MAIZE TRUST PROJECT FOR SURVEY ON AREA PLANTED TO GM MAIZE IN SOUTH AFRICA

FINAL REPORT ON AREA PLANTED: PLANTING YEAR 2005, HARVESTING YEAR 2006

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(31 March 2006)

Wynand J. van der Walt, FoodNCropBio

INTRODUCTION

All stakeholders in the maize industry agree that the South African production scenario is presently unpredictable. Factors that impact on farmers' decisions to plant include price movements on SAFEX grain exchange, influence of Rand/US Dollar exchange rate which determines the import parity tariff, surplus of several million tons carry-over grain from the 2004 and 2005 harvests, some uncertainty on the actual 2005 crop estimate, anticipated exports into Africa, and farmers switching to wheat. Perhaps the most important factor has been crop financing as determined by credit policies of major banks and agricultural coops/companies.

These uncertainties, aggravated by low grain prices and a dry spring, have resulted in a massive reduction of some 45 per cent in maize hectareage. Nevertheless, the early October 2005 estimate by the Crop Estimates Committee of intention to plant 1.6 million ha, was close to the realized crop planting of 1,546 million ha. Likewise, the October rough estimate of 500 000 ha under GM crops (maize, cotton, soybeans), as contained in the 2005 ISAAA global review, came very close to the actual area planted.

GLOBAL GM CROPS

The 2005 Global Review released by ISAAA showed that GM crop plantings increased by 11 per cent to reach 90 million hectares, involving an estimated 8.5 million farmers of whom 7.7 were small-holder subsistence farmers. The total GM area was planted in 18 countries, while four countries joined the group with small plantings. The latter were Portugal, France, Germany and the Czech Republic. Spain has continued with Bt maize to reach 60 000 ha, despite the unofficial EU moratorium. South Africa with an estimated 500 000 ha (maize, cotton, soybeans) moved down to position 8 amongst the 14 countries that grew more than 50 000 ha each.

Herbicide tolerant soybeans remained the major GM crop with over 54 million ha (60 per cent of the total 90 million ha), while insect resistant Bt maize came second at 11.3 million ha, representing 13 per cent of the total maize area. This GM maize

was planted in 12 countries. The third most important GM crop was maize with Bt insect resistance combined with herbicide tolerance (known as stacked traits), grown on 6.5 million ha. This brings the global area under GM maize to 17.8 million ha, some 20 per cent of the total 89 million ha planted. The importance of stacked traits is evident from the 71 per cent growth from the 2004 figure of 3.8 million ha.

A copy of the 2005 ISAAA executive summary will be submitted as a separate document to this report. The summary can also be accessed from the ISAAA website at <http://www.isaaa.org>. The full 46 pp global review can be obtained at a fee of $50 from publications@isaa.org

REGULATORY ENVIRONMENT AND IMPACT ON TRADE

Since maize grain imports and exports are influenced by international GMO legislation and consumer preferences, farmers are starting to consider market requirements when deciding on planting options. Therefore, it was considered useful to include brief comments on relevant GM legislation.

In South Africa all genetic modification activities and products are regulated under the GMO Act and its regulations. The GMO Act is administered by the Department of Agriculture and all decision making is vested in the GMO Executive Council which comprises a senior official from each of the Departments of Agriculture, Health, Environment & Tourism, Labour, Trade & Industry, and Science & Technology. Water Affairs & Forestry will soon be added, as well as Arts & Culture. There are some 9 different kinds of permits, including ones for import and export of commodity consignments that are or may contain GMOs, contained use, field trials, and commercial release, as well as in transit procedures for imported commodity GMO products destined for third countries. A copy of a synopsis of the GMO Act and regulations, prepared by FoodNCropBio, can be supplied upon request. GM presence in grain below 1 per cent, is generally regarded as non-GM. Labelling is mandatory if a food product from GM plants has a different composition/ nutrition than conventional, or if it contains novel DNA or its novel protein from a human or animal gene (at present there are no commercial GM plants having human or animal genes).

South African stakeholders and government, under the auspices of the SA Bureau of Standards, have drafted requirements for production of non-GM products, taking into account that GM and conventional crop farming has come to stay.

SADC states have agreed on a policy to source maize grain from the region, preferably non-GM. GM grain or co-mingled grain will have to be milled before it will be accepted. SADC policy also states that local capacity needs to be built in order to manage GMO legislation. Such national biosafety legislation is at various stages of adoption. The SADC Committee on Biotechnology and Biosafety was expected to draft guidelines for policy and legislation but has not functioned for the past 18 months.

The USA regulates GM crops under the Environmental Protection Agency, the Food and Drug Agency, and the USDA-APHIS. Almost all US GM maize grain is co-mingled with conventional due to cost and impracticality of grain segregation. Biosafety assessments are based on the final product and do not distinguish between GM and conventional production systems.

The EU has adopted Regulations 1829/2003 and 1830/2003 to regulate (in addition to 90/220/EEC) approvals for GM crops, a system for labeling and traceability of foods and feed through a trail of documentation. All non-GM grains, products and ingredients must be labeled GM if they contain more than 0.9 per cent unintended presence of EU approved GM crop origin, more than 0.5 per cent of GM origin not yet approved but considered safe, and zero tolerance of unapproved not assessed GM. The EU labeling system is based on the production method, not the safety of the product. They have accepted co-existence of GM, conventional and organic farming and are drafting guidelines and legislation.

Japan has drafted biosafety legislation for GMO products and has approved a range of GM crops for import. It allows a threshold of 5 per cent GM in non-GM products, but may bring this down to 3 per cent.

METHODOLOGY IN ESTIMATING AREA PLANTED TO GM MAIZE

The first estimate (October 2005) was based on intention to plant GM maize as reflected by anticipated seed sales, measured against the Crop Estimates Committee estimate based on a survey of intention by farmers to plant maize.

The final estimate proceeded by way of obtaining confidential company information on actual sales, as reconciled at end of the financial year (February) and provided by late March. This information is broken down between white and yellow maize, and per GM trait: insect resistance (Bt) and herbicide tolerance (RoundupReady®). These sales data are converted, in association with key company officials, to hectares by a breakdown of sales per planting region according to planting density. Seed companies in recent years sell seed by seed count and not weight. Nevertheless, the guidelines used are seeding rates in kg/ha, taking into account the seed count per kg. Seeding rates of 25 kg/ha are used for irrigation production, 12 kg/ ha for the Eastern Highveld and Natal, and 6-8 kg/ha for the Free State, North-West and Northern Province. A 25 kg pocket on average contains some 80 000 seeds. The surface areas planted are expressed as percentages of the total area, as estimated in the latest Crop Estimate Committee report (23 March 2006). FoodNCropBio as consultancy, uses other means to verify the accuracy of data obtained and analyses conducted.

No information is available per official maize growing region as seed companies mostly use their own defined regions and as buyers may have more than one farm in different regions. Seed sampling and sales to small-scale and subsistence farmers

still make up a minor proportion of their maize production and no breakdown of area planted was available.

AREAS PLANTED TO WHITE AND YELLOW MAIZE

Commercial release of insect resistant Bt maize was granted approval in 1998 and started slowly due to inadequate seed supplies. The first hybrids were yellow maize, followed by white maize in 2000. Initial hybrids were US developed and adoption increased when the trait was incorporated into locally developed hybrids. Herbicide tolerant maize was approved for commercial release in 2002.

Adoption of GM maize has continued to grow, moving from 166 000 ha in 2002 to 236 000 ha in 2003, 341 000 in 2004, 410 000 ha in 2005, and 455 287 ha in 2006 harvesting seasons, respectively. These increases on a year-on-year hectares basis were 42, 44, 20 and 11per cent; and on a percentage of the total market share 17, 58, 29 per year from 2003 to 2005, respectively. GM market share doubled from 14 per cent in 2005 to 29.4 per cent in 2006.

Table 1 contains the final analyses for areas planted to white and yellow GM maize in harvesting seasons 2005 and 2006, broken down by GM trait. Results show that despite the dramatic reduction in maize hectareage, GM maize significantly increased in terms of percentage of the total crop planted. This was specifically influenced by the increase in white GM plantings that moved from 147 000 to 281 000 ha in 2006.

Insect resistant Bt maize still accounts for the major segment at 72 per cent of total GM maize, but herbicide tolerant maize has increased from 19 000 ha in 2005 to 127 629 ha. White GM maize increased from 8.6 per cent of total white crop in 2005 to 28.8 per cent of the present white planting, 22.7 per cent now represented by Bt and 6.2 per cent by herbicide tolerant trait. Yellow maize moved from 24 per cent of the total yellow planting to 30.5 in 2006, 18.7 per cent being Bt and 11.8 per cent herbicide tolerant trait. Total GM maize increased from 410 000 ha in 2005 to 455 287 ha in 2006, despite the reduction in national planting from 2.810 million to 1.546 million ha. In terms of percentage share of total plantings, GM maize doubled, increasing from 14.6 per cent to 29.4 per cent.

TESTING FOR PRESENCE OF GM MATERIAL

Most of the maize grain may in future consist of co-mingled GM and conventional. The substantial growth in GM share of the maize market will require better coordination between farmers to ensure that those who serve non-GM markets will be able to meet market requirements. In future, new GM quality traits will also require that these special qualities be retained to the end user market. Some agri-businesses maintain separate storage facilities for non-GM grain, some farmers

TABLE 1
AREA PLANTED TO WHITE AND YELLOW GM MAIZE
BY TRAIT FOR THE 2005 AND 2006 HARVESTING YEARS *

MAIZE TYPE	*YEAR*	*HECTARES*	*% OF TOTAL HA.*
WHITE I.R.	**2006**	**220 691**	**22.7**
WHITE H.T.	**2006**	**60 000**	**6.2**
TOTAL WHITE	**2006**	**280 691**	**28.8**
WHITE I.R.	**2005**	**142 000**	**8.3**
WHITE H.T.	**2005**	**5 000**	**0.3**
TOTAL WHITE	**2005**	**147 000**	**8.6**
YELLOW I.R.	**2006**	**106 967**	**18.7**
YELLOW H.T.	**2006**	**67 629**	**11.8**
TOTAL YELLOW	**2006**	**174 596**	**30.5**
YELLOW I.R.	**2005**	**249 000**	**22.4**
YELLOW H.T.	**2005**	**14 000**	**1.3**
TOTAL YELLOW	**2005**	**263 000**	**23.7**
GRAND TOTAL GM	**2006**	**455 287**	**29.4**
GRAND TOTAL GM	**2005**	**410 000**	**14.6**

- **I.R. = Insect resistant (Bt)**
- **H.T. = Herbicide tolerant (RoundupReady ®)**
- **Percentage for white GM maize based on total white area planted, for yellow GM maize based on total yellow area planted, and grand total percentage for white and yellow GM combined based on total maize area planted.**
- **Crop Estimates Committee data for 2005 were 2.810 million ha planted (1.7 million ha white and 1.11 million yellow. Latest 2006 estimates are 1.546 million ha planted (0.973 million ha white and 0.573 million yellow).**

engage in contract production of non-GM for a major industrial grain processor, and a few regions have farmer groups who join forces in growing only non-GM.

The South African Identity Preservation (I.P.) system under the S A Bureau of Standards has been finalized for the seed to grain part, while I.P. for food processing and detection diagnostics are still to be approved. This system will provide a formal basis for voluntary I.P.

There are as yet no formal thresholds for presence of GM seed in conventional seed lots, or of GM grain or material in non-GM products. International trade is presently being complicated by absence of or conflicting legal standards on such thresholds, apart from buyers setting their own standards.

Two reports have been released on testing for presence of GM material in commercial products. The first was a quantitative analysis done by the S A Grains

Laboratory that found presence ranging from zero to modest levels in maize grain samples from various production regions. The composite grain samples were obtained from silo operators in each region and the actual method of sampling is not clear. The results do not accurately reflect the market share of GM maize planted in the regions. The second survey involved a qualitative analysis (GM material present or absent) on maize grain and processed products, reported by a group at the University of the Free State. The positive presence of GM material was widespread. Again, the exact method for sampling is unclear and the results do not reflect market share of GM maize. These results show the urgent need for international standardized diagnostic methods, standardized sampling techniques as already exist internationally for testing seeds and possible accreditation by the Department of Agriculture of GM testing laboratories. The International Seed Testing Association found, over several cycles of controlled sample testing by over 40 international laboratories, that false positive and false negative readings occur, especially at low levels of GM presence. Laboratories should understand their liability when certificates are issued that may be based on incorrect technical results.

GM MAIZE SEED TRADE AND TRIALS

Some of the official permit records do not make it clear what the objectives were for imports or exports due to different interpretations of terminology. Tentative data for the period January to end November 2005 indicate that seed companies exported 1252 MT of GM maize seed for commercial planting purposes, 23 small consignments for field trials, and 23 very small quantities for contained use (breeding nurseries or greenhouses). Commercial seed imports totaled 84 MT, while small samples for trials, breeding or parental seed numbered 58 permits granted.

Genetic modifications in the pipeline for permit approval include stacked traits for herbicide tolerance and insect resistance, and another herbicide tolerant maize strain. Two promising developments at a trial stage from the University of Cape Town are streak virus resistant lines and strains with genes for drought tolerance transferred from the indigenous resurrection plant.

SUMMARY

Maize represents the major component of GM crop plants in South Africa, contributing 75 per cent of the total GM area of 609 287 ha. Despite the 47 per cent reduction in total maize planted in 2005/2006, the GM maize planting increased over 2004/2005. GM maize percentage of the total doubled in one year. South Africa ranked 8th amongst 21 countries that planted GM crops in 2005.

It is also advisable that laboratories that conduct diagnostic testing on GM presence in seeds, grain and agricultural products, undergo periodic independent monitoring by government so that adherence to the same international sampling and testing techniques can be assured. Preferably, such labs should be subject to accreditation.

It is clear that farmers find sufficient benefit from GM technology and that maize production will have to accommodate GM and conventional farming. A voluntary Identity Preservation system is being finalized that will enable producers to serve specific markets. However, producers need to be more pro-active to ensure that legislation and requirements do not become so complicated and costly that co-existence will not be economically feasible. Communication and cooperation between neighbours are becoming more important so as to prevent costly litigation. It is also important that the agricultural industry engage their counterparts in SADC so that member states can expedite their biosafety legislation in a way that will not complicate trade.

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