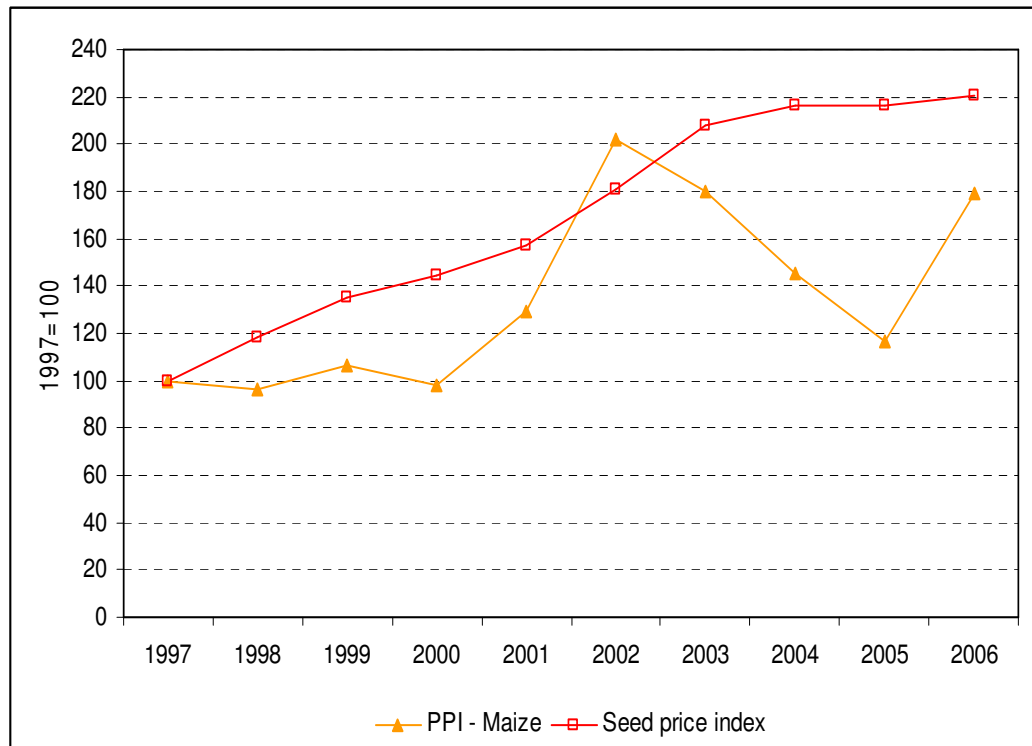


Figure 11: Average price movements for maize seed and maize
(Source: PPI-Maize, DoA 2007; Seed price index, GrainSA, 2007)

¹² It is reported that yields vary between 3 to 4 tons per hectare to produce seed under irrigation.

¹³ Based on information obtain from interviews with industry role-players.

Tractor sales represent 60 percent of all machinery sold in South Africa. Of this 97 percent is imported due to economies of scale related.

Tractor prices were 73.9% higher in 2006 than in 1997.

Factors that impact on tractor prices include competition between tractor manufacturers, exchange rate movements and the rand per kilowatt (R/kW).

Changes in tractor prices

Tractor sales represent 60 percent of all machinery sold in South Africa. Of this 97 percent is imported due to economies of scale related issues. It is reported that machinery (read tractor) purchasing patterns by maize producers changed significantly over the last two to three years. Factors that impact on tractor prices include competition between tractor manufacturers (wider range of models), exchange rate movements and the rand per kilowatt (R/kW); the latter increased significantly as a result of new technologies that were introduced.¹⁴.

Figure 12 shows the price index for tractors¹⁵, PPI-Maize and the R/\$ index. The price index for tractors increased with 73.9 percent from 1997 to 2006, while PPI-Maize increased with 78.7 percent. Due to the large proportion of imports, the exchange rate is expected to have a significant impact on tractor prices. The downward stickiness depicted in the price index for tractors between 2002 and 2003 can probably be attributed to tractors being ordered by local distributors during periods of higher prices that were not sold during the same period.

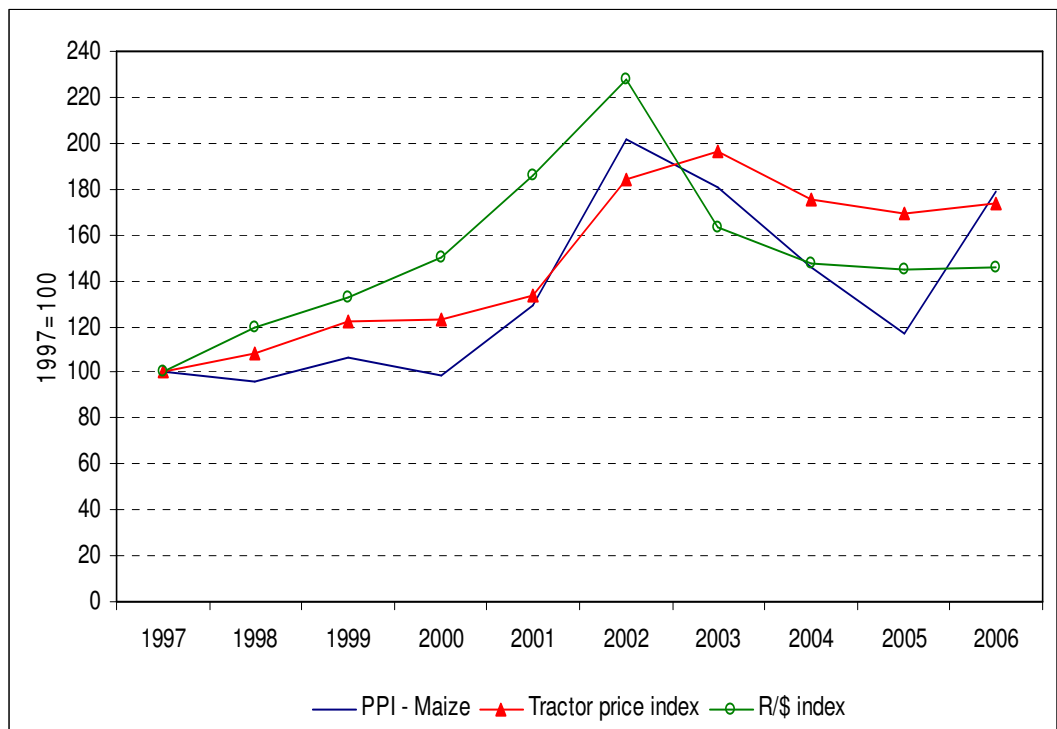


Figure 12: Average price movements for tractors and maize
(Source: PPI-Maize, DoA 2007; Tractor price index, GrainSA, 2007)

¹⁴ Based on information obtain from interviews with Agfacts, Jim Rankin.

¹⁵ Recommended retail prices, excluding personal discounts.

Disclaimer:

Although everything has been done to ensure the accuracy of the information in this publication, the NAMC does not take responsibility for the accuracy or the opinions contained in this publication. Results of actions based on this information, will not be the responsibility of the NAMC.

Appendix A: Definitions of different price indices

FRPI-Total includes price indices for machinery and implements, materials for fixed improvements and intermediate goods. The latter includes fertiliser, fuel, farm feed, animal health and crop protection, packing material, and maintenance and repairs

PPI-Total includes indices of producer prices of field crops, horticulture and animal production.

PPI-Field crops include indices of producer prices for summer grains, winter grains, oilseeds, sugarcane, hay, dry beans, cotton and tobacco.

PPI-Maize is the price index for producer prices for maize

Appendix B: Composition typical of production costs

Table B.1 shows the different input cost components included in a typical input cost budget. The focus of this report is on the variable cost component only.

Table B.1: Input cost components.

Variable cost	Capital cost
Seed	Machinery & Equipment:
Fertiliser & Lime	Depreciation
Herbicides	Interest
Insecticides en fungicides	Fixed improvements:
Fuel	Interest
Maintenance and repairs	Depreciation
Crop insurance	Repairs & maintenance
Casual labour	
Marketing cost	
Drying & cleaning cost	
License & Insurance	
Permanent labour	
Interest on production credit	
Contract work	
Other cost	

Appendix C: “Other cost” & “All other” cost items

The “other cost” category includes banking fees, printing and stationary, donations, water and electricity, telephone and auditing costs.

The “All other” cost category includes cost of crop insurance, marketing, drying and cleaning, license and insurance and contract work.