Submission to the Competition Commission regarding the proposed acquisition of Pannar Seed by Pioneer Hi-Bred

The African Centre for Biosafety is a non-profit organization, based in Johannesburg. We provide authoritative, credible, relevant and current information, research and policy analysis on issues pertaining to genetic engineering, biosafety, and biopiracy in Africa.

As a stakeholder we were requested by the Competition Commission to make written comments on the proposed merger, which we submitted to the Commission on the 21st of October, 2010. We were given further opportunity to make presentations in person at the Commission offices, on the 22nd. Having acknowledged our inputs, and also the time constraints we were under to make them, we wish to thank the Commission for giving us an opportunity to expand on a few key issues that were raised at the meeting, namely:

- The currently prevailing seed systems in South Africa, how these have changed over time, and what the implications of these changes are;
- The breadth and importance of the breeding and research work carried out by Pannar seed in South Africa;
- Some alternative suggestions to ensure the fruits of Pannar's research can be preserved for the public and national good.

We also wish to acknowledge the extremely high level of co-operation we have received from Pannar seed, in particular its managing director, Mr Deon van Rooyen, who not only agreed to meet with us to discuss the acquisition, but also to assist us with our Promotion of Access to Information Act (PAIA) application for information on the proposed acquisition, We applaud Pannar for their willingness to engage with us as a relevant stakeholder.

1. Seed systems in South Africa

In South Africa there are three principle seed systems: Open Pollinated Varieties (OPV) Hybrids, and genetically modified (GM) seeds. OPV's carry the greatest genetic diversity, as they are typically bred for very specific localised agro-ecological conditions. While they may not give as high yields as hybrid seeds (in the case the hybrid seed is used in conjunction with sufficient inputs such as irrigation or chemical fertilizers), they are more vigilant in the face of environmental stresses. OPV's are not subject to plant breeders rights (PBRs), or other forms of intellectual property, and are often traded between farmers. In addition, they can also be saved at the end of a planting season and used the following year without the risk of declining yields or IP infringement. In 2008/09, excluding maize, cotton, soybean, sunflower and grain sorghum, OPVs were the dominant seed type for all grain crops in South Africa.[1]

Hybrid seeds and Plant Breeders Rights

Hybrid seeds are the result of cross breeding and backcrossing between related species, often over many generations, to identify valuable traits (such as higher yield, resistance to disease, or early maturity. In some cases, Hybrid breeding programmes have resulted in significant yield gains in the short term. However, the yield advantages bred into these varieties are usually conditional upon their use in conjunction with other inputs, such as irrigation and chemical fertilizers. Unlike OPVs, hybrid varieties are in effect 'owned' by the breeder, through mechanisms such as plant breeders rights.

The de facto international rules on PBRs for hybrid varieties are set by the UPOV Convention. The treaty was adopted in Paris in 1961 and entered into force in 1968. The treaty was revised in 1972, 1978 and 1991. All members, with the exception of Belgium, are parties to either the 1978 or 1991 Acts.[2] South Africa has been a contracting party to UPOV since 1977, and signed the 1991 UPOV Act on the 19th of March, 1991.[3]

Plant Breeders Rights (PBR), as defined under UPOV, give breeders a 20 year monopoly over the commercial propagation of their protected varieties, but cannot restrict farmers from saving seed or breeders from doing further research using protected varieties.[4] Under UPPOV 1991, farmers may save and re-sow protected varieties on their own land, but only if their government has enacted an optional exception to the 1991 Act.

PBR only provides for protection of the variety in question, not the method necessary to obtain that variety. To qualify or protection a variety must meet a number of conditions: distinctness, uniformity, stability and novelty. PBRs do not extend to 'private behaviour'. For example, if an individual is using the variety to propate flowers or vegetables for their own private (non-commercial) use. The UPOV convention also allows legislators to introduce 'farmers' privilege' into their national plant breeders rights, such as saving seeds back at the end of a harvest for the following year. The breeder also cannot act against third parties who use the protected variety for experimental purposes.[5]

GM plants and patents

When the US Supreme court ruled in *Diamond v Chakrabarty, 1980,* that a genetically modified strain of bacterium was eligible for patent protection, a precedent was set, the reverberations of which can still be felt today. A study commissioned by the Netherlands Minister of Agriculture, Nature and Food Quality in 2009 concluded that the extension of patent rights into plant breeding, together with technological developments in biology, has significantly contributed to the current levels of concentration found in the sector, and is a threat to future innovation.[6] An immediate difference between PBRs and patent protection is the scope and subject of protection. Unlike in PBR, where only one variety is protected, the subject matter for which protection is sought is largely determined by the applicant, and can extend to the *method* used in the production process, not just the end result. This has often resulted in incredibly broad claims extending to matters not even investigated by the applicant, so called 'reach through' claims on material that is developed by using the invention, for example.

Two more recent areas of biotechnology have lent themselves to an even greater proliferation of patenting on life forms: 'Gene-stacking' and 'climate ready' crops. Gene 'stacking' occurs when two GM varieties are bread together to produce progeny with 'desirable' GM traits from both parents, the most common application at the moment being to breed plants that are resistant to herbicides and insect pests. Stacked GMOs are extremely lucrative to the large biotechnology companies as the 'technology fee' paid by farmers increases with the amount of genes stacked into one variety. For example, the technology fee paid by farmers for triple stacked maize accounts for approximately 51% of the total cost of the seed, whereas for a single trait GM maize variety the fee is around 25%. In the case of double stacked GM cotton the fee rises to 67%.[7] The NGO Grain has raised concerns that stacking more traits into a plant significantly widens the scope for patents.[8]

Under the guise of fighting climate change, the biotechnology industry has been involved in nothing less than a stampede to patent genes in plants that can withstand environmental stresses, such as drought or saline soils. In 2008 the ETC Group revealed that between them, Monsanto, BASF, DuPont, Syngenta, Bayer and Dow, had filed 532 patent documents on such genes. The 532 documents represent 55 patent families (corresponding to a single 'invention' submitted for patent monopoly in more than one country). The same six companies control 42 of the 44 patent families.[9]

Farmer contracts

The primary vehicle used by the biotechnology industry to prevent farmers saving seeds is through the binding contracts it makes its customers sign. In Canada, farmers wishing to plant Roundup ready seeds (genetically engineered to be tolerant to glyphosate based herbicides) have to sign a technology use agreement. Under the terms of the contract, farmers can only use the seed for planting one crop and the crop can only be sold for consumption to a commercial

purchaser authorised by Monsanto. Monsanto also dictates the herbicides the farmer must use and reserves the right to make unannounced inspections of the farmer's fields. German chemical giant BASF operates a similar policy, titled the 'Clearfield production system', even though the seeds it stipulates must be purchased are non-GM, and therefore not covered by patents. The fact that the farmers have signed a contract renders all its provisions enforceable.[10]

The U.S. based NGO, the Centre for Food Safety (CFS), has been monitoring Monsanto's 'unprecedented' use of patents and restrictive licensing agreements to investigate and sue farmers suspected of seed saving. As of October 26th, 2007, Monsanto had filed 112 lawsuits against farmers for alleged violations of its technology agreements and / or its patents on GM seeds. The 57 cases that ended in disclosed damages awarded to Monsanto amounted to $22.5 million dollars, the average judgment being nearly $400,000. Further, based on information from Monsanto's own website, the CFS has estimate that as of June 2006, the company had instituted between 2,391 and 4,531 out of court settlements, resulting in damages to Monsanto that could have been as high as $160 million.[11]

Many of these high profile cases have arisen because of gene-flow from GM crops to non-GM crops. In Canada, Canola grower Percy Schmeiser had been using farmers saved seed since 1993. In 1996 Monsanto introduced its Roundup Ready Canola in the area. Two years later, after private inspectors took samples from Schmeiser's fields that had been contaminated, he was taken to court and sued for patent infringement. In the words of the presiding judge '…whether or not the crop was sprayed with Roundup during its growing period is not important. Growth of the seed, reproducing a patented gene and cell, and sale of the harvested crop constitutes taking the essence of the plaintiffs invention…'

The experience of GM cotton farmers in the Makhathini Flats in KwaZulu Natal should serve as a stark warning as to risks faced by farmers, particularly small scale farmers, where crops are covered by patents. Despite all farmers in the scheme having to sign technology agreements with Monsanto which, among other things, prohibited seed saving, a Biowatch survey conducted in 2003 revealed that only 6 of 36 farmers questioned understood the contents of their contracts.[12] While being heralded by the biotechnology industry as a means of lifting thousands of small holder farmers out of poverty, statistics on farming debt in the area tell a very different story. By 1998, the year GM cotton was introduced into the area, the Land Bank had become the sole provider of agricultural credit. Such was the all-round enthusiasm for the new technology, it issued more than R8 million in the crops first year, However, owing to institutional and climatic constraints the Bank was forced to close 1447 out of 1648 loans. By the time the Land Bank ceased lending in Makhathini in 2004, it was owed a total arrears of nearly R23 million.[13]

Figure 1: Maize seed market shares (%) 2004/05 – 2009/10

Year	GMO	Hybrid	Farmer saved	Open-pollinated
2004/05	20	77	9	23
2005/06	23	79	1	21
2006/07	37	84	1	16
2007/08	42	85	2	15
2008/09	52	63.3	No data	10.2
2009/10	58	63.4	No data	8.5

Source: South African National Seed Organisation annual reports 2004/05 – 2009/10

NB. Figures for GM seed are for the South African domestic seed market only. Hybrid and Open Pollinated figures included both domestic and international sales, making exact comparisons difficult. However, it gives a good indication of the huge growth in GM maize seed sales in the last 5 years, and the comparative decline of Open Pollinated Varieties.

Figure 2: GM Cotton and GM Soya seed sales in South Africa (% of total sales)

Year	Cotton	Soybean
2004/05	90	52
2005/06	93	83
2006/07	85	85
2007/08	81	78
2008/09	95	88
2009/10	97	95

Source: SANSOR annual reports 2004/05 – 2009/10

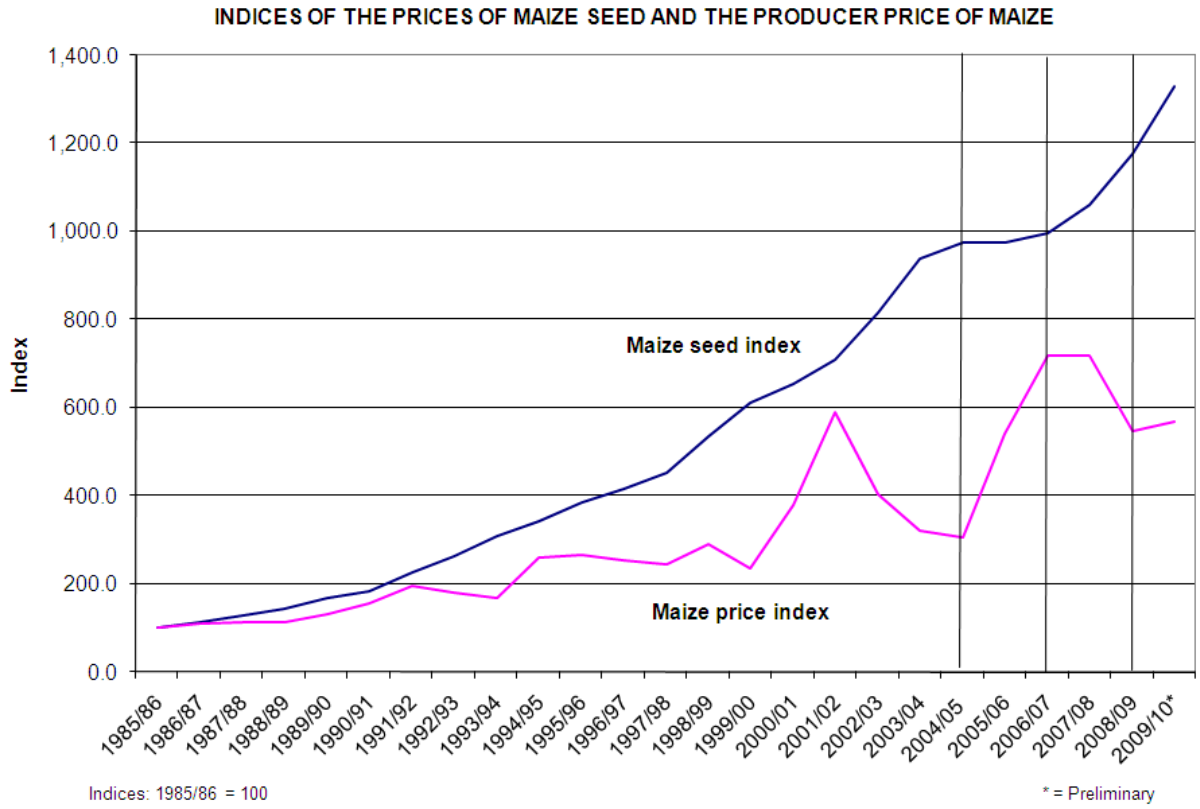
2. Maize Seed prices in South Africa

Since 1994, South Africa's agricultural policy has adapted to accommodate the liberalisation measures of the Bretton Woods institutions. These measures included the removal of direct government controls over imports and exports, lowering of tariffs, dismantling national marketing boards and increasing the role of the private sector in agricultural finance. Tariff structures that emerged after 1994 have generally afforded greater protection to value-added products rather than commodities, resulting in South African farmers having to sell their produce into increasingly oligopolistic markets and buy their inputs from oligopolistic suppliers. The effect on South African farmers has been a marked reduction in their terms of trade.[14] For example, between June 2008 and June 2009 the average price received by local farmers for agricultural produce rose by 6.2%, while the prices paid by farmers for inputs rose by an average of 23.2%.[15]

Figure 3, below, illustrates this dramatically, as since 1985 the price farmers receive for maize has failed to keep up with the price of maize seed. By 1998, Monsanto[16], Syngenta[17] and Pioneer had all established agricultural operations in South Africa, and GM maize cultivars had been introduced into commercial seed markets. In the last decade, even the commodity price booms of 2001/02 and 2006 to 2008 failed to mitigate the increase in maize seed prices.

Between 2006 and 2008 the price of fertiliser in South Africa increased by over 200%. Since most agrochemical inputs are oil based and imported, their price is heavily dependent on the price of oil and the exchange rate. South African producers currently have to contend with a high Rand, and generally weak commodity prices. Even if the global economy picks up, the price of oil will rise correspondingly, therefore offsetting any gains in commodity prices through higher input costs.[18]

Figure 3: Maize seed and the producer price of maize, 1985 - 2010



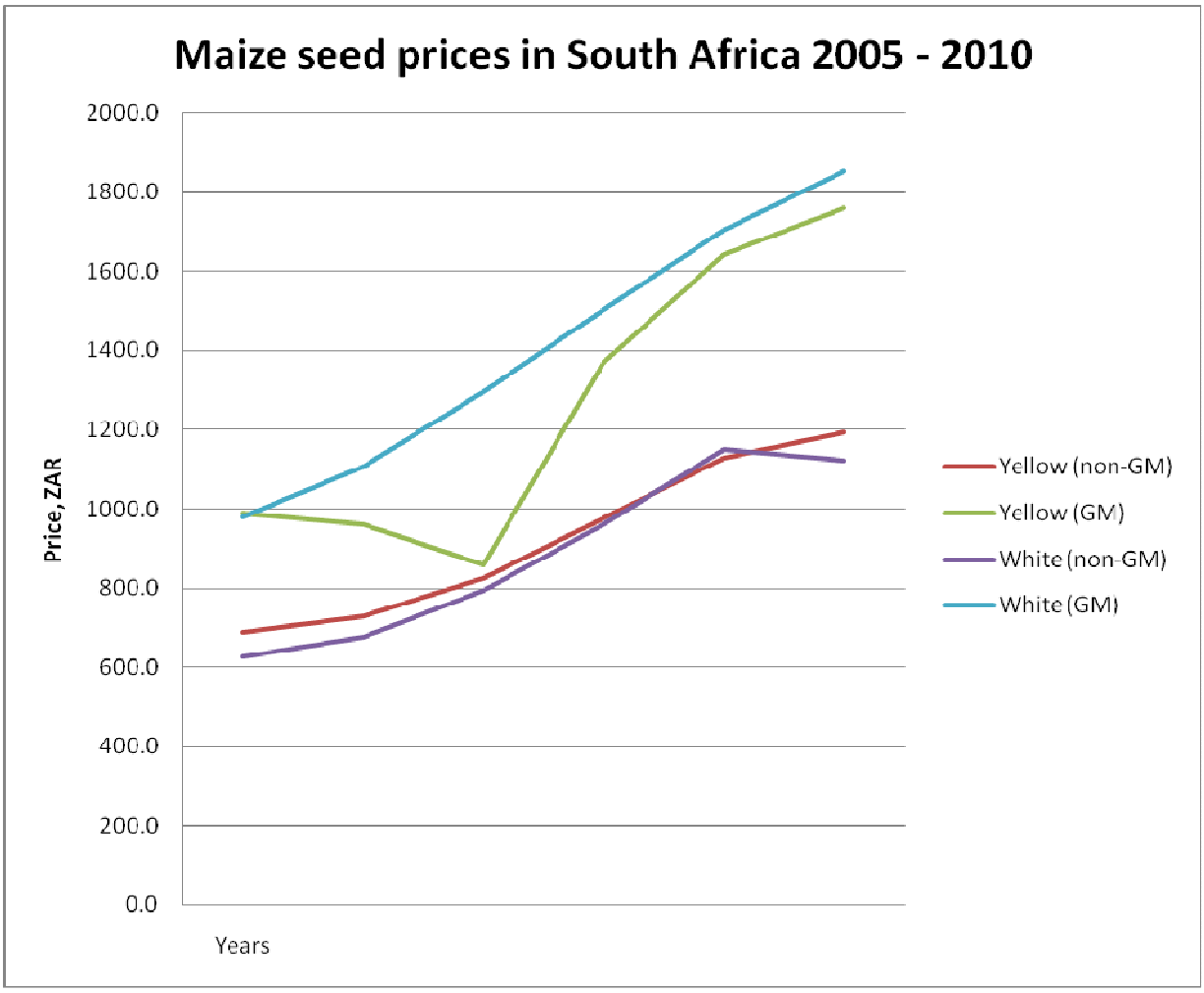
Source: Grain SA

Figure 4: Maize seed prices in South Africa, 2005 – 2010 (Rs)

Type	company	2005	2006	2007	2008	2009	2010	% change 2005 - 2010
Yellow (non-GM)	Pioneer	676.0	725.0	801.0	906.8	979.0	1108.3	39.0
	Link Seed	695.0	691.3	893.0	1193.0	1446.0	1363.0	49.0
	Agricol	646.4	654.4	791.5	928.8	1020.2	1141.9	43.4
	Pannar	738.9	822.1	882.9	1035.4	1250.8	1337.8	44.8
	Monsanto		757.8	758.3	820.4	946.0	1022.0	25.9
	Average	**689.1**	**730.1**	**825.3**	**976.9**	**1128.4**	**1194.6**	**40.4**
Yellow (GM)	Pioneer	813.0	842.0	945.0	1222.0	1376.0	1478.0	43.0
	Pannar	1165.0	1224.0	1466.0	1615.0	2105.0	2187.0	44.0
	Monsanto		813.0	170.0	1273.1	1447.7	1616.1	49.7
	Average	**989.0**	**959.7**	**860.3**	**1370.0**	**1642.9**	**1760.4**	**45.6**
White (non GM)	Pioneer	669.0	705.0	801.0	960.0	1144.0	1245.0	46.3
	Link Seed	584.0	658.0	858.0	968.0	1211.0	940.0	37.9
	Agricol	602.5	605.0	774.2	1008.3	1111.7	1186.7	49.2
	Pannar	648.0	691.0	753.0	837.0	987.0	1059.0	38.8
	Monsanto		719.6	788.2	1026.5	1289.7	1186.5	39.4
	Average	**625.9**	**675.7**	**794.9**	**960.0**	**1148.7**	**1123.4**	**42.3**
White (GM)	Pioneer	810.0	863.0	1042.0	1304.0	1477.0	1574.0	48.5
	Pannar	1150.0	1306.3	1503.0	1700.0	1916.0	2085.0	44.8
	Monsanto		1147.2	1337.9	1503.4	1725.3	1900.0	39.6
	Average	**980.0**	**1105.5**	**1294.3**	**1502.5**	**1706.1**	**1853.0**	**44.3**

Source: Grain SA

Figure 5: Maize seed price increases in South Africa, 2005 - 2010



Source: Grain SA

3. Overview of Pannar Seed

Pannar Seed is South Africa's largest independent seed company, having been in operation since its inception in Greytown, KwaZulu Natal in 1958. It has been a family run business ever since: The current chairman founded the company, while Deon van Rooyen, its managing director, has been with the company for 30 years. Pannar was the first private seed company to introduce its own maize hybrids in South Africa in the 1960s. In the late 1970s it expanded its business into other African countries. After 1990 it was able to further immerse itself into the continent, and presently has five agricultural research stations in Southern Africa, as well as partnerships with some of the continent's most prominent research organizations, including the Kenyan Agricultural Research Institute (KARI), The International Maize and Wheat Improvement Centre's (CIMMYT) Harare station, and the International Institute for Tropical Agriculture (IITA)

in Nigeria, Outside of Africa Pannar also has significant operations (including research stations) in the USA and Argentina.[19] In 2005 Pannar purchased Pau seeds in the US from Bayer.[20]

As well as having one of the world's largest white maize breeding programmes, Pannar is also one of the world's leading private sorghum breeders (75% of all sorghum varieties registered in South Africa are owned by Pannar[21]). Current research in this field also includes white sorghum for the Sudan.[22] The Department of Agriculture, Forestry, and Fisheries (DAFF) 2010 variety list for seed crops lists 369 varieties owned by Pannar, or its subsidiary Stark Ayres.

The company's largest customer base is in the Free State and North West Province, followed by the N12 corridoor stretching from Eastern Gauteng through Mpumalanga to the Mozambique border, then Kwa-Zulu Natal and Limpopo. It focuses on working with small scale farmers in the Eastern Cape and KZN, and is looking to expand this activity into Mpumalanga.

Having met with representatives of Pannar to discuss the proposed acquisition and its potential implications for the sector, we have been able to ascertain that the company is actively engaging with public officials in South Africa, at both national and provincial level, and that it is actively involved in farmer extension services. We applaud the efforts the company is making in this regard. This is a vital service which, along with its rich germplasm and seed holdings, make Pannar an important national asset.

4. Overview of Pioneer Hi-Bred

Pioneer Hi-Bred started operations as the Hi-Bred Corn Company in 1926. By 1949 its annual sales of seed corn had surpassed 1 million units. It had also expanded its operations into Canada. In 1971, the now renamed Pioneer Hi-Bred International had established research stations outside of the United States, and expanded its operations into Western Europe, Central and South America. During the 1970s and 1980 the company opened operations in central Europe and Asia, established Soybean and Sunflower operations, begun hybrid rice breeding in Indian, and had become the largest company by market share in the lucrative North America maize market. In 1989 it organized its first biotechnology team, and introduced its first GM maize and soybean products in 1997.[23]

In 1997 Pioneer Hi-Bred was the world's largest seed company, and DuPont was one of the world's largest chemical companies, with 1998 sales of $25.7 billion. DuPont initially obtained 20% equity in the company in 1997, for $1.7 billion. In October 1999 it purchased the remaining 80% for a further $7.7 billion. The deal gave DuPont's scientists, who in the words of the Wall Street Journal at the time 'have probably had the most success at genetically altering the nutritional attributes of crops', access to the world's largest proprietary seed bank. As Pioneer were a seed company it also gave DuPont another link in the agricultural value chain, between the laboratory and the farmer.[24] Unlike Monsanto, which increased its global seed market share largely through out right acquisitions, Pioneer has entered into a series of customized agreements with some of the largest remaining independent seed companies to share germplasm. These agreements involve co-branding and distribution separate the Pioneer brand.

This strategy is also being extended to other crops, such as soybeans, as well as other countries, including Brazil, Mexico, and South Africa.[25] DuPont also has a 50/50 joint venture with Syngenta called GreenLeaf Genetics to sell foundation seed, which is derived directly from the breeder or parent seed, to other seed companies.[26]

According to the company website, from its headquarters in Iowa, USA, Pioneer markets and sells hybrid maize in nearly 70 countries worldwide ,and operates more than 90 primary research locations. In 2006 seed sales outside of North America passed the $1 billion mark. It's website lists operations in North, Central and South America; Europe; India; China; The Asia Pacific and South East Asian regions; as well as Egypt, Ethiopia, Kenya, Malawi, South Africa, Tanzania, Zambia and Zimbabwe.[27]Pioneer's business in Africa dates back to the 1960s, in the form of an independent producer/distributor agreement that lasted until 1987. In 1991, Pioneer opened its first own research station in Delmas, with sales beginning in 1992. Pioneer's South African operation is its largest in Africa. The company employs 160 people in South Africa, and has approximately 7,000 customers. According to company literature, Pioneer has one full time employee working with small scale farmers. In Africa Pioneer employs over 300 people, and has over 560,000 customers. In 2009 it opened a new research centre in Kenya, and began seed production and conditioning in Zambia.

Pioneer Hi-Bred owns 76 hybrid maize varieties in South Africa, as well as 5 GM soybean varieties (just over 20% of all registered GM soybean varieties in South Africa)[28].The South African Seed Association estimates that in 2009/10 marketing year that 88% of all soybean seed sold in the country was Genetically Modified.[29]It is a subsidiary of the DuPont chemical company, who in 2007 accounted for 15% of the global proprietary seed market. In the same year its seed sales were worth $3.3 billion[30]. While up to date figures are difficult to come by, in 2010 the company was placed 86th on the Fortune 500 list of the worlds's largest public companies, with profits of $1.75 billion.[31] Further, in the first half of 2010 Pioneer's global seed sales experience a 14% increase on the previous year.[32].

5. Scenarios:

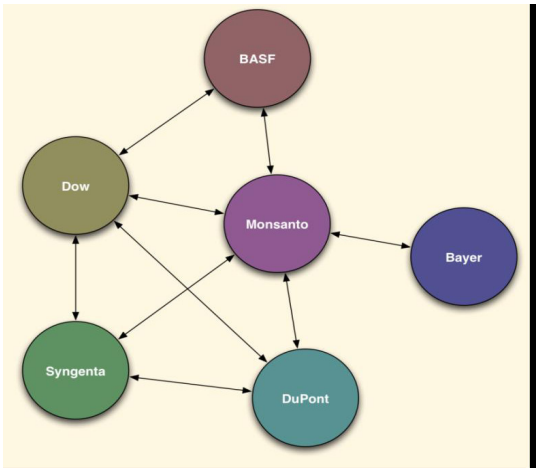
Competition

Globally, the proprietary seed market (brand-name seed subject to exclusive monopoly) accounts for 82% of the commercial seed market. Of the proprietary seed market, 10 multinational companies account for two thirds of its market; Monsanto, DuPont and Syngenta account for 47% of this market. The ETC group 'conservatively' estimated in 2007 that these same three companies controlled 65% of the global proprietary seed market.[33]

These amazing levels of market share and influence have come about not predominantly from endogenous innovation with the firms, but are the result of a spree of mergers and acquisitions that began in the sector in the mid 1990s. For example, by 2008 Monsanto either fully or partially owned 83 seed companies around the world, while Syngenta fully or partially controlled 23 seed companies.

In addition to simple mergers and acquisitions, a spate of cross licensing agreements in the sector has further eroded competition in agri-chemical and seed markets, without attracting the same level of attention and scrutiny that traditional 'M&A's do. For example, in 2007 Monsanto, the world's largest seed company, announced a $1.5 billion collaboration with BASF, the world's largest chemical company, to increase yields and drought tolerance in maize, cotton, canola and soybeans. In 2008, Monsanto and Sygenta, and Syngenta and DuPont all announced cross licensing agreements.

Figure 6: Cross licensing agreements in the agro-chemical and seed industry



Source: Howard (2008)

These high levels of global concentration are also evident from a South Africa perspective. In addition to the information provided on variety ownership, by its own accounts Monsanto had a 50% share in the maize market in 2009. In 2002, Monsanto Pannar and Pioneer had a 90% share of agronomic seeds (maize, wheat and sorghum) in South Africa.

It has been argued that this acquisition is essential in order to provide competition to Monsanto, the world's largest biotechnology seed company, As highlighted in our previous submission, Should Pioneer Hi-Bred's acquisition of Pannar Seed be approved, the multinational company will effectively have control of 52% and 57% of all white GM maize and Yellow GM maize varieties in South Africa respectively. In 2009/10 55% of all maize seed sold in South Africa was GM,[34] This would merely change a monopolistic situation into a duopolistic one, Further, the two companies would still be marketing 29 GM maize varieties in South Africa under license from Monsanto. All this suggests that an investigation into Monsanto's market strength in South Africa is well merited, as is being carried out presently by the US Department of Justice.[35]

Legal

The experience from the United States is indicative of the implications for an agricultural sector dominated by a handful of multi-national corporations. In a distinct departure from traditional US patent law, property rights for privately developed varieties for asexually reproducing plants were granted by the Plant Patent Act of 1930 (PPA). The 1970 Plant Variety Protection Act (PVPA), following decades of lobbying by the domestic seed industry, enshrined property rights to sexual reproduction in plants, including seed germination. At a stroke, the majority of commercial crops were now protected by patent laws for 17 years. However, the PVPA was still limited by two major exemptions: seed saving by farmers and for research purposes.[36]

The *Diamond v Chakrabarty* Supreme Court decision in 1980, which ruled that a genetically engineered bacterium was eligible for patenting 'opened the floodgates for broader definitions of what is patentable', and 'set in motion the trend towards legal acceptance of the commodification…of germplasm'. The *Ex Parte Hibberd* case of 1985 consolidated this position. In it, the U.S. Board of Patent Appeals and Interferences reversed the Patent & Trademark Office (PTO) decision that held that the PPA and PVPA were the only sources of patent protection for plants. After the *Hibberd* decision, plant patents were allowed to be included under the broad category of utility patents, which are generally preferred by plant breeders as they allow the patenting of the individual components of varieties. In *Hibberd*, the claimant made over 260 separate claims for a single item that included DNA sequences and genes. Subsequently, the PTO granted over 1,800 expansive utility patents for germplasm. By the beginning of the 21st century, further court cases brought against US farmers by large seed companies (including Pioneer Hi-Bred), further eroded the previous exemptions of the PPA and PVA.[37]

Since 1980, as the amount of plant process GM patent applications and approvals has increased rapidly, the numbers of companies these patents are being awarded to has diminished just as markedly. Between 1980 and 1984, the USPTO granted 135 such patents, with the top 5 companies in the field accounting for 31.6%. From 2000 to 2004 597 patents were awarded, though the top 5 companies now accounted for 80.5% of the total.

Figure 7: Top 10 applying companies for GM-plant patents 2003 - 2007

USPTO patent applications (total 2992)			EPO patent applications (total 1220)		
Company	Number	Share (%)	Company	Number	Share (%)
Pioneer Hi-Bred	843	28.5	Pioneer Hi-Bred	107	8.8
Monsanto	728	24.6	BASF	105	8.6
Syngenta	167	5.6	Monsanto	101	8.3
BASF	128	4.3	Bayer Crop Science	57	4.7
Bayer Crop Science	89	3.0	Crop Design	36	3.0
CERES INC	74	2.5	Syngenta	28	2.3
Mertec LLC	58	2.0	Unilver	23	1.9
Anix Corporation	49	1,7	Icon Genetics	22	1.8%
Dow AgroScience LLC	48	1.6	Novartis	21	1.7
Delta & Pine Land	39	1.3	Mendel Biotechnology	18	1.5
Total	2223	75.1		518	42.5

NB: Crop design was acquired by BASF in 2006, Icon Genetics by Bayer in 2006, Delta & Pine Land was taken over by Monsanto in 2006

Technology transfer – the Golden Egg?

Pioneer's proposed acquisition of Pannar Seed has been described as a 'win-win' situation, as Pioneer will gain access to Pannar's extensive local and African germplasm collections, while Pannar will benefit from Pioneer's advanced breeding technologies and economies of scale. We sincerely hope the relationship would be reciprocal, though past experiences of this nature in South Africa urge for caution. When Monsanto entered the soya and wheat seed markets in South Africa ten years ago, through the acquisition Sensako and Carnia, it soon scaled down its operations, first in soybeans then in wheat.[38] Commenting on the experiences of Bt cotton farmers in Makhathini, Witt et al note that no technology is 'inserted into a vacuum', and that ecological and political economic contexts must be considered.[39]

From much broader vantage point, The International Assessment of Agriculture Knowledge, Science and Technology for Development (IAASTD) defines the dominant policy model in agriculture globally as 'technology supply push', which propagates 'market-propelled waves of technological change that squeeze farm-gate prices, stimulate farmers to capture economies of scale, deliver high internal rates of return to investments in agricultural research, bur also encourage externalization of significant social and environmental costs.' The report goes further, arguing that the whole system of knowledge production in agriculture 'requires a new approach and worldview to guide development of knowledge, science and technology as well as policies and institutional changes to enable their sustainability' as well as 'the revalorization of traditional and local knowledge and their interaction with formal science'.[40]

Seed and germplasm conservation

The Food and Agricultural Organisation (FAO) of the UN, in a recent report on the plant genetic resources for agriculture (PGRFA), recognises the importance of national gene banks in securing genetic diversity. It also argues that more work needs to be done to document and preserve genetic diversity found in farmers fields, or *in situ.*[41]

Many countries now recognize the importance of preserving non-commercial and wild crop relatives of plants. For example, the European Commission adopted directive (2008/62/EC) in 2008 to 'protect seed varieties of agricultural crops, which may be threatened by genetic erosion', and enable small plant breeding companies to supply local markets with naturally adapted seed varieties. Genebanks and botanical gardens have long been holders of the planet's genetic diversity. According to the FAO the total number of accessions in collections held in genebanks world wide has increased by 20% since 1996, to over 7.4 million. There are now also over 130 genebanks worldwide that hold more than 10,000 accessions, including the 'Doomsday vault', on Svalbard, Norway that opened in 2008 with over 400,000 accessions. Ghana has collected over 9,000 new accessions of legumes, maize, roots and tubers since 1996, while Iran has doubled its holdings in its national gene bank over the same period.[42]

The FAO argues that PGRFA can be strengthened by improving linkages between genebank managers and plant breeders as, globally, public organizations are still the largest single source of plant germplasm used by breeders in national programmes. Since its first report into PGRFA in 1996, the FAO notes a marked decline in public sector plant breeding, which carries an inherent risk to subsistence farmers, as the even where the private sector has stepped into this space, it has focused largely on a few commercial crops for which farmers need to buy seed each season. Very often these crops are not the basis of food security in most developing countries. The recommendations of the 2010 PGRFA report, including the strengthening of national programmes related to PGRFA, and increasing the funding and capacity building of public plant breeding worldwide, including for under-utilised crops and crop wild relatives,[43] will be extremely difficult to achieve in an arena that is seeing ever greater private sector concentration.

In a 2007 study into the conservation and utilization of maize germplasm, a group of experts recognised that 'the genetic germplasm and knowledge of maize constitute and immeasurable treasure for mankind', and that 'the collection and study of accessions of races of maize are unprecedented in man's agricultural heritage'. Bearing this in mind, arguments are put forward that, with adequate safeguards of IPRs, there is no reason why privately developed maize lines should not be made available to publically held collections. In a survey into attitudes towards wheat breeding in South Africa by Monsanto, 54% of respondents argued that the government should bear the cost (as it is ultimately a public benefit), while 23% said seed companies should pay.[44]

Pannar has one of the world's largest white maize breeding programmes. This is crucial as not only is it a significant store of genetic diversity, but white maize is also the staple food for

hundreds of millions of people in Southern and Eastern Africa. In the long term, as average incomes rise, meat consumption increases accordingly. As yellow maize is the primary source of animal feed in South Africa, rising meat consumption could drastically impact on the commercial viability of sustaining such a large white maize breeding programme. According to Deon van Rooyen at Pannar seed, the current ration of white to yellow maize grown in South Africa is 63/35. He surmised that this could ultimately balance out at 50/50 in the foreseeable future. In the face of ever increasing climatic variability, the rich diversity of white maize germplasm that Pannar has created will be vitally important role in ensuring the continuing viability of maize as a staple food nationally, and in the wider region.

Sustainable agriculture?

A recent UNEP-UNCTAD study into organic agriculture in Africa found that in agricultural yields in organic systems do not fall over 'conventional' farming methods (contrary to many assumptions); the vast majority of case studies showed improvements in soil fertility, water supply and biodiversity; and led to improvements in social capital, including more and stronger local social organizations.[45] A team of researchers from the University of Michigan, comparing conventional and organic farming methods in both developing and developed countries came to similar conclusions, though in the developing countries observed yield gains from organic methods were even higher, ranging in factor increases from 1.3 up to 2.9.[46]

The International Assessment of Agriculture Knowledge, Science and Technology for Development (IAASTD) is widely acknowledged as the most comprehensive and rigorous assessment of agriculture to date. The result of three years of study by over 900 leading authorities on the matter, it reached the conclusion that 'technologies such as high-yielding varieties, agro-chemicals and mechanization have primarily benefited the better resourced groups in society and transnational corporations, rather than the most vulnerable ones.' In the words of its director, Professor Robert T. Watson 'If we do persist in business as usual, the world's people cannot be fed over the next century. It will mean environmental degradation, and the gap between the haves and the have-nots will expand.'[47]

Globally, wherever GMOs have been planted on a commercial scale, huge environmental and socio economic problems have been reported. In the United States, farmers who have been planting herbicide tolerant plants for over a decade are now having to return to more traditional manual methods, or more toxic herbicides to combat the emergence of 'super-weeds' that have developed resistance to Glyphosate.[48] Recent shocking research to emerge from Argentina has revealed the serious risk to human health that accompanies the indiscriminate application of Glyphosate that typifies their use.[49] The other major commercial GM 'trait' currently on the market infers resistance to certain insect pests, by inserting a soil bacterium gene into the plant, known as *Bacillus thuringiensis* (Bt). Evidence is emerging from the United States[50] and China[51] that through either the development of resistance by the target organisms, or the emergence of secondary pests, the effectiveness of Bt maize is a short term phenomenon. At the recent UN Convention on Biodiversity (CBD) Conference of the Parties (COP) a paper was presented

showing evidence that even in South Africa insects are starting to develop resistance to Bt maize (which is currently the most widely used GM maize type in the country).[52]

Annexure 1:

Acronyms

Bt	Bacillus thuringiensis
CDB	Convention on Biodiversity
COP	Conference of the Parties
DNA	Deoxyribonucleic acid
EPO	European Patent Office
GM	Genetically Modified
IAASTD	International Assessment of Agriculture Knowledge, Science and Technology for Development
NGO	Non-Governmental Organisation
OPV	Open Pollinated Variety
PBR	Plant Breeders Rights
PGRFA	Plant Genetic Resources For Agriculture
SANSOR	South African National Seed Organisation
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNFAO	United Nations Food & Agricultural Organisation
UPOV	The International Union for the Protection of New Varieties of Plants
USPTO	United States Patent & Trademark Office

Annexure 2: Varieties owned by Pannar Seed

crop	varieties owned	Starke Ayres	total
onion (hyb)	7	3	10
onion (opv)	1	1	2
onion hyb int.day	5	1	6
onion (opv) int.day			0
cauliflower (hyb)	1	4	5
cauliflower (opv)		1	1
Broccoli	0	2	2
Cabbage (hyb)	0	9	9
sweet pepper (hyb)	0	4	4
sweet pepper (opv)	0	1	1
Chilli (hyb)	0	2	2
Chilli (opv)			0
Blue buffalo grass	2	0	2
Makataan	0	1	1
Watermelon (dip hyb)	1	6	7
Watermelon (trip hyb)	0	7	7
Sweet Melon (hyb)	0	8	8
Cucumber (hyb)	0	1	1
Cucumber (tunnel)	0	4	4
pumpkin & squash (hyb)	5	3	8
pumpkin & squash (moschata) (hyb)	1	0	1
Squash	8	1	9
Cocksfoot	1	0	1
Carrot (hyb)	0	8	8
Carrot (opv)	1	1	2
teff	3	0	3
Tall Fescue	1	0	1
soyabean	8	0	8
soyabean (GMO)	10	0	10
Sunflower - Hi Oil (hyb)	32	0	32
Basterraaigras (hyb)	1	0	1
Italian & Westerwolds Ryegrass	9	0	9
Perenial ryegrass	5	0	5
tomato	15	8	23
tomato (opv)	1	1	2

Lucerne	8	0	8
Bahia-/Notatum grass	1	0	1
Drybean	20	0	20
Garden Bean - Dwarf	5	0	5
Rye	2	0	2
Grain Sorghum	37	0	37
Sorghum bicolor x S Sudanense	3	0	3
Sorghum (hyb)	1	0	1
Red Clover	2	0	2
wheat	14	0	14
Triticale	3	0	3
Maize - white (hyb)	25	0	25
Maize - white (GM)	10	0	10
Maize - yellow (hyb)	18	0	18
Maize - yellow (GM)	18	0	18
Sweet Corn	7	0	7
Total	292	77	369

Annex 3: Pioneer Hi-bred, Pannar traits under license from Monsanto

Pioneer Hi-bred, Pannar traits available in South Africa, under license from Monsanto

	Pioneer			Pannar		
Crop	**RR**	**Yield Guard (Bt)**	**stacked**	**RR**	**Yield Guard (Bt)**	**stacked**
yellow maize	32P68 R	Phb33A14 B	32D95 BR	PAN 3P-502R	PAN 3D-432B	PAN 3D-736BR
	32D91 R	33R78 B		PAN 4P-516R	PAN 3D-432B	PAN 3Q-740BR
		32D96 B		PAN 6P-563R	PAN4P-316B	PAN 4P-716BR
		31D48 B		PAN 6Q-508R	PAN 623B	PAN 4P-767BR
					PAN 6Q-308B	PAN 6Q-708BR
					PAN 6236B	
White maize	31M81	32A05 B			PAN 5Q-433B	
		30B95 B			PAN 6Q-445B	
		30Y79 B				
		30D07 B				
soya	95B53 R			A 5409RG		
	96B01 R			PAN 1454R		
				PAN 1583R		
				PAN 1664R		
				PAN 1666R		
				PAN 535R		
				PAN 737R		

Source: websites of Pioneer Hi-Bred and Pannar Seed.

References:

[1] ACB (2009). **Biotechnology, seed and agrochemicals – Global and South African Industry structure and trends.** http://biosafetyafrica.org.za/images/stories/dmdocuments/Biotech-Booklet-11.pdf

[2] Duffield, G. (2008). **Turning plant varieties into Intellectual Property: The UPOV Convention** in Tansey & Rajotte (eds) *The future control of food- A guide to the international negotiations and rules on intellectual property, biodiversity and food security.* Earthscan: London.

[3] http://www.wipo.int/treaties/en/Remarks.jsp?cnty_id=1612C (accessed 02/11/2010)

[4] Kuyek, D (2004). **Stolen seeds: The privatisation of Canada's agricultural biodiversity.** http://www.interpares.ca/en/publications/pdf/stolen_seeds.pdf

[5] Louwaars et al. (2009). **Breeding Business: The future of plant breeding in the light of developments in patent rights and plant breeders rights**

[6] Ibid.

[7] Jones, G (2010). **The GM stacked gene revolution: A biosafety nightmare.** ACB briefing paper. http://biosafetyafrica.org.za/images/stories/dmdocuments/ACB_GM_stacked_gene_revolution.pdf

[8] GRAIN (2009). **The new weapons of genetic engineering.** Seedling. http://www.grain.org/seedling/?id=576

[9] ETC Group (2008). **Who owns nature? Corporate Power and the final frontier in the commodification of life.** http://www.etcgroup.org/en/node/706

[10] Kuyek, D (2004). **Stolen seeds: The privatisation of Canada's agricultural biodiversity.** http://www.interpares.ca/en/publications/pdf/stolen_seeds.pdf

[11] Centre for Food Safety (2007). **Monsanto vs. U.S. Farmers. November 2007 update.** http://www.centerforfoodsafety.org/pubs/CFSMOnsantovsFarmerReport1.13.05.pdf (accessed 03/11/2010)

[12] Pschorn-Strauss, E (2005) **Bt Cotton in South Africa – The case of the Makhatini Farmers,** GRAIN Seedling.

[13] Witt. H, Patel. R & Schnurr, M (2006). **Can the poor help GM crops? Technology, representation & cotton in the Makhathini Flats, South Africa.** Review of African Political Economy No.109:497-513

[14] Vink, N. & Van Rooyen, J. (2009). **The economic performance of agriculture in South Africa since 1994: Implications for food security.** Development planning division working paper series No.17, DBSA: Midrand. http://www.dbsa.org/Research/DPD%20Working%20papers%20documents/DPD%20No17.pdf (accessed 30/08/2010)

[15] Department of Agriculture, forestry and fisheries (2009). **Food price trends amid the global economic slowdown.** DAFF Economic Research Division. http://www.nda.agric.za/docs/Economic_analysis/Food_price_trends.pdf (accessed 01/09/2010)

[16] http://www.biosafetyafrica.net/index.html/images/stories/dmdocuments/ACBMonsantoFactSheet.pdf (accessed 01/11/2010)

[17] http://www.cipro.co.za/products_services/search.asp (accessed 01/11/2010)

[18] Greenberg, S (2010). **Status report on land and agricultural policy in South Africa, 2010.** Institute for Poverty, Land and Agrarian Studies. UWC. http://www.plaas.org.za/pubs/rr/PLAAS_RR40_Greenberg.pdf

[19] Deon van Rooyen, Managing Director, Pannar Seed (Pty) Personal Correspondence. 04/11/2010

[20] ACB (2009). **Biotechnology, seed and agrochemicals – Global and South African Industry structure and trends.**

[21] DAFF variety lists 2010.

[22] Ibid.

[23] http://www.pioneer.com/web/site/portal/menuitem.cc20eec90551c318bc0c0a03d10093a0/ (accessed 1/11/2010)

[24] Lipin. S, Kilman. S, Waren. S **DuPont Agrees to Purchase Seed firm for $7.7 billion**. Wall Street Journal. March 15th, 1999 http://www.biotech-info.net/dupont_agrees.html

[25] Howard, P (2009). **Visualising consolidation in the global seed industry: 1996 – 2008.** *Sustainability* **2009**, *1*, 1266-1287; doi:10.3390/su1041266

[26] Ibid.

[27] http://www.pioneer.com/web/site/portal/menuitem.b96ee68df9eaf318bc0c0a03d10093a0/ (accessed 01/11/2010)
[28] DAFF varieity holders list 2010
[29] SANSOR (2010).
[30] ETC Group (2008). **Who owns nature? Corporate Power and the final frontier in the commodification of life.** http://www.etcgroup.org/en/node/706
[31] http://money.cnn.com/magazines/fortune/fortune500/2010/full_list/
[32] http://www2.dupont.com/Media_Center/en_US/daily_news/july/article20100728.html
[33] ETC Group (2008). **Who owns nature? Corporate Power and the final frontier in the commodification of life.** http://www.etcgroup.org/en/node/706
[34] SANSOR 2009/10 Annual Report.
[35] **Comments of DuPont/Pioneer Hi-Bred International regarding agriculture and anti-trust enforcement issues in our 21st century economy.** http://www.pioneer.com/CMRoot/Pioneer/media_room/DuPont_DOJ_USDA_Comments.pdf
[36] Stein, H (2005). **Intellectual Property and genetically modified seeds: The United States, trade and the developing world.** Northwestern journal of technology and intellectual property. Vol. 3, no.2. http://www.law.northwestern.edu/journals/njtip/v3/n2/4/Stein.pdf (accessed 03/11/2010)
[37] Ibid.
[38] ACB (2009). **Biotechnology, seed and agrochemicals – Global and South African Industry structure and trends.** http://biosafetyafrica.org.za/images/stories/dmdocuments/Biotech-Booklet-11.pdf
[39] Witt. H, Patel. R & Schnurr, M (2006). **Can the poor help GM crops? Technology, representation & cotton in the Makhathini Flats, South Africa.** Review of African Political Economy No.109:497-513
[40] **Biotechnology and sustainable development: Findings from the UN-International Assessment of Agricultural Knowledge, Science and Technology for development.** Pesticide Action Network. http://www.panna.org/sites/default/files/GMOBriefFINAL_2.pdf
[41] FAO (2010). **The second report on the state of the world's plant genetic resources for food and agriculture – Synthetic report.** Commission on Genetic Resources for Food and Agriculture of the FAO
[42] Ibid.
[43] Ibid
[44] ACB (2009). **Biotechnology, seed and agrochemicals – Global and South African Industry structure and trends.** http://biosafetyafrica.org.za/images/stories/dmdocuments/Biotech-Booklet-11.pdf
[45] UNEP-UNCTAD (2009). **Organic agriculture and food security in Africa.**
[46] Ho, MW (2009). **Scientists find organic agriculture can feed the world.** Third World Network Briefing paper, no.55.
[47] http://www.panna.org/sites/default/files/GMOBriefFINAL_2.pdf
[48] Jones (2010). **The GM stacked gene revolution – a biosafety nightmare.** ACB briefing paper. http://www.biosafetyafrica.net/index.html/images/stories/dmdocuments/ACB_GM_stacked_gene_revolution.pdf
[49] Robinson, C (2010). **Argentina's Roundup Human tragedy.** Institute of science in society. http://www.i-sis.org.uk/argentinasRoundupHumanTragedy.php
[50] Jones (2010)
[51] GRAIN (2010). **GM in the public eye in Asia.** http://db.zs-intern.de/uploads/1274424063-atg-26-en.pdf
[52] Van den Berg (forthcoming). **Bt-Resistant target pests – Quick occurrence in South Africa.** Abstract presented at the European Network of Scientists for Social and Environmental Responsibility (ENSSER) conference: Advancing the Understanding of biosafety – scientific findings. Nagoya, 7-9 October 2010.