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ACB's Submission of objection to commodity clearance of Pioneer Hi-Bred RSA (Pty) Ltd 's genetically modified soybean DAS-814419-2 x DAS-44406-6

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Key Concerns

- The stacked soybean DAS-81419-2 x DAS-44406-6 has been genetically engineered to confer tolerance to three herbicides, 2,4-D, glufosinate ammonium and glyphosate. This gives rise to grave concerns around the combinatorial effects of multiple herbicides that pose great risks to human and animal health, water bodies and the environment.
- The Pioneer Hi-Bred's application for commodity clearance of DAS-81419-2 x DAS-44406-6 soybean will further maintain and expand the current corporate captured market for soybean in South Africa - particularly for the industrial animal sector - and the creation of new markets for outdated and toxic herbicides such as 2,4-D, glufosinate ammonium and glyphosate. Furthermore, once this approval is granted, it will entrench the legitimisation of the seed variety, that will increase the burden of pesticides borne by South African food systems and society.
- The DAS-81419-2 x DAS-44406-6 soybean is intended for importation of GM soybean largely for animal feed. The knock on effect on humans consuming animals fed with GM grain in technological production systems that are designed for increased use of toxic pesticides is cause for great concern. This is worrisome particularly as there is limited to no testing of imported GM grains for all herbicide residues, due to the lack of capacity or resources on the part of government health authorities, responsible for inspection and monitoring of imported foodstuffs.
- Pesticide residues will contaminate South Africa's food systems, and exacerbate our current public health crises. This is extremely problematic given that there are no comprehensive, independent and transparent environmental, socio-economic and food safety assessment studies of the combined effects of 2,4-D, glufosinate, glyphosate and their adjuvants, on human and animal health, in the public domain.
- We continue to reiterate and urge the South African authorities to ensure that comprehensive, independent and transparent environmental, socio-economic and food safety assessment of the combined effects of 2,4-D, glufosinate, glyphosate and their adjuvants are done and that this must be factored into decision making. And that these should be conducted by a multidisciplinary team of experts appointed by governments, in proper public consultation and in an open and transparent manner by way of public hearings. Having said this, we reiterate our objection and opposition to GM based agriculture and trade systems and urge the South African government to ban all toxic herbicides including 2,4-D and phase these out of our food systems, including transitioning out of GM-based agriculture towards agro-ecologically diverse farming and food systems.

Introduction

The African Centre for Biodiversity (previously 'Biosafety') (ACB) was established in 2003 and registered in 2004. ACB carries out research, analysis, capacity and movement building, and advocacy, and shares information to widen awareness and catalyse collective action and influence decision-making on issues of biosafety, agricultural biodiversity and farmer managed seed systems (FMSS) in Africa. The ACB's work both informs and amplifies the voices of social movements fighting for food justice and food sovereignty in Africa.

The ACB has played an essential watch-dog role in regard to GM approvals in South Africa for the last 17 years, adding substantially to the discourse about the scientific assessment of GMOs, as well as issues of socio-economic impacts and democratic decision-making, through lodging substantive comments/objections in regard to numerous GM applications.

In this regard, we have a substantial track record in regard to our engagement with GM applications linked to the 2,4 herbicide tolerant seeds/crops. In these years, the Department of Agriculture, Land Reform and Rural Development (DALRRD) previously known as, Department of Agriculture, Forest and Fisheries (DAFF), has approved and granted a number of permits on 2,4-D (maize and soya) for commodity clearance (asynchrony approvals), trial release and most recently in October 2019, the Executive Council of DALRRD approved the general release of three 2,4-D maize varieties; DAS 40278-9, NK603xDAS 40278-9 and MON89034xTC1507xNK603xDAS40278-9¹.

2,4-D is one of the two herbicide ingredients in the infamous war chemical 'Agent Orange' used to devastating effect during the Vietnam war, leaving in its wake generations of children affected by birth defects and cancers (ACB, 2019a). The World Health Organisation's International Agency for Research on Cancer (IARC) classifies the Chlorophenoxy herbicide group, as 'possibly carcinogenic to humans'. In 2012, the ACB launched a petition against its import intended for the South African food supply. In 2017, the ACB published a briefing on the environmental releases of the three 2,4-D GM maize varieties for field trials, exposing the failures of the GM varieties in field trial performances, to increase yields and the risks of increased pesticide cocktails to be used on South African food systems and environment (ACB, 2017a).

In regard to the GM soybean tolerant to 2,4 D, the ACB is on record for objecting to a commodity clearance application for Dow Agrosciences, application on 2,4-D event, DAS 68416-4 in 2012, where we raised concerns around, flaws in food safety studies, risks posed by both 2,4-D and glufosinate ammonium as a result of residues on GM soybeans, posing unacceptable risks to humans and animals (ACB, 2012). The ACB also further raised huge concerns on the lack of testing of chemical residues on imported grain in South Africa by the government or any other independent bodies.

In 2012, the ACB further objected to the commodity clearance application of single event DAS-44406-6, whose import permit was granted to Dow AgroSciences by South African GM regulators. DAS-44406-6 is

¹ See Permit list <https://www.dalrrd.gov.za/doiDev/sideMenu/biosafety/doc/GMO%20permits%20-%20for%20publishing%202019.pdf>

engineered for tolerance to three herbicides, 2,4-D, glufosinate ammonium and glyphosate. The ACB alongside other organisations in their submissions to the UN High Commissioner for Human Rights, Special Rapporteur on the Right of Everyone to the Enjoyment of the Highest Attainable Standard of Physical and Mental Health², also raised key concerns on the combinatorial effects of multiple herbicides in the event, and the risk this poses to human and animal health, water bodies and environment among others.

In this submission, the ACB objects to the approval for commodity clearance of Pioneer Hi-Bred RSA's DAS-81419-2 x DAS-44406-6 soybean into the South African food system. According to the International Service for the Acquisition of Agri-biotech Applications (ISAAA) database website, DAS-81419-2 x DAS-44406-6 soybean has been approved in Argentina, Brazil, Colombia, Japan, Mexico, South Korea and Taiwan for direct use as food, feed and processing, between 2016 and 2017. Cultivation is currently taking place only in two countries- Argentina and Brazil. At the moment, the single event DAS-44406-6 has already been approved in South Africa for commodity clearance since 2013, while the DAS-44406-6, and stacked DAS-81419-2 x DAS-44406-6 varieties are currently undergoing field trials in South Africa (since 2018). The commodity clearance application thus raises grave concerns as it also further signifies a move towards the legitimisation and full adoption of this GM variety and its associated toxic chemicals in the country, for further commercial cultivation.

Summary of Application

According to the application submitted by Pioneer Hi-Bred RSA (Pty) Ltd;

DAS-81419-2 x DAS-44406-6 soybean was produced by conventional breeding methods by crossing two genetically modified soybean lines containing events DAS-81419-2 and DAS-44406-6.

DAS-81419-2 soybean was modified by the insertion of three gene cassettes containing: the *cry1Fv3* and *cry1Ac* (*synpro*) genes from *Bacillus thuringiensis* as well as the *pat* gene from *Streptomyces viridochromogenes*. DAS-81419-2 soybean was produced using *Agrobacterium*-mediated transformation of soybean cells using plasmid pDAB9582.

DAS-44406-6 soybean was genetically modified by insertion of three gene cassettes containing: the *2mepsps* gene from *Zea mays*, the *aad-12* gene from *Delftia acidovorans*, and the *pat* gene from *Streptomyces viridochromogenes*. DAS-44406-6 soybean was produced using *Agrobacterium* mediated transformation of soybean cells using plasmid pDAB8264.

Consequently, DAS-81419-2 x DAS-44406-6 soybean expresses Cry1F and Cry1Ac proteins which confer protection against certain lepidopteran soybean pests. DAS-81419-2 x DAS-44406-6 soybean also expresses PAT, 2mEPSPS and AAD-12 proteins which confer tolerance to glufosinate-ammonium, glyphosate and 2,4-D herbicides, respectively.

² See letters to the UN Special Rapporteurs and the UN High Commissioner on Human Rights https://www.acbio.org.za/sites/default/files/2015/02/UN-SR-health-letter-24-D-28_11_2012.pdf, https://www.acbio.org.za/sites/default/files/2015/02/UN-SR-health-letter-24-D-19_03_2013.pdf and https://www.acbio.org.za/sites/default/files/2015/02/UN-High-Commissioner-on-Human-Rights-OHCHR-19_03_2013.pdf

Furthermore, both single events DAS-81419-2 and DAS-44406-6 have been risk assessed and authorised for import, use in food and feed in South Africa. Commodity clearance approvals were granted in 2013 and 2016 for DAS-44406-6 and DAS-81419-2 soybean, respectively. Additionally, DAS-81419-2 x DAS-44406-6 soybean has been authorized for trial release in South Africa since 2018.

GM Soybean in South Africa

Soybeans are oilseed crops produced in South Africa, driven mainly by the demand for protein feed in the animal feed industry, led by the industrial poultry industry. Yet, human consumption accounts for merely 3% of total soya consumption (DALRRD, 2019).

GM soybeans were first approved for commercialisation in SA in 2001 and by 2006, 75% of the soybean crop grown was GE (USDA, 2020). Currently GM soybean production represents 22% - of plantings in South Africa with more than 95% soybeans planted to GM seeds (USDA, 2020). During the 2019/20 production season, 705,000 hectares of soybeans were planted, producing 1.3. million tons (USDA, 2020).

According to DALRRD, nineteen single and double stacked events of GM Soybean have been approved for commodity clearance³. While only one event GTS40-3-2 has been approved for general release, and this is currently under cultivation in the country⁴.

Compared to GM maize, South Africa imports very little soybean when one considers that in 2018/19, the country imported 9,098 tons of non-GM maize, mainly from Zambia and Mozambique(USDA, 2020). During October/November 2020, 175,000 MT of Monsanto's GM (GTS40-3-2) soybean was imported by ETC and Glencore trading companies, from the USA for food and feed⁵. Previous shipments of GM soya into the country in the past few years have included other GM events such as Monsanto's (now Bayer) stacked variety MON89788 XMON87701 and BASF's CV127 varieties (ACB, 2016). CV127 is tolerant of the imidazolinone class of pesticides which have been associated with cancer of the colon and bladder and its use is restricted in the European Union (Greenpeace, 2015 & ACB, 2016).

Entrenching and expansion of corporate control over our food systems

GM herbicide tolerant (HT) soybean production is linked to the multiple multi-billion-dollar GM seed, pesticide and grains' trade for the industrial animal feed, meat and fast food sectors. According to the biotech industry, 48% of the global biotech crop area – approximately 91.9 million hectares) was under GM soybean production in 2019 (ISAAA, 2020). Brazil currently leads in GM soybean production at 35.1 million

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https://www.dalrrd.gov.za/doc/Commodity%20Clearance%20Approvals%20_GMO%20Act%2015%201997.pdf

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https://www.dalrrd.gov.za/doc/General%20Release%20Approvals%20%20_GMO%20Act%2015%201997%20%202018.pdf

⁵ <https://www.dalrrd.gov.za/daaDev/sideMenu/biosafety/doc/GMO%20permit%20list%20-%202020.pdf>

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hectares, followed by Argentina and the United States (ISAAA, 2020). These three countries dominate soybean production and export. These GM soya beans are cultivated by a small number of countries on very large-scale private plantations, responsible for 80% of the production (IISD, 2020).

When it comes to global grain traders, historically, four major corporations called the 'ABCD': Archer Daniels Midland (ADM), Bunge, Cargill and Louis Dreyfus Commodities, account to 70% of the global market share (Wiggerthale, 2021). Current figures are hard to come by but, in 2016, the six leading agricultural commodity traders, including Cargill, Wilmar International Limited, Louis Dreyfus commodities, Bunge, COFCO group and Archer Daniels Midland had combined revenues of \$444 billion, far exceeding the combined global market value for seeds, pesticides, farm equipment and fertilizers (ETC Group & IPES Food, 2017). At the same time, Bunge continues to top as the world's largest exporter of soybeans (Reuters, 2019). Thus, Bunge has the ability to import massive amounts of GM soy products into South Africa from Latin America either for use in South Africa or for re-export to neighbouring African countries. Bunge, Cargill and the Noble Group, have also invested massively in new soya bean crushing facilities in South Africa in the past (ACB, 2016). New players since the mid-20th century such as Glencore, has a market share of 10%.

Further to that, there are three major commercial grain silo owners, namely Afgri, NWK and Senwes, who own 73% of the available storage capacity within the national grain storage market. Other important players are VKB and Suidwes. In 2011, the ACB raised concerns around the merger between Senwes and Bunge's joint venture and the imbalances and inequalities in the food system embedded in the venture.

Not only will DAS-81419-2 x DAS-44406-6 soybean for commodity clearance, ensure that the grain and oil traders continue to maintain and expand the current captured market for animal feed derived from GM HT crops but will further create new markets for outdated and toxic herbicides such as 2,4 D, glufosinate, and glyphosate. Thus the ACB continues to call for a ban on all toxic herbicides including 2,4-D and a phasing out of our food systems. Further, it is important that there are deeper conversations and democratic decisions around the future directions of agricultural policy and food in the country - towards a from chemical input-intensive weed management, and agriculture in general, to agroecological methodologies

Increasing chemical burden and risk to human and animal health

Although the application for commodity clearance approval of DAS-81419-2 x DAS-44406-6 soybean is not intended for cultivation in South Africa, it is destined for human and animal consumption. According to the applicant, there will be no difference in the use of DAS-81419-2 soybean compared to conventional soybean already in the market. This is based on the claim that the GM soybean carries the same nutritional value as the conventional bred. GM proponents have long claimed that genetic engineering will deliver healthier and more nutritious "biofortified" crops. However, no such nutritionally enhanced GM foods are available in the marketplace. In some cases, GM foods have been found to be less nutritious than their non-GM counterparts due to unexpected effects of the genetic engineering process such in the case of GM soy found to have 12–14% lower levels of cancer-fighting isoflavones than non-GM soy.⁶

⁶ http://www.panna.org/sites/default/files/GMO_Myths_and_Truths_1.3.pdf

It is particularly concerning that this GM soybean will be sprayed with 2,4 D and glufosinate ammonium and glyphosate that pose unacceptable risks to humans and animals. Glufosinate is classified as showing reproductive toxicity and there are indications of additive or synergistic effects of the residues from spraying.⁷ It is also linked to neurological and reproductive/developmental problems. It is known to mimic a natural brain chemical, called glutamate, and has been associated with interrupting brain cell signalling, resulting in learning and memory problems, structural abnormalities in the brain and impaired brain development in laboratory animals. In humans, paternal exposure has been linked to developmental defects in children. Due to concerns over the toxicity of glufosinate, its use is currently restricted in the EU. Further, in 2017⁸. France withdrew the licence for glufosinate, citing uncertainty over its effects on health.

ACB has submitted numerous objections, wherein we provided comprehensive assessments of the health risks associated with 2,4-D (ACB, 2012, 2017a, 2017b). Nonetheless, it is worth repeating that 2,4-D has been heavily linked with cancer of the white blood cells, is cytotoxic, mutagenic and belongs to a herbicide group classified as 'possibly carcinogenic to humans' by the World Health Organisation. The use of 2,4-D is banned completely in Norway, Sweden and Denmark.⁹ In Canada several provinces have restricted 2,4-D's use.

Glyphosate is one of the world's most ubiquitous agro-chemicals, and traded as an active ingredient in the global herbicide market. Glyphosate formations can induce cell death in human umbilical, embryonic and placental cells¹⁰. Cell exposure to glyphosate can trigger programmed cell death and can impair this process in human embryonic kidney cells¹¹. In terms of animal health, transgenic DNA fragments have been detected in goats fed on GM soybean. Further, fragments were also detected in tissues and organs of nursed kids, hinting at potential gene transfer through milk¹². Several countries have undertaken scientific re-evaluation of glyphosate, with some initiating partial bans with most recent including Thailand, Malawi and France in 2019 and in June 2020, Mexico announcing that the country will phase out glyphosate by 2024, citing human health and environmental concerns. Until the 2024 ban, the country will gradually reduce use of the herbicide¹³. In 2019 ACB joined other civil society organisations and citizens across Africa in a campaign calling upon their governments to issue an immediate ban on all use of glyphosate and glyphosate-based herbicides (GBHs), take adequate measures to ensure other more toxic chemicals do not replace glyphosate; and initiate a shift from chemical, input-intensive agriculture to agroecological farming systems (ACB, 2019b). Tragically, these pleas have fallen on deaf ears.

Our worries are compounded by the fact that herbicide residues on imported grains are not being tested in SA by our government or anyone else for that matter. The biosafety regulation has great deal of shortcomings, particularly when it comes to associated chemical use with GMOs. This issue has been and continues to be taken up by the ACB with the relevant environmental authorities.

⁷ <http://ec.europa.eu/food/plant/pesticides/eupesticidesdatabase/public/eventhomepagelanguageEN>

⁸ <http://www.testbiotech.org/en/node/505>

⁹ http://www.davidsuzuki.org/publications/downloads/2011/Bilan_reglementations_pesticides_2011_EN_VF.pdf

¹⁰ <https://pubmed.ncbi.nlm.nih.gov/19105591/DOI:10.1021/tx800218n>

¹¹ <https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/abs/10.1002/jat.2712>

¹² <https://www.sciencedirect.com/science/article/pii/S1751731110000728>.

¹³ <https://www.baumhedlundlaw.com/toxic-tort-law/monsanto-roundup-lawsuit/where-is-glyphosate-banned/>

Food and Safety Risks

With animals being the likely primary consumers of the 2,4-D GM soyabean variety, there are health risks as a result of evidence of transgenic DNA being taken up by animal organs of the animals that consume GM grain. This has occurred in sheep, pigs, and rainbow trout (ACB, 2012). GM DNA from soya was detected in the blood, organs and milk of goats. The implications of this, and the knock on effect on humans consuming GM fed animals, is cause for great concern. Given the lack of testing of imported grain for pesticide residues, and that all imported GM maize and soybean grains are commingled with other GM varieties containing other traits, South Africans are being subjected to ingesting a cocktail of pesticide residues.

Further to that, there are limitations in regard to the 'maximum residue levels' (MRLs)¹⁴ set for pesticides, by the government – in terms of the regulations (Foodstuffs, Cosmetics and Disinfectants Act, 1972) - which are not stringent enough to ensure the safety of South African food products. In 2017 the ACB raised concerns surrounding the approval process and the acceptable daily intake (ADI)¹⁵ doses (ACB, 2017b).

Lack of assessment of combined effects of 2,4-D, glufosinate, glyphosate and their adjuvants

GM varieties and imports continue to entrench the current unsustainable and inequitable industrialisation of the global food system, including and especially in SA. It is an ecocidal project, that is destroying biodiversity and polluting our bodies, animals, food, lands and water with toxic war chemicals. The COVID 19 pandemic has exposed the fragilities of our food systems and has highlighted the devastating impacts of industrial agricultural expansion, genetically uniform agricultural systems and the global agri-food trade.

Despite this warning from the COVID 19 pandemic, there continues to be an increase in the application of GMOs of the 2,4-D variety, for introduction into the South African farming and food systems. This trend is extremely worrying especially in the light of the approval of 2,4-D maize varieties for cultivation in South Africa and now the 2,4-D soybean GM seeds/crops under trials. South Africa's agricultural and food system as it is, is already heavily burdened with the increased use of pesticide due to an industrial, chemical-based crop production system. The country has registered more than 500 pesticides and is one of the four largest importers of pesticides in sub-Saharan Africa (ACB, 2017b). Further to this, publicly available data already links pesticide use in South Africa to severe health problems, including birth defects, endocrine disruption and organophosphate poisoning, as well ecotoxicological effects in aquatic organisms, exposing our already stressed and declining biodiversity to environmental hazards and the contamination of South Africa's limited water supplies (Quinn et al., 2011, & ACB, 2016). Thus this worrying trend not only requires a shift from the current approach in the agricultural systems but creates an urgent need for a process towards decolonising and de-corporatising our food systems and a shift towards sovereignty.

¹⁴ 'maximum residue level' is the legal limit for pesticide residues in food for human consumption and animal feeds, when a pesticide is applied in accordance with its authorised conditions of use. MRLs are generally based on formulas that determine the actual level of pesticides found in the diet, and the accepted daily intake (ADI) of a specific pesticide.

¹⁵ The ADI is the safety limit determined by regulators, based on long term toxicity studies on the active ingredient of the pesticide, and, in theory, is meant to represent safe levels to be consumed over an entire lifespan

The DAS-81419-2 x DAS-44406-6 soybean will continue to add to the list of toxic chemicals that will contaminate South Africa's food systems, and exacerbate public health vulnerabilities. This is extremely problematic especially where there are no comprehensive, independent and transparent environmental, socio-economic and food safety assessment of combined effects of 2,4-D, glufosinate, glyphosate and their adjuvants, in the public domain, as recommended by the ACB and other civil society organisations already in 2012/2013¹⁶. A further request then, was for public hearings, and despite the granting of this request, , ACB's concerns were largely dismissed and we were in fact ambushed by the biotech industry (ACB, 2017a). In 2019, the ACB further requested for an environmental impact assessment to be conducted prior to the approval of 2,4-D maize varieties, but to date this hasn't been done and is not in the public domain.

Conclusion

The ACB firmly requests that the Executive Council rejects the approval of DAS-81419-2 x DAS-44406-6 soybean to prevent it from entering South Africa.

The ACB further calls for a ban on all toxic herbicides including 2,4-D and a phasing out of our food systems from GM based agriculture towards agro ecologically diverse farming and food systems built on economies that protect small producers, protect nature and provides linkages between smallholder farmers, farmer seed systems that will ensure the ultimate conservation of our biodiversity.

¹⁶ See Letters to the UN Special Rapporteur and the UN High Commissioner for Human Rights https://www.acbio.org.za/sites/default/files/2015/02/UN-SR-health-letter-24-D-28_11_2012.pdf, https://www.acbio.org.za/sites/default/files/2015/02/UN-SR-health-letter-24-D-19_03_2013.pdf and https://www.acbio.org.za/sites/default/files/2015/02/UN-High-Commissioner-on-Human-Rights-OHCHR-19_03_2013.pdf

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