INTERIM OVERVIEW REPORT ON GM MAIZE IN SOUTH AFRICA FOR THE 2012/2013 SEASON

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EXECUTIVE SUMMARY

The study has a *primary objective* of surveying and analyzing GM (genetically modified) maize production that can serve as a database for stakeholders in the food chain, biotechnologists, consumer groups and government departments. It covers relevant regulatory developments and analysis of permits granted for GM maize commodity clearance, field trials, general release, imports and exports, as well as analyses of maize cultivars, GM market shares by traits and hectares planted.

***The survey* is based on collating and analyzing actual maize seed sales data provided on a confidential basis by seed companies, calculating the hectares planted according to seeding regimes, and expressing GM hectares planted in terms of percentages of total area as estimated by the Crop Estimates Committee.**

***Global GM* crop plantings have increased by 8% to reach 170 million hectares grown by 17.4 million farmers in 28 countries. The cumulative area under GM crops over 16 years stands at 1.5 billion hectares. The US remains the global leader, followed by Brazil, Argentina, Canada, India, China, Paraguay, South Africa back in 8th position, and Pakistan. Global GM maize planting now covers 55.1 million hectares in 17 countries and represents 35% of all maize produced. The strongest growth came from stacked traits.**

***Benefits* brought by GM technology include improved food production efficiency, reduced impact on the environment, economic benefits to farmers, while boosting conservation agricultural practices, but proper management is also required.**

The report covers a number of outstanding *regulatory* amendments to the GMO Act. DAFF is investigating handling of stacked genes, low level presence and adventitious presence of GM but progress has not yet been communicated. The Consumer Protection Act has entered into force on 1st April 2011 but implementation of its mandatory labeling of GM goods in Section 24 (6) in the Act and relevant regulation 7 remains in the melting pot due to its ambiguity, making compliance and enforcement impossible. Such labeling of all goods that are GMOs or contain genetically modified ingredients,

and that are derived through genetic modification, will impact on agri-businesses and producers, and eventually on consumers.

Maize producers have a choice of 451 white and yellow *cultivars* of which 32% or 144 were GM. Since year 2000, a total of 14 million hectares were planted to GM maize that yielded over 40 million MT of grain without any proven negative impact on humans, animals or the environment

Some 370 *permits* were granted in 2012 and maize accounted for 333 or 87%. These include permits for commodity clearance, import, export, trial release for testing, to various other uses. GM grain export permits amounted to almost 1.7 million MT which will not synchronize with SAGIS records due to lag between permit approval and shipping. GM maize seed exported totaled 3 784 MT and imports were 1 155 MT.

***South Africa* increased its *GM area* from 2.4 to 2.9 million hectares combined of the three crops: maize (2.428), soybeans (0.500) and cotton (0.014). Total GM maize planted comprised 1.321 million hectares white (80.5% of white) and 1.106 million yellow (93% of yellow), with GM share of the total planting at 86%. Insect resistance trait alone decreased to 34.5% of GM share, while stacked insect resistance and herbicide tolerance increased to a share of 49.3%, and herbicide tolerance alone stood at 16.2%.**

***Field trials* are ongoing with drought tolerance and some 14 other new stacked gene combinations incorporating various combinations of insect resistance and herbicide tolerance genes.**

Investigations on occurrence of incidence of tolerance or resistance in *stalk borers* to the Bt gene continued and steps have been taken to strengthen compliance with refugia and combining new Bt genes. A new cultivar with two Bt genes, approved in 2010, showed excellent resistance to stalk borers.

INTERIM OVERVIEW AND ANALYSIS REPORT ON GM MAIZE IN SOUTH AFRICA FOR THE 2012/2013 SEASON

1. INTRODUCTION

This survey has been funded by the Maize Trust on an annual application basis since 2006/7 season and continues to grow in issues covered. The objective remains to survey and analyze adoption of genetically modified (GM) maize by producers in South Africa in order to establish an updated database on GM plantings, available to maize industry stakeholders as a source of information. This information enables traders in maize grain and products to convey information to trading partners as may be required by customers, domestically and in other countries, and to comply with the Cartagena Protocol on Biosafety.

The report also covers updates on regulatory developments. These include lifting of the "temporary moratorium" on GM commodity grain imports that may contain genetic modifications ("events") not yet approved in South Africa, final standards for handling imports of such GM commodities, update on laboratories that conduct commercial GMO detection tests (local and regional), monitoring incidence of stalk borer tolerance to Bt, and publishing of regulations, specifically those which dictate mandatory labelling of 'goods' that contain GM ingredients, said regulations supposedly to have been implemented in 2011. All of these impact on seed companies, producers and grain traders and now extend to food manufacturers and retailers, labeling impacting on both local and imported 'goods'.

Beneficiaries of this information include the following parties and their clients or colleagues:

AgriSA, GrainSA, grain traders, millers, silo industry, industrial processors, food and animal feed manufacturers and their clients, seed industry, agricultural producers, CEC, SAGIS, SAGL, Department of Agriculture, Forestry and Fisheries, ARC, the GMO

Secretariat, GMO Executive Council and Advisory Committee, and the media.

Data in this report are based on reliable confidential statistics provided by biotechnology seed companies and cover hectares of GM maize planted and percentage of market with a breakdown per trait -- insect resistant (IR) or herbicide tolerant (HT) and stacked genes (IR/HR) -- shown separately for white and yellow maize, as well as historic data since year 2000 in order to highlight trends. An analysis of permits granted during 2007 is also included as maize seed and grain imports and exports that are GM or may contain material of GM origin have trade relevance for the industry. Statistics are primarily based on commercial maize plantings. Additional information on smallholder adoption of GM maize is difficult to obtain

2. METHODOLOGY AND APPROACH USED IN SURVEY

The survey goes through two stages so that information is refined with latest information available at each stage. Seed companies provide a confidential breakdown of seed sales per GM trait (Bt insect resistance, glyphosate herbicide tolerance, and stacked genes for both traits), per white and yellow maize, and per seed density used (6-8 kg/ha for drier Western and Northern regions, 10-12 kg/ha for Eastern and South-Eastern regions, and 20-25 kg/ha for irrigation farming. Seed is mostly sold on seed count basis in pockets containing 60 000 or 80 000 seeds and, in fact, seed count gives a more accurate picture of area planted to a pocket than mass as one kilo of seed may contain 2 500 to 3 500 seeds, depending upon seed size and shape.

For the final report, this survey using data solicited during October 2012, will be refined and re-assessed in June/July 2013, qualified by latest CEC estimates of maize plantings at that stage, and further discussions with and data from six seed companies that market GM seed (Pannar, Pioneer, Monsanto, Link Seed, Agricol, and Klein Karoo Saad). Syngenta licenses their technology and responds only to specific questions on technical issues related to the survey. Further information was solicited from interviews with leading farmers and a range of maize industry experts. All these inputs were synthesized

into an expected maize area of between 2.80 and 2.83 million hectares for 2012-13. The subsequent lower area in North-West and higher area in the Free State may result in a final estimate of 2.8 million ha.

It should be noted that during recent months, several changes have occurred in seed industry companies. Pioneer Hi-Bred acquired a majority shareholding in Pannar Seed while DuPont de Nemours acquired the global business of the US multinational Pioneer Seed. The local financial institution, Zeder, bought major interest in Agricol (Pty)(Ltd), KleinKaroo Seed and KleinKaroo Seed Marketing, while Linkseed was acquired by the French company Limagrain. This has not and will not at present affect collaboration of the acquired companies in our national surveys as they still operate under their trade names.

The breakdown by GM trait has been based on the same market shares as for 2010/11 as there was no reason to expect major changes in regional or national adoption rates per trait. Increase in stacked traits adoption was supported by sufficient seed supplies to meet demand.

It has become a common practice by certain parties to attack the credibility of GM maize data in our reports and in media releases. My present position is not to react to such allegations via the media as our data are accepted as the best present reflection of GM crop adoption, including by the International Service for the Acquisition of Agri-Biotech Application (ISAAA), an international non-profit organization that uses the data in their global reviews. Yet, the following points may be valuable for readers of this report:

1. ***Our October first estimated area to be planted to maize is determined before the CEC estimate comes out. For 2012-13 it was 2.82 mill ha, the CEC first estimate moved up from intention to plant to 2.781 by February. Our first estimate for 2011-12 was 2.58 mill ha, that of the CEC 2.60. For the latter season, both initial estimates were too low due to a late planting splurge, especially in North-West, and ended at 2.699 mill ha area.***

2. ***Expressing GM maize as percentage of total maize area is a moving target as CEC estimates may change monthly; therefore we stick to first estimate until a final survey is completed in June.***
3. ***Our first estimate is the one that is used in ISAAA publications as the deadline for drafting the global review is November – a bit of disadvantage for Southern hemisphere countries. The final June calculations are used in the final report to the Maize Trust and we use the final CEC area estimate as baseline for calculating percentages.***
4. ***Thus, the ISAAA data are based on first estimates, year-on-year, and the final report to the Maize Trust on final estimates, year-on-year. Therefore, the two reports will never be identical.***
5. ***The recent attack on the data released in March 2013 committed the classical error of comparing the first estimate data of October 2011 with the first estimates for 2012-13, ignoring the final estimates for 2011-12 for year-on-year comparison. The first spike in GM area came from the first to the final estimate in area, then some more for this season. Therefore, the ISAAA data contain two spikes.***
6. ***For interest' sake, our first estimate for soya beans for 2012-13 was 500 000 ha, the CEC estimate followed with 505 000 ha, then jumped to 529 000 planted, then came down to present 515 000.***

3. GLOBAL ADOPTION OF GM CROPS

Annual overviews are compiled by ISAAA, released by way of international media conferences and published as Briefs, executive summaries, highlights and media releases. The South African media conference took place on 7 March 2013 in Centurion with guest speaker Mr Johannes Möller, President of Agri SA.

The key points on 2012 global GM- biotech crops are:

- **It was the 17th successful year of commercial GM crops**
- **Since 1996 GM crop area has grown 100-fold to present 170 million hectares in 2012**
- **For the first time developing countries grew more GM crop area than developed countries**

- **Twenty of the 28 GM countries were developing countries, with Sudan and Cuba having joined**
- **Adoption increased to 17.3 million farmers, 90 per cent being smallholders**
- **The top 5 GM crop countries are USA, Brazil, Argentina, Canada and India**
- **South Africa remains the leader in Africa with Burkina Faso, Egypt, and Sudan growing commercial GM crops, while Cameroon, Kenya, Malawi, Nigeria, Uganda planting GM trials**
- **Five EU countries planted Bt maize for a total of 129 000 ha**
- **Benefits include improved food security, sustainability, mitigating climate change, reducing pesticide use, and alleviating rural poverty**

Salient points from 2012 global GM/biotech crop planting (C. James, 2011, "Brief 44: Global Status of Commercialized Biotech/GM Crops: 2012", available in executive summary format on www.isaaa.org) are summarized as follows:

- **GM area planted in 2012 increased by 170 million ha in 2012, again proving that GM/biotechnology remains the fastest agri-technology adoption in history.**
- **Accumulative adoption has now reached 1.5 billion has since 1996.**
- **These crops were planted by 17.3 million farmers in 30 countries, 90% million being smallholder farmers (7 million in China, 7 million in India). New countries are Cuba with 3 000 ha GM maize and Sudan with 20 000 ha GM cotton. The latter two present new developments: Cuba having added their own Bt maize resistant to army worm to their GM vaccines and therapeutic pharmaceutical innovations, and Sudan having gone commercial with GM bollworm resistant cotton technology provided by China.**

- **The USA leads with 69.5 million ha followed by Brazil 36.6, Argentina 23.9, , Canada 11.6, India 10.8, China 4.0, Paraguay 3.4, South Africa 2.9, Pakistan 2.8, , and Uruguay 1.4 million ha. The remaining 19 countries (in order of**

magnitude) are Bolivia, Philippines, Australia, Burkina Faso, Myanmar, Mexico, Spain, Chile, Colombia, Honduras, Sudan, Portugal, Czech Republic, Cuba, Egypt, Costa Rica, Slovakia, and Romania.

- **Five EU countries – Spain, Romania, Portugal, Czech Republic, Slovakia -- planted 129 000 ha of Bt maize.**

- **Brazil showed the biggest increase with 6.3 million ha or 21% more planted. The late blight resistant 'Fortuna' potato is expected to be grown in Europe in 2014. Sweden and Germany could not plant the GM altered starch potato 'Amflora' as the technology owner withdrew it from the EU market and moved its biotech division to the US.**

- **The US remained the world leader with some 90% adoption over all its biotech crops. Canada grew a record 8.4 million ha of GM canola, representing 97.5% adoption rate.**

- **Developing countries now planted 52% of total GM area.**

- **In addition to the 28 countries growing GM crops, another 31 have approved products from biotech crops for import as food and/or feed, and/or for trial planting. The EU has approved a range of GM traits for maize, soya beans, canola, cotton, and sugarbeet for use as food/feed, but not for planting (except MON810 Bt maize), GM potato for feed and starch, as well as GM tobacco and carnation for direct use.**

- **Soya beans remained the major GM crop (80.7 million ha), followed by maize (55.1 million ha), cotton (24.2 million ha) and canola (9.2 million ha).**

- **The major trait was herbicide tolerance at 100 million ha, followed by double and triple stacked traits at 43.7 million ha, and insect resistance at 26.1 million ha. GM maize with eight genes stacked for different insect resistance and**

herbicide tolerance went commercial in US and Canada in 2010.

- **New anticipated developments include drought tolerant maize that will be grown commercially in the US in 2013 and in Africa by 2017, Golden Rice with pro-vitamin A in the Philippines in 2013, then biotech maize and Bt rice in China.**

The major benefits of GM crops can be summarized as increased agricultural production efficiency, reduced impact on the environment, improved economic benefits for farmers, and facilitating crop rotation and conservation agricultural in the case of herbicide tolerant cultivars. The agricultural revolutions in Argentina and Brazil have essentially been driven by these technologies.

Global production of GM maize, grown in 16 countries, increased to 55.1 million ha (35% of global maize) with the five lead countries US, Brazil, Argentina, South Africa, and Canada, followed by another 11 countries.

The global trends will be shown in the final report.

4. SOUTH AFRICAN REGULATORY SYSTEM

4.1 *The GMO Act 15/1997 (as amended in 2006)*

Some recent issues can be highlighted as follows:

- **The 'moratorium' on importing commodity grains that contain genetic modifications ('events') not yet approved in South Africa had been lifted late in 2011. Maize producing countries USA, Argentina and Brazil all have events not approved in SA. The process of applying for an import permit for commodities seems to have created delays and affected stakeholders have requested DAFF to speed up approval of permit applications. Such delays will create serious problems in the event of drought or disasters that will require import of maize grain.**

- **The draft Plant Breeders' Rights Act has followed a course of several consultations with plant breeding stakeholders. The final text has gone to portfolio committees, has been approved by Cabinet and has now been handed back to DAFF but the contents are not available for comment.**
- **Several matters in the GMO Act (revised) remain a cause for concern: several departments have been changed or merged in 2010 so that the composition of the Council does not comply with the Act, while several other contentious issues have remained unchanged. The GMO Executive Council is still in the process of examining modalities for assessing stacked gene traits, and isolation distances between GM and non-GM fields. Also under discussion, are low level presence (LLP) of unapproved genetic events in grain and food products, and adventitious presence (AP) of approved GM in non-GM products (unavoidable presence/co-mixing) and what standards should be set. There is no evidence to date that progress has been made on these issues or attempts to interact with stakeholder experts.**

4.2 ***Other departmental legislation***

- **The Consumer Protection Act 28/2008 requires mandatory labelling of 'goods' that contain genetically modified ingredients or components, whether such goods were produced locally or imported. Regulation 7 in the regulations contains several sub-regulations for labelling but these have been drafted in such an ambiguous way so as to leave industry sectors somewhat confused on what and how to label. The Act entered into force on April 2011 and labelling regulations had to meet the deadline of 1 October, which very few parties have yet complied with. The Commissioner has set up a team that includes representatives from DTI, DST, DAFF and DoH to investigate the labelling issue but there is no evidence that recommendations from the team or from industry had been accepted. At present the re-examination of the regulation is still in the melting pot.**
  The Technology Innovation Agency (TIA), a body under the DST, has developed a Bio-Economy Strategy to replace the 2011

National Biotechnology Strategy. Apparently, the first draft has been sent back for further amendments and improvements.

5 STATUS OF SOUTH AFRICAN GM MAIZE

5.1 *The permit system*

Approvals under the GMO Act are based on issuing of permits. The latest list includes the following activities:

Registration of facilities, trial release into the environment, commodity clearance, contained use, general release, import for contained use, import for general release or commodity clearance, import for trial release into the environment, import for contained use or use as food, feed or processing, export for intentional release into the environment, commodity use for food, feed or processing, time extension for GMO activities. In addition, these applications have to be accompanied by an affidavit. For exports, a GMO lab test certificate for non-GM is required and a letter from importing country that it will accept the consignment. Only two labs are recognized by the Department of Agriculture (DAFF) for testing samples and issuing a GM certificate: University of the Free State and Incotec-Proteios.

Note should be taken of maximum times assigned for decision making as contained in the Cartagena Protocol on Biosafety and as repeated at the 2010 ICGEB-facilitated workshop between DAFF and the Argentine Department of Agriculture, Livestock and Fisheries, as per table below:

APPLICATIONS AND THE PERIOD REQUIRED FOR PROCESSING AND DECISIONS

1. Import-export GMOs with general release-commodity clearance approval	30 days
2. Contained use of GMOs and/or import-export permit *	120 days
3. Trial release of GMOs and/or import-export permit *	120 days
4. General release of GMOs	270 days
5. Extension permit	90 days
6. Use of GMOs with commodity clearance approval	30 days
7. Registration of facilities	60 days
8. Commodity clearance of GMOs	270 days

- **Import-export of GMOs that do not have general release or commodity clearance approval**
- **Government Gazette 32966, 26 February 2010**

Granting of a permit for any GMO activity does not mean that the activity will be executed in the month or year, or in quantity approved. This means that GMO permits and SAGIS data on grain imports-exports will not be similar. Key statistics are as follows:

- **Some 379 permits were granted for the year 2012**
- **Maize permits accounted for 333 or 87.6% of total**
- **Commodity clearance permits were 2: one maize, one soya bean**
- **Maize commodity export permits amounted to 47 in respect of 1.687 million MT of grain. This will not be similar to SAGIS data due to lags between granting of permits and execution of exports, plus calendar year versus marketing year.**
- **Commercial maize seed exports for planting involved 8 permits for 3 784 MT in total**
- **Commercial maize seed import permits were 11 for a total of 1155 MT, showing the positive seed trade balance**
- **Maize seed exports for contained use involved 167 permits (seed use for labs or greenhouses tests, multiplication, or**

confined field tests), while experimental seed export for planting had 5 permits

- **Maize seed import permits for trial release (field tests) numbered 30, while 73 import permits were granted for breeding, research, multiplication or used as parent lines in hybrid seed production.**
- **Other permit approvals covered GM vaccines, soya beans, cotton, and cassava.**

It should be noted that the technology owner is responsible for applying for a commodity clearance approval with submission of all required biosafety and genetic data. Once granted, the grain importer can then apply for a user importer permit. Imports of commodity grain have been subjected to a de facto moratorium since 2006 on commodities that contain genetic events not yet approved in SA, but by late 2011 this was lifted and the 19 permits granted. Such permits are based on the genetic events that are or may be present in the consignment(s) to be imported from the country of origin.

Commodity clearance applies to grains for food, feed or processing and does not imply authorization for trial planting or commercial use as seed to raise a crop.

5.2 *GM maize cultivars on the official Variety List* .

+++++++ to be updated in final report as the latest lists have been received at the time of drafting of this report +++++++++++++++

5.3 *Intellectual property rights*

++++++++++++++++ to be updated in final report as the latest PBR list was only recently received +++++++++++

The following development is important for owners of intellectual property:

A senior patent attorney and collaborator advised me in 2012 on an unexpected new regulation that had emanated from the SA Reserve Bank. The salient points are as follows:

SA residents require SARB approval to sell IP to foreigners or to move their IP offshore for tax or business reasons, SARB approval is required for sale of IP owned by residents and registered offshore. This implies that licensing IP offshore may likely attract SARB scrutiny. The Regulation is contrary to a 2010 test case, Oilwell vs Protec, in the Supreme Court decision that IP is not a 'capital' under the Currency and Exchange Control Regulations of 1933.

My collaborator advised that they may oppose this regulation as there was no consultation with affected parties, that Parliament has to approve such regulations and that it is unconstitutional.

At present I have had no updates on this issue. One wonders how this may affect recent mergers/acquisitions in the local seed industry, or joint IP ownership on co-funded research projects.

Modern biotech cultivars are protected by plant breeders' rights in terms of the Plant Breeders' Rights Act (15/1976 as amended in 2006); patent rights under the Patents Act but only for specific claims such as novel gene constructs, vectors, promoters, bacterial phages (plasmids) as carriers for the novel genes, and other claims; and trade marks under the Trade Marks Act. Breeders' rights protection under the UPOV Convention 1991 has been extended from 15 to 20 years for plant varieties and from 20 to 25 years for fruit and forestry trees. A new Plant Breeders Right's Act has been completed, but not published as a draft Bill. The UPOV Convention in Article 15(2) provides for farmers to retain harvested material for re-use for planting on his own farm to produce another crop (the farmer's privilege exemption), subject to 'safeguarding the legitimate interests of the breeder" – a rather vague exemption which member states have to define at national level. Patent rights protection ends after 20 years but trade marks continue as long as the owner pays annual duties.

Commercial breeders of maize hybrids and OPVs are increasingly making use of contract law to reduce alienation of their proprietary

cultivars. By purchasing a bag of seed, the buyer agrees to the restraint that he/she will not use the seed for further multiplication, selection or breeding. This restraint over-rides the UPOV 'breeders' privilege' of the freedom to use PBR-protected varieties for breeding which is qualified by the principle of essentially derived varieties (minimal differences from the original variety) Repetitive use of a protected variety to produce another variety remains an infringement. Contract law in the case of GM varieties is especially important as the technology owner is compelled to maintain responsibility (and liability) for and stewardship over the technology product, apart from submitting an annual report to the DAFF on issues like compulsory planting of refuge areas to conventional seed, and monitoring possible development of tolerance to insects or weeds. The owner cannot comply with these requirements if he has no contact with or knowledge of parties who are using his varieties for breeding or planting. The contentious issue of what happens to stewardship when patents expire is presently being debated globally.

5.4. ***GM maize approved for commodity release***

The maize commodity clearance events approved in 2011 as per designated identifiers are as follows:

MIR604
Bt11 x GA21
Bt11 x MIR604
MIR604 x GA21
Bt11
Bt 176
Bt11 x MIR604 x GA21
Bt11 x MIR162 x MIR604 x GA21
Bt11 x MIR162 x GA21
Bt11 x MIR162 x TC1507 x GA21
GA21
T25
TC1507
TC1507 x NK603
51922
NK603

NK603 x 59122
TC1507 x 59122
TC1507 x 50122 x NK603
MON810
MON810 x GA21
MON810 x NK603
MON863
MON863 x MON810
MON863 x MON810 x NK603
MON8817
DAS-40278-9 (herbicide tolerance, approved in June 2012)

5.5 ***Maize genetic events approved for general commercial release***

The list of approved events for conditional general commercial release does not imply that all such GM cultivars are presently being planted. It takes time to incorporate the genetic modification into locally adapted cultivars and build up seed supplies.

- **1997: Mon810 insect resistance**
- **2002: NK603 herbicide tolerance**
- **2002: Bt11 insect resistance plus herbicide tolerance**
- **2007: MON810 x NK603 insect resistance, herbicide tolerance**
- **2010: MON89034 two stacked Bt genes for insect resistance**
- **2010: MON89034 x NK603 stacked insect resistance, herbicide tolerance**
- **2010: GA21 herbicide tolerance**
- **2010: Bt11 x GA21, insect resistance, for herbicide tolerance**
- **TC1507, insect resistance, herbicide tolerance (approved July 2012)**

5.6 ***Approved maize field trials with new GM combinations***

New insect resistance genes and herbicide tolerance genes or existing genes put into new hybrid combinations, and various stacked combinations of these novel genes will serve to counteract development of target insect resistance and weed tolerance to herbicides, and also enable the producer to apply biotech

management with various GM traits combined in cultivars relevant for his specific farm situations. Field trials approved during 2012 include various stacked traits for insect resistance and herbicide tolerance and are as follows:

MON87460 = DT
MON89034 = IR/IR + HT
PHP37050 = IR+HT
TC1507xMON810 = IR
TC1507 x NK603 = IR + HT
TC1507xMON810xNK603 = IR+HT
PHP37048 = IR +HT
PHP36676 = IR + HT
PHP36682 = IR + HT
Bt11 x MIR162 x TC1507 X GA21 = IR + HT

DT = drought tolerance, IR = insect resistance, HT = herbicide tolerance

5.7 *Commercial status of GM maize planting in 2012/2013 season*

The analysis was based on an October first estimate of 2.82 million ha maize planting, up 5% from 2011 planting, and comprising 1.641 million white and 1.189 million yellow.

The white maize sector of 1.641 million hectares comprised 80.5% biotech or 1.321 million hectares with the single Bt gene accounting for 498,000, hectares (38%), herbicide tolerance 158,000 hectares (11%) and Bt-herbicide tolerance stacks at 666,000 hectares (50%).

The yellow maize planting of 1.189 million hectares comprised 93% or 1.106 million hectares of biotech. The biotech breakdown by trait for yellow maize is 31% or 339,000 hectares for the single Bt trait, 21% or 235,000 hectares for herbicide tolerance, and 48% or 531,390 hectares for the stacked Bt - herbicide tolerant product. Similar data on small holder usage for 2011/12 are not yet available.

It can be seen from the data in Tables 1 and 2 below, that GM trait adoption in white and yellow maize followed the same trends.

TABLE 1: AREA PLANTED TO GM WHITE MAIZE
2000-2012 HARVEST YEARS BY TRAITS (HECTARES x 1000)

YEAR	Bt	HT	Bt + HT	TOTAL
2000	0	0	0	0
2001	0	0	0	0
2002	6	0	0	6
2003	60	0	0	60
2004	144	0	0	144
2005	142	5	0	147
2006	221	60	0	281
2007	712	139	0	851
2008	696	218	61	975
2009	660	160	226	1046
2010	984	117	111	1212
2011	497	99	411	1008
2012	518	113	495	1126
2013*	498	158	666	1321
TOTAL	4640	909	1365	6989

TABLE 2: AREA PLANTED TO YELLOW MAIZE
2000-2012 HARVEST YEARS BY TRAITS (HECTARES X 1000)

YEAR	Bt	HT	Bt + HT	TOTAL
2000	3	0	0	3
2001	59	0	0	59
2002	160	0	0	160
2003	176	0	0	176
2004	197	0	0	197
2005	249	14	0	263
2006	107	68	0	175
2007	391	137	0	528
2008	406	159	23	588
2009	376	159	107	642
2010	326	153	187	666
2011	288	149	260	666
2012	329	157	261	747
2013*	340	235	531	1106
TOTAL	3067	996	838	4901

TABLE 4: TOTAL AREA PLANTED TO GM MAIZE
2000-2012 HARVEST YEARS BY TRAITS (HECTARES x 1000)

YEAR	Bt	HT	Bt + HT	TOTAL
2000	3	0	0	3
2001	59	0	0	59
2002	166	0	0	166
2003	236	0	0	236
2004	341	0	0	341
2005	391	19	0	410
2006	328	128	0	456
2007	1103	276	0	1379
2008	1102	377	84	1563
2009	1036	319	333	1688
2010	1305	245	340	1890
2011	785	248	671	1704
2012	847	270	756	1873
2013*	838	393	1197	2428
TOTAL	8540	1907	2184	14196

Note: Bt = insect resistance; HT = herbicide resistance, Bt + HT = stacked traits
*** = Provisional estimates for 2012 planting, 2013 harvest**

5.8 *Smallholder farmer adoption of GM maize*

Data are still being awaited.

5.9 *Incidence of potential stalk borer resistance to Bt maize*

Monitoring of continued outbreaks of potential insect resistance has been assigned to GM seed companies who are required to submit an annual report to DAFF. In addition, several monitoring and impact studies are being conducted by North West University in association with ARC and others. The first stacked Bt genes with added herbicide tolerance had been approved in 2010 for commercial release and has shown excellent resistance to stalk borers, while a range of other cultivars with various stacked combinations is in the second year of field trials. Also in field trials are hybrids with stacked genes for tolerance to different herbicides. The objective is to

have these stacked technologies approved and introduced before potential weed tolerance appears, and to offer producers new options for weed management.

6. UPDATE ON BIOTECHNOLOGY AND BIOSAFETY IN AFRICA

The final report will contain (a) an overview of field trials with GM crops in Africa, (b) some details of the genetic modifications in a few of these crops, and (c) contact details of relevant regulatory authorities in African countries and some destination countries to which our maize grain go, for those parties involved in grain trade.

8. MEDIA COVERAGE

The March 2013 media conference on global status of GM crops, including an overview of the SA status, received widespread coverage on TV, radio, printed media, and websites. This event benefited from the presentation by the keynote speaker, Mr Johannes Möller, President of Agri –SA. Mr. Bennie van Zyl, CEO of Transvaal Agricultural Union included in his word of thanks to Mr Möller, also positive comments on the value of GM-biotech crops for South Africa. Support by the Maize Trust was included in all media interactions. A complete media report will be included in the final report. The Word text of the March SA Grain article by the author is attached hereto as an addendum.

Report submitted by:

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Pretoria, 20 March 2013

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ANNEXURE 1

ARTIKEL VIR SA GRAAN MAART 2013

(Dr. Wynand van der Walt)

"Stories en Feite oor GM Voedsel"

Nuwe tegnologieë bring dikwels onsekerhede en vrae in die gemeenskap. Genetiese modifisering (GM) is geen uitsondering nie. Die debat hieroor het verskillende fasette en het toenemend gepolariseerd geraak en sodoende die publiek verward gelaat. Die jongste verdagmakery oor veiligheid van voedsel van GM-gewasse is sprekend hiervan.

Die onlangse bewerings van 'n Franse professor dat GM mielies gevaarlik is vir mense, is verwerp deur die Europese Voedselveiligheids-Gesag en 'n reeks ander instansies. Hierdie saak verdien nie verdere aandag nie. 'n Tweede mite is dat die Europese Unie nie voedsel en voer van GM oorsprong toelaat nie. Goedgekeur vir gebruik vir voedsel en voer is die volgende GMs, met aantal genetiese modifiserings in hakies:

Kanola (4), mielies (25), sojabone (3), katoen (7), suikerbeet (1); plus aartappel vir voer en industriële stysel, GM angelier as blom en GM tabak vir direkte gebruik. Die EU voer meer as 33 miljoen soja jaarliks in, meeste waarvan GM of vermeng is.

In 2011/12 het ons GM mieliegraan uitgevoer na Portugal, Spanje en Italië.

Kommunikasie

Wetenskaplikes en eienaars van moderne biotegnologie moet seker maak dat hulle feitelike inligting oordra aan die publiek. Netso het owerhede die verantwoordelikheid om die publiek gerus te stel dat daar behoorlike wette en regulasies – wat streng toegepas word – in plek is. Dieselfde vereiste is van toepassing op partye wat GM aanval as 'n groot risiko vir mensgesondheid. Al drie hierdie rolspelers moet deurlopend gedaag word om feite met stawende bewyse aan Jan Publiek oor te dra.

Die harde feit, soos die spreekwoordelike koei, is dat daar nog geen bewyse is dat Suid-Afrikaanse GM navorsing sedert die sewentigs, plaasproewe met GM gewasse sedert 1990 en kommersiële GM aanplanting vanaf 1998 enige negatiewe impak op mens of dier gehad het nie. Ons praat hier van o.a. kumulatiewe 40 miljoen ton GM mielies geproduseer op meer as 10 miljoen hektaar, miljoene hektaar GM sojabone, en ge-eet deur miljoene mense en diere.

Wat sê die wet?

Die GMO wet is pro-aktief en vereis dat aansoeke vir plaasproewe met GM gewasse, saadvermeerdering of kommersiële aanplanting, dokumentasie moet verskaf van alle toetse op veiligheid vir mens, dier en die omgewing, alvorens 'n permit goedgekeur word. Sodanige dossier word beoordeel deur tien wetenskaplikes van die GMO Advieskomitee, waarna verteenwoordigers van ses departemente - landbou, gesondheid, omgewingsake, arbeid, wetenskap en tegnologie, handel en nywerheid – gesamentlik as die amptelike GMO Uitvoerende Raad 'n besluit maak oor die aansoek. Hierbenewens is daar 'n 13 - bladsy stel riglyne waarvolgens die GMO Advieskomitee aansoeke moet beoordeel, asook 'n 65 – bladsy stel riglyne vir wetenskaplikes wat met GMOs navorsing doen.

In hierdie proses word internasionale riglyne gevolg. Die eerste hiervan is standaarde van Codex Alimentarius (die gesamentlike liggaam van die VN – Voedsel en Landbou Organisasie en die VN – Wêreld Gesondheids-Organisasie) wat vereiste ondersoeke soos volg stipuleer:

Direkte gesondheidseffekte (toksiene), neiging tot allergiese reaksies (allergene), komponente met voedings of toksiese eienskappe, stabiliteit van die GM geen, voedingseffekte van die GM modifisering, en onbeplande effekte van inplasing van die GM geen.

Tweedens bepaal die Cartagena Protokol op Bioveiligheid maatrëels oor-grens beweging van lewendige GMOs soos saad en kommoditeitsgrane. Aanhangsel I van die Protokol stel vereistes rakende inligting oor verskeping, hantering, dokumentasie en die tipe modifisering. Aanhangsel II vereis volle besonderhede oor die GM gewas en molukulêre karakterisering van die modifisering, terwyl Aanhangsel III uitgebreide standaarde stel vir die risikobepaling.

Beoordeling van voedselveiligheid

Die proteïen van die Bt geen wat in baie lae vlakke in die plant voorkom, kan as voorbeeld dien. Om genoeg proteïen te kry vir toetse, word die Bt geen geïsoleer, in 'n bakterie geplaas wat dit dan in meetbare hoeveelhede produseer. Moderne diagnostiese toerusting stel wetenskaplikes in staat om die aminosuursamestelling en volgorde te ontleed (dit is die proteïenkode) en die resultaat te vergelyk met kode-profiele van bestaande allergene waarvan alle besonderhede op 'n internasionale databasis beskikbaar is om vas te stel of die Bt-proteïen ooreenstem met 'n gelyste allergeen. Verder word die Bt proteïen getoets vir weerstand teen vertering deur maagsappe en afbreking deur hoë temperature. Toetse vir toksiene volg 'n soortgelyke pad.

Die volgende stap is om die Bt mielie te vergelyk met sy konvensionele eweknie, meesal geneties identies behalwe dat die Bt geen afwesig is. Die Bt en nie-Bt mielies word in veldproewe aangeplant en die graan ontleed vir samestelling in terme van proteïene, stysels, suikers, olies, ander koolhidrate, en ander bestanddele, om sodoende verskille te identifiseer.

Hoe veilig is ons kos?

Dit is welbekend dat ons daagliks agt voedselsoorte gebruik wat vir sommige verbruikers allergiese reaksies tot gevolg mag hê: koeimelk, grondbone, eier, neute, sojaboon, koring, vis en skulpvis, skaaldiere (kreef). Kontaminasie met bakterieë en mikotoksiene geproduseer deur sekere swamme is ook moontlik. Ten spyte van streng regulasies en monitoring vind voedselbesmetting in die wế́reld deurlopend plaas met konvensionele voedselproduksie en prosessering. Onlangse gevalle sluit in *E. coli* ras 0157 bakteriese kontaminasie van slaai in Kanada, bakteriese besmetting van tofu in die EU, asook hamburger bief vermeng met vark- en perdevleis in Engeland. Die ergste geval in dekades is die *E. coli* besmetting van organiese boontjiespruite in Duitsland in 2011wat gelei het tot dosyne sterftes en meer as 4 000 mense in hospitale opgeneem. Daar bestaan nog geen rekord dat enige voedselvergiftiging aan GM-gewasse toegeskryf kon word nie.

Bt mielie is veiliger as sy eweknie

Een van die gevaarlikse besmettings van voedsel kom van mikotoksiene, geproduseer as sekondế́re produkte deur sekere swamme wat kan voorkom op grane en voedselprodukte. Fumonisin mikotoksien, geproduseer deur *Fusarium verticillioides*, word verbind aan keelkanker in volwassenes en defekte in die neurale buis in babas, beide probleme wat veral voorkom in die OosKaap waar insekskade op en swak opberging van mieliegraan algemeen is. Stronkboorder- en kopwurmskade verskaf toegang vir hierdie swam en wurms dra ook swamspore saam. ‘n Oorsig van Prof. Felicia Wu van die Universiteit van Pittsburg in Amerika van jarelange veldproewe op meer as 288 plekke met Bt en konvensionele mieliekultivars wys duidelik dat beperking van insekskade lei tot tussen 1,8 en 15 - voudige vermindering in fumonisin op die graan. Ons Mediese Navorsingsraad in Tygerberg se proewe oor jare wys dieselfde tendens. Die jongste navorsing deur ‘n span kundiges wat die Universiteit van Pretoria insluit, ondersteun ook hierdie bevindings. Vlakke van fumonisin in Suid-Afrikaanse mielies is laer as die maksimum vlak voorgeskryf deur die Amerikaanse Voedsel- en Medisyne Administrasie. Ondertussen word verskeie projekte befonds om deur teling en biotegnologie weerstand in mieliekultivars teen Fusarium te vestig.

Sowat 80 persent van ons mielie-aanplanting en 90 persent van sojabone is GM. Die graan is veilig vir mens en dier en van hoë kwaliteit. Die verbruiker kan met ‘n geruste hart produkte van mielies, sojabone en katoen geniet.

END >>>>>>>>>>>>>>>>>>>>>> 30 Januarie 2013