SUBMISSION BY THE AFRICAN CENTRE FOR BIODIVERSITY
TO THE REGISTRAR (ACT 36 OF 1947)
DEPARTMENT OF AGRICULTURE, LAND AFFAIRS AND RURAL DEVELOPMENT

REVIEW AND DEREGISTRATION OF TOXIC PESTICIDE 2,4-D

in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act 36 of 1947

AFRICAN CENTRE
FOR BIODIVERSITY

NOVEMBER 2023

Table of Contents

African Centre for Biodiversity

The African Centre for Biodiversity (ACB), registered in 2004, is a research and advocacy organisation working towards food sovereignty and agroecology in Africa, with a focus on biosafety, seed systems and agricultural biodiversity. The ACB has been engaging with biosafety issues for the past 20 years at national, regional and international levels. It has a long and established track record of interacting with the Executive Council (EC) established in terms of the Genetically Modified Organisms Act. This includes the ACB having submitted more than 60 objections in respect of various applications for approval, involving diverse genetically modified organisms (GMOs) and associated herbicides, for various purposes. It has also participated in various stakeholder consultations over the years as well as having been involved in administrative appeals and a review to the High Court involving Monsanto's GM drought-tolerant maize.

This submission is supported by the following organisations: **to be added before submission**

Summary of requests

The Registrar is requested to institute a review in terms of section 4 of Act 36 of 1947 into the continued registration of 2,4-D. In this review, interested and affected parties must be afforded an opportunity to make submissions advocating for the cancellation of the registration or the restriction of the uses to which 2,4-D can be put.

All information furnished to the Registrar in its decision to authorise and renew the authorisation of 2,4-D shall be made available to members of the public, with sufficient opportunity given to consider this information to enable informed public participation.[1]

The ACB reiterates that 2,4-D must be classified as a highly hazardous pesticide and for it to be banned along with other pesticides that are highly hazardous.[2]

Contextual background

The ACB has opposed applications for authorisation of the use of several GM events that are engineered to resist herbicides such as 2,4-D and glyphosinate ammonium in South Africa.

In 2012, Dow Chemical applied to the South African GMO authorities for approval to import its GM soybean DAS-68416-4 for human consumption, animal feed and processing. This GM variety is genetically engineered to withstand liberal applications of Dow's toxic chemical herbicide 2,4-D and Bayer CropScience's glufosinate-ammonium.

In its opposing submissions, the ACB highlighted various regulatory failures including:

- paucity of the data received;
- fatal flaws in Dow's food safety studies; and
- risks posed by both 2,4-D and glufosinate-ammonium.

The ACB submissions highlighted the particular concern that GM soybeans will contain residues of both 2,4-D and glufosinate-ammonium and pose unacceptable risks to humans and animals. These risks 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.[3]

In 2019, three GM maize varieties developed by Corteva (formally Dow AgroSciences) – genetically engineered to tolerate the toxic and highly hazardous chemical 2,4-D – were approved for commercial cultivation in SA, despite many years of opposition by civil society, with the ACB playing a leading role.

The GM varieties are:

- DAS 40278- 9
- NK 603 x DAS 40278-9
- MON 89034 x TC 1507 x NK 603 x DAS 40278-9

The main reason highlighted for this having occurred was the fact that the Cartagena Protocol on Biosafety and South Africa's GMO Act 15 of 2007 restrict risk assessments to the GMO itself, to the exclusion of associated chemicals. This is deeply concerning, as the extensive commercial cultivation of these GM maize crops will undoubtedly increase the use of the toxic chemical, 2,4-D in agriculture, depositing

1. *Heatherdale Farms v Deputy Minister of Agriculture* 1980 (3) SA 476 (T) (486F-G). It has long been recognised that a fair decision-making procedure requires (among other things) that a person 'must be put in possession of such information as will render his [or her] right to make representations a real, and not an illusory one'. Hoexter points out that there is 'a crucial link between the amount and type of information disclosed to an affected person and the quality of his or her opportunity to make representations'. Hoexter, Administrative Law in South Africa, at p371, referring to by the Constitutional Court in *Bengwenyama Minerals v Genorah Resources* 2011 (4) SA 113 (CC) paras 69-74.
2. ACB submission: https://acbio.org.za/gm-biosafety/24d-highly-hazardous-pesticide-south-africa. In April 2022, after sustained pressure from civil society, including the Women on Farms' Double Standards' campaign to ban 67 pesticides in SA that are banned in the European Union, the South African government announced its intention to phase out active ingredients and formulations that meet the criteria of carcinogenicity, mutagenicity, and reproductive toxicity categories 1A or 1B of the Global Harmonised System (GHS) of Classification and Labelling of Chemicals. See https://www.groundup.org.za/article/farmworkers-want-67-pesticides-banned/
3. https://acbio.org.za/gm-biosafety/new-generation-gm-herbicide-crops-poison-cocktail-ailing-agriculture/

high amounts of unsafe residues in the environment. This will pose unacceptable risks to the health of farmers, farm workers, consumers, biodiversity and the environment at large. Despite industry efforts claiming the safety of 2,4-D, there is a large body of evidence indicating major health effects, as more fully explored in this submission. When sprayed on crops, 2,4-D is a highly volatile chemical that turns into a gaseous vapour, able to move across vast areas due to pesticide drift, depositing in surface and groundwater and threatening the life of exposed vegetation and animals. Further, runoff that ends up in local rivers and water systems threatens the health of aquatic life also more fully dealt with in this submission.

Within this context, it is deeply disturbing that despite increasing evidence of the significant environmental (and ultimately economic) impacts of GMOs, their associated chemicals, and the production system itself, none of these has ever triggered an environmental impact assessment (EIA), provided for under Section 5(2)(a)(iii) of the GMO Act, read together with the provisions of the National Environmental Management Act 107 of 1998 (NEMA).[4]

In 2021, the ACB opposed the authorisation of the application for commodity clearance of the stacked soybean DAS-81419-2 x DAS-44406-6, which has been genetically engineered to confer tolerance to three herbicides: 2,4-D, glufosinate-ammonium and glyphosate. It raised concerns regarding the combinatorial effects of multiple herbicides that pose great risks to human and animal health, water bodies and the environment.[5]

The DAS-81419-2 x DAS-44406-6 soybean is intended for the importation of GM soybeans largely for animal feed. In its submissions, the ACB highlighted the fact that the authorisation would foster 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 these outdated and toxic herbicides. There is limited to no testing of imported GM grains for all herbicide residues, due to the lack of capacity and resources on the part of government health authorities responsible for the inspection and monitoring of imported foodstuffs.

The ACB warned that pesticide residues will contaminate South Africa's food systems and exacerbate our current public health crises – a highly problematic issue given that there are no comprehensive, independent and transparent environmental, socio-economic and food safety assessment studies of the combined effects of these agrotoxins and their adjuvants, on human and animal health, in the public domain. Thus, the ACB reiterated its call to the South African authorities to ensure that a comprehensive, independent and transparent environmental, socio-economic and food safety assessment of the combined effects of 2,4-D, glufosinate-ammonium, glyphosate, and their adjuvants be undertaken, and for the results thereof to be factored into decision making, utilising a multidisciplinary team of experts appointed by governments to consult the public in a transparent manner by way of public hearings. It reiterated its objection and opposition to GM-based agriculture and trade systems and urged 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 agroecologically diverse farming and food systems. The ACB has called for 2,4-D to be classified as a highly hazardous pesticide and for it to be banned along with other pesticides that are highly hazardous.[6]

4. https://acbio.org.za/wp-content/uploads/2023/03/2-4-d-gm-maize-regulatory-anomalies-regarding-gmos-associated-pesticides.pdf
5. https://acbio.org.za/wp-content/uploads/2022/04/objectioncommodity-pioneer-gm-soybean-das-8149-2-x-das.pdf
6. ACB submission: https://acbio.org.za/gm-biosafety/24d-highly-hazardous-pesticide-south-africa. In April 2022, after sustained pressure from civil society, including the Women on Farms' Double Standards' campaign to ban 67 pesticides in SA that are banned in the European Union, the South African government announced its intention to phase out active ingredients and formulations that meet the criteria of carcinogenicity, mutagenicity, and reproductive toxicity categories 1A or 1B of the Global Harmonised System (GHS) of Classification and Labelling of Chemicals. See https://www.groundup.org.za/article/farmworkers-want-67-pesticides-banned/

Executive summary

2,4-D[7] was first registered for use in 2007. It is currently banned in ester form and restricted from use in several parts of South Africa.[8]

The ACB is not privy to the information that underpinned the Registrar's decision to register 2,4-D for use as an agricultural chemical in SA or to renew such authorisation. However, upon its registration in SA as an agricultural remedy in 2007, evidence has emerged that demonstrates that 2,4-D presents a potentially **significant risk to public health and the environment**. The World Health Organization's International Agency for Research on Cancer (WHO IARC) has determined that there is a risk that 2,4-D causes cancer in the form of non-Hodgkin's lymphoma (NHL). It has also confirmed that there is strong evidence that it causes oxidative stress and moderate evidence that it is an immunosuppressant. Oxidative stress is linked to immunosuppression and cancer. There are also findings in laboratory animals that indicate that 2,4-D is a probable endocrine disruptor. A recent study showed that it impacts adversely on childhood auditory development.

The findings in much of the health research referred to above are based on populations in Europe, Japan, and North America, which have a lower disease burden than SA. This adverse health burden would likely result in stronger associations between 2,4-D and ill health if the studies were undertaken in SA.

The use of this herbicide is widespread and growing due to reliance on extensive cultivation of GM maize varieties that have all been genetically engineered to withstand the spraying of multiple toxic herbicides such as glyphosate, glufosinate-ammonium, and 2,4-D.

2,4-D is an immunosuppressant and SA is a country with the highest rate of HIV/Aids in the world. As such, these GM varieties pose a threat to the state's health programme, with its massive expenditure on bringing down the levels of mortality from HIV/Aids. Not only does 2,4-D pose a threat to public health but also to the environment, particularly in regard to the protection and promotion of biodiversity.

2,4-D is used as a weed killer on a massive scale globally in maize, soya and other crop cultivation that relies on GM seeds. The seeds are modified to enable the crop to withstand the herbicide and as a consequence of the widespread growing of GM crops together with this herbicide, as well as glyphosate and other agrotoxins, superweeds have developed that threaten both agriculture and biodiversity.[9]

The use of herbicides like 2,4-D has contributed to the promotion of large-scale agriculture using GM crops. In SA, around 2 million hectares of GM maize is grown and several approvals of GM maize events (varieties) resistant to the chemical 2,4-D have been approved for commercial cultivation. Maize is a staple food, with the majority of people consuming maize at least once a day. Further to this, enabling the cultivation of GM crops on a wide scale, 2,4-D also indirectly contributes to the risks and consequences associated with GM agriculture generally.

The ACB has for many years resisted the importation and authorisation for the cultivation of GM crops, through several strong objections setting out the grounds for the rejection of the applications. These objections, as well as petitions to the government and parliament; participation in parliamentary hearings; letters to the Minister of Environment

7. Denotes all herbicides containing formulations of 2,4-Dichlorophenoxyacetic acid (2,4-D), which is an herbicide and secondarily a plant growth regulator. Formulations include esters, acids and several salts, which vary in their chemical properties, environmental behaviour, and to a lesser extent, toxicity. The salt and ester forms are derivatives of the parent acid. Unless otherwise stated, the discussion in this submission refers to the acid form: http://npic.orst.edu/factsheets/24Dgen.html
8. 2,4-D (dimethylamine salt) is banned in parts of the magisterial districts of Camperdown, Pietermaritzburg and Richmond. Aerial application in KwaZulu-Natal was banned in 1991 – Government Notice No. R 2370 of 27 September 1991.
   2,4-D esters were withdrawn from all agricultural uses in the Western Cape in 1980. Banned in KwaZulu-Natal in 1991. Use is not supported, as per the label. Government Notice No. R 2370 of 27 September 1991.
   2,4-DB (sodium salt): banned in parts of the magisterial districts of Camperdown, Pietermaritzburg and Richmond. Aerial application in KwaZulu-Natal was banned in 1991 -– Government Notice No. R 2370 of 27 September 1991.
9. Attack of the Superweeds. Herbicides are losing the war – and agriculture may never be the same again. By H. Claire Brown. Published Aug. 18, 2021. Updated June 15, 2023 – New York Times. https://www.nytimes.com/2021/08/18/magazine/superweeds-monsanto.html;

and appeals to the United Nations (UN) High Commission for Human Rights and UN Special Rapporteurs have been supported by civil society groups. During the course of this work, the ACB has recorded the continuous failure of Dow AgroSciences to provide the requisite information to illustrate the safety of GM maize products.

In making regulatory decisions, the Registrar is obliged to take into account all relevant considerations, including relevant information, and failure to do so renders the decision reviewable under the Promotion of Administrative Justice Act 3 of 2000 (PAJA). The power to authorise chemicals is given to the Registrar under Act 36 of 1947, together with the power to review the chemicals in the public interest.

This implies a duty to:

- review registrations when new information that might have a bearing on the public interest comes to light, and
- adopt a precautionary approach, when undertaking the review.

Alternatively, if the scientific information referred to above has been taken into account in renewals of 2,4-D registrations, it is submitted that the Registrar has failed to take a precautionary approach as required by the NEMA and international law. The content of the precautionary principle, and its basis in law, is set out in Section 5(iii) of the submission. More particularly, it is submitted that the Registrar has to date not taken sufficient action to protect vulnerable persons, especially farm workers, children, pregnant women, and the developing foetus.

The State has a constitutional duty to 'respect, protect, promote and fulfil' the rights in the Bill of Rights, which include the right to life and the right of everyone to an environment that is not harmful to their health or well-being. Furthermore, in all matters concerning the care, protection and well-being of a child, the State has a legal duty to apply the standard that the child's best interest is of paramount importance. Finally, the State has a legal duty to take all reasonable, positive steps to prevent foreseeable harm from herbicide chemical exposure. This duty arises from the Constitution's Bill of Rights, Section 24, which states that everyone has the right to an environment that is neither harmful to their health nor well-being, and to have the environment protected through reasonable legislative and other measures that prevent pollution and ecological degradation. This duty arises particularly in light of the State's prior conduct of registering 2,4-D as an agricultural remedy for sale, distribution and use in SA – in so doing, creating a potential source of danger through exposure to 2,4-D and consequent dangers to health, particularly for children. The relevant constitutional principles are discussed in Section 5(ii).

The Registrar not only has a duty to take reasonable measures to protect health in terms of the constitution but also has a statutory discretion to review and withdraw the permission granted to use an agricultural remedy, in the public interest. Act 36 of 1947 provides as follows:

4. **Cancellation of registration.**
– (1) The registrar may cancel the registration of any fertilizer, farm feed, agricultural remedy, or stock remedy at any time if he is satisfied – ....(e) that it is contrary to the public interest that such fertilizer, farm feed, agricultural remedy, or stock remedy, shall remain registered; ...

This discretion must be exercised constitutionally – through reasonable measures that protect health and the environment. The potentially carcinogenic effects, coupled with immunosuppressant and other effects of 2,4-D, pose a significant potential threat to public health. In the public interest, the Registrar needs to act now in reviewing its license, rather than waiting for several years until the current licenses are due for renewal.

In reviewing the registration, where evidence of significant potential harm exists, even if there is scientific uncertainty, a precautionary approach is required. The ACB will submit that the growing use of 2,4-D and evidence of its potential harm triggers a duty on the Registrar to review the registration and remove it from the market.

Overview

This submission petitions the Registrar of Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies to review the registration of **all** agricultural remedies containing 2,4-D, in terms of section 4(1)(e) of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act 36 of 1947, with a view to the cancellation of their registration.

Based on our review, this submission requests the Department of Agriculture to undertake a comprehensive evaluation of the use of 2,4-D as a herbicide and to take all reasonable measures, where necessary in conjunction with other government Departments, to protect human health and the environment. Specific recommended measures are set out in Section 6 below.

2,4-D is a selective systemic phenoxy herbicide that mimics the plant growth regulator indole-3-acetic acid (also known as auxin) and is used to control the growth of broadleaf weeds, weedy trees and brush, on turf, forests and woodlots (conifer release and forest site preparation); terrestrial feed and feed crops; and industrial non-food sites (non-cropland). The different forms of 2,4-D (acid, amine salts and esters) are formulated as emulsifiable concentrate/emulsion, solution, suspension, soluble or wettable granules, granules and pellets. Products containing 2,4-D can be applied by ground equipment or by air.[10]

2,4-D is registered for agricultural and household use in SA. Following the WHO toxicity classification of pesticides, 2,4-D is currently registered by the Department of Agriculture as a Class II 'moderately hazardous' pesticide. This classification does not, however, take account of the full spectrum of toxicity evidenced in recent scientific studies, as will be discussed in this submission.

Since its introduction in 1945, 2,4-D has been widely used to control weeds in agriculture, forestry, and urban and residential settings. Risks of exposure to 2,4-D can arise as a result of:

- dietary exposure;
- residential exposure to the chemical post application; for example, when the chemical is used as a weed killer on lawns and parks;
- occupational exposure; for example, during mixing/loading liquids for aerial/chemigation and ground boom application; mixing wettable powder for ground boom application; aerial application and application by backpack sprayer; high-pressure hand wand and hand-held spray or duster.

2,4-D is routinely found in non-target areas where it affects biodiversity. For example, in a review of scientific literature on 2,4-D in 2018, findings demonstrate that 2,4-D is present in surface water of regions where its usage is high. The highest concentrations of 2,4-D were detected in soil, air and surface water surrounded by crop fields.[11]

Section 2 of this submission summarises recent scientific evidence supporting a total ban on the use of 2,4-D in SA. Health impacts include those on the immune and reproductive systems and early childhood development, as well as being a potential cause of oxidative stress and cancer.

2,4-D is moderately toxic to small mammals and birds, slightly toxic to fish and aquatic invertebrates, and its ester forms can be highly toxic to fish and other aquatic life.[12]

An overview of some of the regulatory developments concerning 2,4-D in foreign jurisdictions is contained in Section 2 of the submission.

10. www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management/public/protecting-your-health-environment/questions-answers-final-decision-evaluation-2-4-d.html
11. Islam F, Wang J, Farooq MA, et al. Potential impact of the herbicide 2,4-dichlorophenoxyacetic acid on human and ecosystems. Environ Int. 2018 Feb;111:332-351. doi: 10.1016/j.envint.2017.10.020. Epub 2017 Dec 6. PMID: 29203058. https://pubmed.ncbi.nlm.nih.gov/29203058/
12. https://www.epa.gov/ingredients-used-pesticide-products/24-d

Health impacts: international context

Extensive international scientific research leads to the conclusion that 2,4-D presents a risk of significant potential harm to human health and the environment.

Some of its most significant potential impacts on health are discussed below, including that 2,4-D has been found to be possibly carcinogenic and there is strong evidence that it is an immunosuppressant. It is associated with reproductive damage in males and auditory damage in the developing child.

Several countries have restricted its use, and it has been banned for aerial spraying in parts of SA.[13] While this is not a comprehensive analysis of global restrictions, it does provide an indication of regulatory approaches in several jurisdictions.

In Australia, specifically Tasmania, users of 2,4-D must apply for a permit for use during only the period 15 September to 15 April, to try and minimise the risk. Other states in Australia have taken a similar approach. There are also strict regulatory controls on its use during these periods and permits will only be granted after consideration of several factors, such as:

- distance between the target area and susceptible crops;
- application method, e.g. boom spray, spot spray, or wiper application; and
- availability of alternative herbicides or weed control methods.[14]

In Canada, a re-evaluation of 2,4-D has placed restrictions on its use; for example, by buffer zones to protect adjacent non-target vegetation.[15] The European Union (EU) sets very stringent permissible water concentrations for 2,4-D, in order to keep it out of drinking water. The EU legal limit for 2,4-D in drinking water is 0.10 microgram/litre, whereas the WHO Guideline limits for 2,4-D in drinking water, is 30 micrograms/litre. **This is 300 times the EU legal limit**.[16]

Potential significant impacts

1. Cancer

There is evidence of an association between non-Hodgkin's lymphoma (NHL), a form of cancer, and exposure to 2,4-D. In 2015, the WHO IARC confirmed its 1987 classification of 2,4-D as a group 2B, a possible human carcinogen.[17]

Overview of studies to date

In 2018, IARC published a comprehensive overview of carcinogenic risks of 2,4-D.[18] In coming to this conclusion, factors that contribute to cancer; namely, NHL – a type of cancer of the lymph nodes – were considered, including oxidative stress and immunosuppression. The conclusion reached was that the evidence that 2,4-D induces oxidative stress that can operate in humans is *strong*. The evidence that 2,4-D causes immunosuppression is *moderate* and the evidence that it is genotoxic and modulates receptor activity is weak.[19] Based on the above overview, the conclusion was drawn that 2,4-D is *possibly carcinogenic to humans* (*Group 2B*).[20]

13. See footnote 7.
14. https://nre.tas.gov.au/agriculture/agvet-chemicals/prohibited-and-restricted-agricultural-chemical-products/restrictions-on-the-use-of-2-4-d-herbicides
15. https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management/public/protecting-your-health-environment/questions-answers-final-decision-evaluation-2-4-d.html#why
16. https://www.hse.ie/eng/health/hl/water/drinkingwater/faq-pesticides.pdf
17. Smith AM, Smith MT, La Merrill MA, Liaw J, Steinmaus C. 2,4-dichlorophenoxyacetic acid (2,4-D) and risk of non-Hodgkin lymphoma: a meta-analysis accounting for exposure levels. Ann Epidemiol. 2017 Apr;27(4):281-289.e4. doi: 10.1016/j.annepidem.2017.03.003. Epub 2017 Mar 31. PMID: 28476329; PMCID: PMC6336441.
18. DDT, Lindane, and 2,4-D / IARC Working Group on the Evaluation of Carcinogenic Risks to Humans (2015: Lyon, France) (IARC monographs on the evaluation of carcinogenic risks to humans ; volume 113) (IARC, 2015)
19. IARC, 2015- page 479
20. Id page 480. It stated: "6.1 Cancer in humans: There is inadequate evidence in humans for the carcinogenicity of 2,4-dichlorophenoxy- acetic acid (2,4-D). There is limited evidence in experimental animals for the carcinogenicity of 2,4-dichloro- phenoxyacetic acid (2,4-D) . Overall evaluation 6.3 Overall evaluation 2,4-Dichlorophenoxyacetic acid (2,4-D) is possibly carcinogenic to humans (Group 2B)"

The study of 2,4-D as a potential cause of cancer has been extensive and at least two meta studies have been undertaken. The first in 2015[21] considered eight studies and concluded that there was no clear association overall. However, a later study in 2017[22] pointed out that this study did not specifically examine high-exposure groups. The 2017 study concluded a systematic review and meta-analysis of the peer-reviewed epidemiologic studies of the associations between 2,4-D and NHL, with a particular focus on high-exposure groups, and evaluations of heterogeneity, dose-response and bias. It concluded that, overall, the findings provide new evidence for an association between NHL and exposure to the herbicide 2,4-D. It stated:

2,4-Dichlorophenoxyacetic acid (2,4-D) is one of the most used selective herbicides in the world. A number of epidemiology studies have found an association between 2,4-D exposure and NHL but these results are inconsistent and controversial. A previous meta-analysis found no clear association overall but did not specifically examine high-exposure groups. We have conducted a systematic review and meta-analysis of the peer-reviewed epidemiologic studies of the associations between 2,4-D and NHL, with a particular focus on high-exposure groups, and evaluations of heterogeneity, dose-response, and bias. A total of 12 observational studies, 11 case-control studies, and one cohort study, were included. The summary relative risk for NHL using study results comparing subjects who were ever versus never exposed to 2,4-D was 1.38 (95% confidence interval (CI), 1.07–1.77). However, in analyses focusing on results from highly exposed groups, the summary relative risk for NHL was 1.73 (95% CI, 1.10–2.72). No clear bias based on study design, exposure assessment methodology, or outcome misclassification was seen. Overall, these findings provide new evidence for an association between NHL and exposure to the herbicide 2,4-D.

While the United States Environmental Protection Agency may have concluded as far back as 2007 that there was a lack of sufficient evidence to establish a link between 2,4-D exposure and cancer, it is currently undertaking a 15-year registration review[23] for 2,4-D and related compounds and could change this conclusion.

2. Oxidative stress

Extensive research during the last two decades has revealed the mechanism by which continued oxidative stress can lead to chronic inflammation, which in turn could mediate the most chronic diseases including cancer and diabetes, as well as cardiovascular, neurological and pulmonary diseases.[24] Studies have shown increases in oxidative stress in maize farmers where 2,4-D was in use.[25] Sunscreen enhances the negative effect of 2,4-D, which is a concern for farm workers and others in Southern Africa. One study found that sunscreen increases dermal penetration of 2,4-D by over 60%, from an average penetration of 54.9% to 86.9%.[26]

3. Immunosuppressant

The WHO IARC states that the evidence that 2,4-D causes immunosuppression is '*moderate*.'[27] This is significant for at least two reasons: the first is because of the link between immunosuppression and cancer; and the second is because of the prevalence of HIV and Aids in SA.

4. Impacts on auditory function in infants

Prenatal exposure to the herbicide 2,4-D has been found to be associated with deficits in auditory processing during infancy.[28]

5. Haemal, liver, and kidney impacts

2,4-D has been associated with liver effects in a human case report; in rats and mice; and with reproductive toxicity in males in some studies in rats.[29]

21. Goodman JE, Loftus CT, Zu K. 2,4-Dichlorophenoxyacetic acid and non-Hodgkin's lymphoma, gastric cancer, and prostate cancer: meta-analyses of the published literature. Ann Epidemiol. 2015;25(8):626-36.e4. PubMed PMID: 26066538.
22. See footnote 16
23. https://www.epa.gov/pesticide-reevaluation
24. Oxidative stress, inflammation, and cancer: How are they linked?:Simone Reuter, Subash C. Gupta, Madan M. Chaturvedi, and Bharat B. Aggarwal-https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2990475/
25. For example: Lerro CC, Beane Freeman LE, Portengen L, Kang D, et al. A longitudinal study of atrazine and 2,4-D exposure and oxidative stress markers among iowa corn farmers. 24 January 2017.https://doi.org/10.1002/em.22069
26. Pont AR, Charron AR, Wilson RM, Brand RM. Effects of active sunscreen ingredient combinations on the topical penetration of the herbicide 2,4-dichloro-phenoxyacetic acid. Toxicology and Industrial Health. 2003;19(1):1-8. doi:10.1191/0748233703th1720a
27. IARC, 2015 page 479
28. Silver MK, Shao J, Li M, Ji C, Chen M, Xia Y, Lozoff B, Meeker JD. Prenatal exposure to the herbicide 2,4-D is associated with deficits in auditory processing during infancy. Environ Res. 2019 May;172:486-494. doi: 10.1016/j.envres.2019.02.046. Epub 2019 Mar 1. PMID: 30851698; PMCID: PMC6511332.
29. IARC, 2015 page 480

6 . Reproductive health
Men who work with 2,4-D are at risk for abnormally shaped sperm and thus fertility problems; the risk depends on the amount and duration of exposure and other personal factors.[30]

7. Impacts on neurological health
Evidence of developmental neurotoxicity of chlorophenoxy herbicides, in particular 2,4-D, is discussed in several published journal articles.[31]

Studies have shown that 2,4-D can reduce growth rates, induce reproductive system problems, produce changes in appearance or behaviour, and could cause the death of non-target species including plants, animals and microorganisms. It is also known as an endocrine disruptor, affecting developmental processes even at low concentrations.[32]

According to Regulation No. 1272/2008 of the EU on classification, labelling and packaging of substances and mixtures, 2,4-D is classified as having category 1 impacts regarding both skin irritation and eye damage, category 4 for acute toxicity, category 3 for specific target organ exposure – single exposure, and category 3 for being hazardous to aquatic environments.

8. Biodiversity
Apart from the impacts set out above, 2,4-D is associated with significant adverse impacts on biodiversity and the environment.

2,4-D and other herbicides, such as glyphosate, used in conjunction with GM crop plants, are contributing to the development of superweeds that threaten biodiversity, agriculture and the biotech industry itself. Weed resistance to herbicides, especially multiple-herbicide resistance, poses a serious threat to global food production.[33] For example, in the US a weed called Palmer amarynth[34] has been shown to resist multiple herbicides and is considered to pose a serious threat to global food production. (Herbicide-resistant weeds are generally less of a concern on organic farms, but these make up less than 1% of total U.S. acreage.) An article in the New York Times summarised the concerns as follows:

It's hard to estimate exactly how much damage has already been wrought by herbicide resistance; the weeds are gaining ground faster than scientists can survey them. But research published in 2016 by the Weed Science Society of America[35] found that uncontrolled weeds could cause tens of billions of dollars of crop losses every year. Bob Hartzler, a retired weed scientist at Iowa State University, estimates that the tipping point when weed killers cease to be effective on some problematic species, including Palmer amaranth, is just five to 10 years away. "There's general consensus among most weed scientists that the problems we see are just going to continue to accelerate," he says. "And that's why we're sort of pessimistic that we can continue this herbicide-only system."[36]

South African context

Factors specific to Southern Africa

SA is the largest pesticide user in sub-Saharan Africa.[37] The extensive studies referred to above regarding the health impacts of 2,4-D rely largely on populations in Europe and North America, where poverty, malnutrition, and disease levels are generally

30. The effects of workplace hazards on male reproductive health- USA National Institute for Occupational Safety and Health. 1996 updated in 2014 - https://stacks.cdc.gov/view/cdc/21443
31. Bjørling-Poulsen, M., Andersen, H.R. & Grandjean, P. Potential developmental neurotoxicity of pesticides used in Europe. Environ Health 7, 50 (2008). https://doi.org/10.1186/1476-069X-7-50; Rosso SB, Cáceres AO, de Duffard AM, Duffard RO, Quiroga S. 2,4-Dichlorophenoxyacetic Acid Disrupts The Cytoskeleton And Disorganizes The Golgi Apparatus Of Cultured Neurons. Toxicol Sci. 2000 Jul;56(1):133-40. doi: 10.1093/toxsci/56.1.133. PMID: 10869461. https://pubmed.ncbi.nlm.nih.gov/10869461/
32. Islam F, Wang J, Farooq MA, Khan MSS, Xu L, Zhu J, Zhao M, Muños S, Li QX, Zhou W. Potential impact of the herbicide 2,4-dichlorophenoxyacetic acid on human and ecosystems. Environ Int. 2018 Feb;111:332-351. doi: 10.1016/j.envint.2017.10.020. Epub 2017 Dec 6. PMID: 29203058. -https://pubmed.ncbi.nlm.nih.gov/29203058/
33. https://acbio.org.za/gm-biosafety/new-generation-gm-herbicide-crops-poison-cocktail-ailing-agriculture/
34. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7841332/
35. https://wssa.net/2016/05/wssa-calculates-billions-in-potential-economic-losses-from-uncontrolled-weeds/
36. https://www.nytimes.com/2021/08/18/magazine/superweeds-monsanto.html
37. Ilzé Horak, Suranie Horn, Rialet Pieters. Agrochemicals in freshwater systems and their potential as endocrine disrupting chemicals: A South African context,Environmental Pollution. Volume 268, Part A, 2021, 115718. https://doi.org/10.1016/j.envpol.2020.115718.

significantly lower than is the case among black, and particularly rural, South Africans (see table below). Also, levels of enforcement of labels in SA are weak compared to developed countries, which results in widespread contamination by pesticide drift, including of herbicides such as 2,4-D. Exposures to 2,4-D are likely to be higher, and health impacts and outcomes more extreme, in SA than in well-regulated jurisdictions, where public health levels are far higher. These factors are critical to the Registrar in exercising discretion in reviewing the future registration of 2,4-D and the application of a precautionary approach.

Non-compliance with labels

It is important to note that one of the bases for considering 2,4-D 'safe' in jurisdictions such as the US is the proviso that labels are complied with.[38] In developed countries such as in Europe, North America and Japan, labels are more stringent than they are in SA, relying on restrictions on aerial spraying to prevent exposure to non-target areas. For example, on SA's 2,4-D label, under 'spray drift management' there are no requirements for droplet size, whereas in countries such as Canada[39] and the US[40] there are detailed provisions for droplet size given on the labels. Managing droplet size for aerial spraying of pesticides and herbicides can contribute to reducing spray drift to non-target areas.

In SA, labelling is far vaguer and more difficult to enforce, resulting in widespread contamination by 2,4-D. This outcome is demonstrated for example in a study in a maize-dominated agricultural area in the North West Province in SA that looked at surface water sources, which were screened for the presence of Cry1Ab, glyphosate and 2,4-D, using enzyme-linked immunosorbent assays (ELISAs).[41] 2,4-D was detected at all the sites. The significance of the report was stated by the authors:

- This report is the first on the presence of glyphosate, 2,4-D, and Cry1Ab in the South African aquatic environment;
- concentration of 2,4-D in South African surface waters exceeds the European guideline for drinking water, including a risk to people using these water sources;
- these preliminary results highlight the need to regularly monitor for the presence of glyphosate, 2,4-D, and Cry1Ab in water resources in SA.

It is a well-known fact that there is widespread non-compliance with label requirements for preventing drift to non-target areas in the application of agricultural chemicals in SA.[42] A 2019 study of the Krom, Breede, and Hex river watersheds,[43] using passive water samplers, detected 248 chemicals, including 187 pesticide compounds in river water samples, in a number of typical fruit farming areas in the Western Cape. This depicts the scale of the problem of pesticide drift very clearly. Many of the chemicals detected are banned in other countries.

It follows that compliance with labels cannot be assured in the case of 2,4-D in SA at the current time.

Representativity of health studies and SA's disease burden

Where foreign studies have found a low correlation between exposure to 2,4-D and health impacts, in most cases they have relied on populations in Europe and North America, where levels of poverty, malnutrition and disease are generally significantly lower than is the case among black communities, and particularly rural South Africans (see table below). Their findings therefore would not be automatically applicable to South African rural communities. Given SA's disease burden, additional caution is

38. The USA EPA states that ester forms of 2,4-D can be highly toxic to fish and other aquatic life but that 2,4-D products can be safely used by following label directions. https://www.epa.gov/ingredients-used-pesticide-products/24-d
39. http://www.cdms.net/ldat/ldEL8000.pdf
40. https://www3.epa.gov/pesticides/chem_search/ppls/002217-00002-20210818.pdf
41. Horn, S., Pieters, R., & Bøhn, T. (2019). A first assessment of glyphosate, 2,4-D and Cry proteins in surface water of South Africa. *South African Journal of Science*, 115(9/10). https://doi.org/10.17159/sajs.2019/5988
42. Lou Curchod, Christelle Oltramare, Marion Junghans, Christian Stamm, Mohamed Aqiel Dalvie, Martin Röösli, Samuel Fuhrimann. Temporal variation of pesticide mixtures in rivers of three agricultural watersheds during a major drought in the Western Cape, South Africa, Water Research X, Volume 6, 2020,100039. https://doi.org/10.1016/j.wroa.2019.100039.
43. Out of the 248 analysed compounds (187 pesticide compounds and 61 transformation products or TPs), 34 parent compounds (18% of the analysed active ingredients) and 19 TPs (31% of the analysed TP) were detected (Table S4 of the SI). The 34 pesticide compounds detected above the limit of detection (LOD) consisted of 13 fungicides, 12 herbicides, and nine insecticides (Fig. 3). Out of the 96 pesticide compounds that have been reported on the spray records, 35 compounds were covered by the analytical method. These included six out of the eight dominating compounds in the spraying records (Tables S3 and S4 of the SI). Only the fungicide mancozeb and the herbicide glyphosate, which are hardly stable in the environment or require particular analytical methods, were not covered (paragraph 3.2.2).

Table 1. Disease prevalence and food insecurity between countries

Health indicator	SA	US	UK	Canada	Global
Alcohol consumption per 1000 population[45]	9.45	9.97	11.45	8.81	
Foetal alcohol	Highest prevalence in the world				
New HIV infections per 1000 uninfected population[46]	4.19	0.27	0.96		
Life expectancy[47]	65.3	78.5	81.4	82.2	72.3[48]
Numbers unable to afford a healthy diet (2021)[49]	39.6 million	4 million	0.3 million	0.2 million	

required when licensing the continued use of this chemical and when reviewing its current use.

SA's colonial and apartheid legacy has resulted in a significant health burden, particularly among black communities and particularly rural South Africans. A study in 2013 indicated that there are still high levels of malnutrition and undernutrition in South Africa, as well as HIV Aids, related to the Apartheid legacy.[44]

Poverty, malnutrition, HIV/AIDS, alcoholism and foetal alcohol syndrome, are all widespread, and in the case of HIV AIDS and foetal alcohol syndrome are **the highest levels in the world**. This disease burden would likely correlate with higher health impacts of chemicals such as 2,4-D, especially in immunosuppressed sub-populations such as those who are HIV-positive.

The table above compares statistics on prevalence of certain diseases and food insecurity in various countries, demonstrating the significant disease burden in SA.

Specific factors of disease burden likely to increase impact of 2,4-D

(a) 2,4-D and immunosuppression

SA has the world's highest rate of HIV /Aids – a fatal disease affecting the immune system. About 13% of the population was living with HIV in 2022.[50] It is also the single largest cause of death in the country.[51] Widespread use of immunosuppressive herbicides such as 2,4-D on crops, where farm workers live and work, accompanied by high levels of pesticide drift, could significantly impact HIV/Aids sufferers in these areas. Furthermore, the widespread use of 2,4-D stands to undermine efforts to bring the disease under control through massive expenditure by the Department of Health.

(b) Poverty and exposure to 2,4-D

Ongoing poverty and historic dispossession have also resulted in high rates of malnutrition. SA has an estimated poverty rate of 28%, which is equivalent to more than 16 million individuals living in extreme

44. Kimani-Murage EW- Exploring the paradox: double burden of malnutrition in rural South Africa - Glob Health Action 2013 Jan 24;6:19249. doi: 10.3402/gha.v6i0.19249.; https://pubmed.ncbi.nlm.nih.gov/?term=Kimani-Murage%20EW%5BAuthor%5D
45. https://worldpopulationreview.com/country-rankings/alcohol-consumption-by-country - litres of pure alcohol per capita
46. WHO World health statistics - https://repository.gheli.harvard.edu/repository/11242/
47. WHO World health statistics - https://repository.gheli.harvard.edu/repository/11242/
48. WHO Data - https://data.who.int/countries/710
49. FAO, IFAD, UNICEF, WFP and WHO. 2023. The State of Food Security and Nutrition in the World 2023. Urbanization, agrifood systems transformation and healthy diets across the rural–urban continuum. Rome, FAO. https://doi.org/10.4060/cc3017en
50. According to Thembisa, which is a mathematical model of the South African HIV epidemic, designed to answer policy questions relating to HIV prevention and treatment. Thembisa is also a demographic projection model and a source of demographic statistics. https://www.thembisa.org/; https://www.dailymaverick.co.za/article/2023-05-31-hiv-in-graphs-latest-figures-show-declining-rates-but-concerns-remain/
51. WHO Data. https://data.who.int/countries/710

poverty.[52] The country's emerging economy is highly dependent on agriculture in terms of job creation and poverty alleviation. This increases the scale of potential exposure to agricultural chemicals including 2,4-D, as a large percentage of SA's population live in agricultural areas.

Stunted childhood growth, otherwise referred to as 'stunting', is an indicator of malnutrition. It is generally acknowledged that stunting is the best indicator of a child's well-being and that a child's linear growth potential is largely determined by the time they turn two years old. A survey conducted in 2023 records the continued high prevalence of stunting related to malnutrition in SA, at 27.4%.

The 2022 national prevalence of stunting in under 5-year-olds was found to be 27.4 %, with 17.5% in the Western Cape.[53] The National Income Dynamics Study (NIDS) reported that 18% of households in SA experienced hunger in 2020 and child hunger was prevalent at 16%.[54] Statistics South Africa (2019) indicated that about 1.6 million households experienced hunger in 2017, with more than 60% of these households being in urban areas. These results indicate that many South Africans are not food secure, even though food balance sheets indicate that nationally South Africa is food secure.[55]

Stunting is associated with many disorders, including reduced neurodevelopment, resulting in lifelong cognitive deficits, educational and employment challenges, increased risk of obesity and non-communicable diseases (NCD) in adulthood, and cycles of intergenerational poverty.[56]

(c) Alcoholism

According to the WHO's data, SA's drinking population consumes 28.9 litres of pure alcohol – per capita a year, the fifth highest consumption rate in the world.[57] Research shows that heavy drinking among poorer, particularly Western Cape South Africans, is deeply rooted in the legacy of the '*dop*' system, whereby alcoholic beverages were offered to farmworkers as part of their wages.[58] A 1998 study showed that, for example, 48% of workers studied had spent some of their lifetime on farms that employed the dop system. More than 68% would be defined as alcoholic. Over 10% of farm workers had *biochemical* evidence of liver injury.[59] Although the 'dop' system has largely died out its legacy continues. Alcohol consumption during pregnancy is also widespread in South Africa, at a rate ranging from 2.5% to 45%. The above-mentioned facts could explain why South Africa is considered to have the highest reported prevalence of foetal alcohol syndrome in the world, which ranges from 29 to 290 per 1000 live births.[60]

(d) Smoking

Smoking rates, unsurprisingly, are relatively high and consistent with findings in urban areas. The high rates predict a considerable burden of tobacco-related disease in future years.

Conclusion

South African farm workers have a considerable burden of morbidity as a result of the historical legacy of poor living and working conditions in the agricultural sector. Alcoholism, the inheritance of the

52.. World Poverty Clock. 2020. South Africa. https://worldpoverty.io/map

53. Western Cape Stunting Baseline Survey on under-5-year-old children - 2023: A collaboration between the Western Cape Department of Health and Wellness and the DG Murray Trust, page 8

54. Bridgman G., van der Berg S, Patel L. 2020. Hunger in South Africa during 2020: results from wave 2 of NIDS–CRAM. Stellenbosch economic working papers: a working paper of the Department of Economics and the Bureau at the University of Stellenbosch. Stellenbosch Department of Economics, University of Stellenbosch, ZDB-ID 3048846-1. Vol. WP, 25.

55. Statistics South Africa. 2019. Towards measuring the extent of food security in South Africa: an examination of hunger and food inadequacy. Government publication. http://www.governmentpublications.lib.uct.ac.za/news/ towards-measuring-extent-food-security-south-africa- examination-hunger-and-food-inadequacy

56. Mendez MA, Adair LS. 1999. Severity and timing of stunting in the first two years of life affect performance on cognitive tests in late childhood. *Journal of Nutrition*, 129(8), pp. 1555– 1562.

57. WHO – Alcohol: Global status report on alcohol and health, 2018 https://iris.who.int/bitstream/handle/10665/274603/9789241565639-eng.pdf?ua=1; https://businesstech.co.za/news/lifestyle/332909/south-africa-has-some-of-the-heaviest-drinkers-in-the-world/

58. May PA et al. 2019. The Dop System of Alcohol Distribution is Dead, but It's Legacy Lives On... Int J Environ Res Public Health. 2019. https://pubmed.ncbi.nlm.nih.gov/31581441/; London L, Nell V, Thompson ML, Myers JF. Health status among farm workers in the Western Cape--collateral evidence from a study of occupational hazards. S Afr Med J. 1998 Sep;88(9):1096-101. PMID: 9798496.

59. L London, ML Thompson, JF Myers, 1998 - Health status among farm workers in the Western Cape--collateral evidence from a study of occupational hazards -S Afr Med J 1998 – https://pubmed.ncbi.nlm.nih.gov/9798496/#:~:text=The%20study%20found%20substantial%20levels,and%20evidence%20of%20substantial%20adult

60. Policy requirements for the Prevention and Management of Fetal Alcohol Spectrum Disorder in South Africa: A Policy Brief - Adebiyi and others. https://www.frontiersin.org/articles/10.3389/fpubh.2021.592726/full#:~:text=Alcohol%20consumption%20during%20pregnancy%20is,000%20live%20births%20(8).

'dop' system, chronic adult malnutrition, and HIV/Aids are among some of the key public health issues readily identifiable. Research into the health status and health needs of farm workers has been neglected in the past, reinforcing their ongoing marginalisation in the organisation of social services. The health services face complex challenges if they are to address the needs of farm workers, particularly if district health services are to operationalise the primary health care approach in rural fanning areas of SA.

This burden of disease would need to be considered in regard to the assessment of the impact of any toxin on public health. Arguably, South Africa's history and current socio-economic circumstances result in a greater disease burden and therefore studies from Japan, Europe, and North America cannot be relied on uncritically, when evaluating the risk to health of continued registration of 2,4-D in SA. A precautionary approach needs to be applied to the evaluation of what is considered an acceptable risk to public health and the environment.

International obligations

SA as a Party to the Convention on Biological Diversity (CBD) should be cognisant of Target 7 of the recently agreed upon Kunming-Montreal Global Biodiversity Framework (GBF) in December 2022, which represents a commitment by the international community to reduce pollution, including reducing the use of pesticides and highly hazardous chemicals, by 2030. SA is a signatory to International Chemicals Management (SAICM) – a global policy framework to foster the sound management of chemicals – which is hosted by the United Nations Environment Programme (UNEP) and adopted in 2006. SA must be seen to be implementing its international obligations.

Legal analysis – overview

1. Act 36 of 1947

The use of 2,4-D in SA is regulated under the Fertilizers, Farm Feeds, Agricultural Remedies, and Stock Remedies Act 36 of 1947 (Act 36 of 1947), and under the auspices of the Department of Agriculture. In terms of the Act, 2,4-D constitutes an 'agricultural remedy', which is defined in section 1 as 'any chemical substance or biological remedy, or any mixture or combination of any substance or remedy intended or offered to be used –

(a) for the destruction, control, repelling, attraction, or prevention of an undesired microbe, alga, nematode, fungus, insect, plant vertebrate, invertebrate, or any product thereof, but excluding any chemical substance, biological remedy, or other remedy in so far as it is controlled under the Medicines and Related Substances Control Act, 1965 (Act 101 of 1965), or the Hazardous Substances Act, 1973 (Act 15 of 1973); or as a plant growth regulator, defoliant, desiccant or legume inoculant, and anything else which the Minister has by notice in the Gazette declared an agricultural remedy for the purposes of this Act'.

The provisions of the Act upon which this submission is based are sections 4(1)(e) and 7bis(1). Section 4(1)(e) provides that the Registrar of Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies ('the Registrar') may, *inter alia*, cancel the registration of any agricultural remedy at any time 'if he/she is satisfied that it is **contrary to the public interest**' that such agricultural remedy shall remain registered [emphasis added].

The "public interest" must include the protection of vulnerable groups such as children – as is clear from inclusion in the 2023 regulations under Act 36 of 1947, of reference to 'potential health effects for vulnerable groups, especially children', as being a factor which must be disclosed when renewal of a registration certificate is sought.[61] Another

61. FERTILIZER, FARM FEEDS, AGRICULTURAL REMEDIES AND STOCK REMEDIES ACT, 1947 (ACT No. 36 OF 1947) REGULATIONS RELATING TO AGRICULTURAL REMEDY published in GN 3812 of 25 August 2023 in GG 49189 – regulation 10(3)(f) – (f) declaration that no new scientific evidence is available on the agricultural remedy's potential health effects for vulnerable groups, especially children;

vulnerable group of critical importance in the regulation of agricultural remedies is farm workers, recognised as vulnerable in the report of the High Level Panel on the assessment of Key legislation and the acceleration of fundamental change.[62]

Section 7b(1) empowers the Minister by notice in the *Gazette* to –

(a) prohibit the acquisition, disposal, sale or use of fertilizers, farm feeds, agricultural remedies or stock remedies; or
(b) prohibit such acquisition, disposal, sale or use, except in accordance with such conditions as may be specified in the notice or except under the authority of and in accordance with such conditions as may be specified in a permit issued by the registrar, and may in like manner repeal or amend any such notice.

It is submitted the Registrar and the Minister has a legal duty to take further measures to restrict the use of 2,4-D given the evidence above that demonstrates that it poses a significant potential threat to health and the environment, and based on research that has been conducted since its initial registration in 2007. The basis of this submission is as follows:

2. Constitutional context

(a) PAJA – Duty to take all relevant information into account

The body of medical research findings since 2007 compels the Registrar to undertake a review of its continued registration, in order to discharge the constitutional duty to take reasonable measures to protect the public health and environment in terms of section 24 of the Constitution.[63]

In this process, given that he will be acting 'in the public interest', he is under a duty to take into consideration all relevant information as required by section 6(2)(e)(iii) of the Promotion of Administration of Justice Act 3 of 2000 (PAJA).

(b) Duty to protect and promote the rights in the Bill of Rights

In exercising public power, functionaries must have regard for the fundamental rights in the Constitution, and the paramount duty of the State to respect, protect, promote and fulfil the rights in the Bill of Rights.[64] The advancement of human rights and freedoms, and adherence to constitutional imperatives, is foundational to our democracy. Section 2 of the Constitution provides that the Constitution is 'the supreme law of the Republic', such that 'law or conduct inconsistent with it is invalid, and the obligations imposed by it must be fulfilled'.

The centrality of the Bill of Rights is expressed in section 7(1) of the Constitution, which provides: 'This Bill of Rights is the cornerstone of democracy in South Africa. It enshrines the rights of all people in our country and affirms the democratic values of human dignity, equality and freedom'. Under section 7(2), the State has a constitutional duty to 'respect, protect, promote and fulfil the rights in the Bill of Rights'.

The provisions of the Bill of Rights bind the State as well as natural and juristic persons, as expressed in section 8, as follows:

8(1) The Bill of Rights applies to all law, and binds the legislature, the executive, the judiciary and all organs of state.
(2) A provision of the Bill of Rights binds a natural or a juristic person, if, and to the extent that, it is applicable, taking into account the nature of the right and the nature of any duty imposed by the right.

The Constitutional Court has repeatedly emphasised that constitutional rights must be generously interpreted.[65] The Constitution also lays down certain principles of interpretation. These are embodied in s 39 of the Constitution, which provides:

"39(1) When interpreting the Bill of Rights, a court, tribunal or forum –
(a) must promote the values that underlie

62. Page 304 available at https://static.pmg.org.za/High_Level_Panel_Report.pdf
63. Section 24 states: Everyone has the right - (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that (i) prevent pollution and ecological degradation; (ii) promote conservation; and
(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.
64. Section 7(2) of the Constitution of the Republic of South Africa, 1996.
65. S v Zuma and Others 1995 (2) SA 642 (CC). See especially para 14 where the Constitutional Court approved the following passage from a judgment of Lord Wilberforce in Minister of Home Affairs (Bermuda v Fisher [1980] AC 319 (PC 328-9: '[A supreme constitution requires] a generous interpretation... suitable to give to individuals the full measure of the fundamental rights and freedoms referred to....' See also S v Mhlungu 1995 (3) SA 391 (CC).

an open and democratic society based on human dignity, equality and freedom;
(b) must consider international law; and
(c) may consider foreign law.

(2) When interpreting any legislation, and when developing the common law or customary law, every court, tribunal or forum must promote the spirit, purport and objects of the Bill of Rights.
(3) ..."

The meaning and import of the injunction contained in s 39(2) has been stated by the Constitutional Court as follows:

This means that all statutes must be interpreted through the prism of the Bill of Rights. All law-making authority must be exercised in accordance with the Constitution.[66]

The relevant provisions in the Bill of Rights, which must inform the exercise of regulatory power by the Department with regard to the registration of harmful agricultural remedies, include:

(c) The right to life

The entrenchment of an unqualified right to life in the Constitution requires the state to take a leading role in affirming respect for human life and dignity. This obligation was articulated by the Constitutional Court in the case of *S v Makwanyane*, where Langa CJ held that the state should be 'a role model' for our society by demonstrating society's regard for human life.[67] Importantly, the right to life imposes a positive duty on the state to protect the lives of its citizens.[68] Moreover, the right to life incorporates a right to an existence consonant with human dignity, which the State must protect. As O'Regan J stated in *S v Makwanyane*:

The right to life is, in one sense, antecedent to all the other rights in the Constitution. Without life in the sense of existence, it would not be possible to exercise rights or to be the bearer of them. But the right to life was included in the Constitution not simply to enshrine the right to existence. It is not life as mere organic matter that the Constitution cherishes, but the right to human life: the right to share in the experience of humanity. This concept of human life is at the centre of our constitutional values. The Constitution seeks to establish a society where the individual value of each member of the community is recognised and treasured...The right to life, thus understood, incorporates the right to dignity. So the rights to human dignity and life are entwined....[69]

(d) Children's rights

Section 28(2) of the Constitution provides that: 'A child's best interests are of paramount importance in every matter concerning the child'. Section 9 of the Children's Act 38 of 2005 similarly states: 'In all matters concerning the care, protection and well-being of a child the standard that the child's best interest is of paramount importance, must be applied.' The 'best interests of the child' principle is affirmed in international instruments, including Article 3 of the 1989 UN Convention on the Rights of the Child (ratified by SA in 1995),[70] and Article 4 of the 1990 African Charter on the Rights and Welfare of the Child (ratified by SA in 2000).[71] Article 4 of the African Charter imposes a broad duty on officials, as it provides that: 'In all actions concerning the child undertaken by any person or authority the best interests of the child shall be the primary consideration.'

In the specific context of the regulation of pesticides and other agricultural remedies containing 2,4-D, consideration of the well-being of children is particularly important. Children are especially vulnerable to certain detrimental effects of agricultural chemicals. This fact has clearly been recognised by the inclusion in the 2023 regulations under Act 36 of 1947 of reference to evidence of harm to children as being a factor which must be disclosed when renewal of a registration certificate is sought.[72]

66. Investigating Directorate: Serious Offences v Hyundai Motor Distributors (Pty) Ltd: In re Hyundai Motor Distributors (Pty) Ltd v Smit NO 2001 (1) SA 545 (CC), para 21.
67. *S v Makwanyane* 1995 (3) 391 (CC), per Langa J at paras 83-5.
68. See Carmichele v Minister of Safety and Security 2001 (4) SA 938 (CC), para 45 especially; Minister of Safety and Security v Hamilton 2001 (3) SA 50 (SCA); Minister of Safety and Security v Van Duivenboden 2002 (6) SA 431 (SCA); Mohamed v President of the Republic of South Africa 2001 (3) SA 893 (CC).
69. *S v Makwanyane* (n 10), per O'Regan J at paras 326-7. See also para 271 (Mahomed J); para 311 (Mokgoro J). The statement was approved by the majority of the court in *Soobramoney v Minister of Health (Kwazulu-Natal)* 1998 (1) SA 765 (CC) para 31.
70. Adopted and opened for signature, ratification and accession by General Assembly resolution 44/25 of 20 November 1989, entered into force 2 September 1990.
71. OAU Doc. CAB/LEG/24.9/49 (1990), entered into force 29 November 1999.
72. Footnote 47 above

Moreover, children are often at greater risk of exposure to pesticides used in and around the home, both by absorption through the skin of floor and carpet residues, as well as through inhalation of higher pesticide concentrations in the less ventilated, infant breathing zone nearest the floor.

(e) Environmental rights

The environmental rights under section 24 of the Constitution provide:

'Everyone has the right –
(a) to an environment that is not harmful to their health or well-being; and
(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -
  (i) prevent pollution and ecological degradation;
  (ii) promote conservation; and
  (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.'

By virtue of s 24, environmental considerations, often ignored in the past, have now been given rightful prominence by their inclusion in the Constitution. Describing this elevation to prominence, it was stated in *Director: Mineral Development, Gauteng Region and Another v Save the Vaal Environment and Others*[73] that:

"Our Constitution, by including environmental rights as fundamental, justiciable human rights, by necessary implication requires that environmental considerations be accorded appropriate recognition and respect in the administrative processes in our country. Together with the change in the ideological climate must also come a change in our legal and administrative approach to environmental concerns."

In overseeing the review of 2,4-D, the Department of Agriculture, and particularly the Registrar of Act 36 of 1947, is at the centre of an administrative process which fundamentally concerns the right of every person to an environment that is not harmful to their health or well-being. Regard must be had to the importance of the environmental rights guaranteed in the constitution, which was articulated by Claassen J in *BP Southern Africa (Pty) Ltd v MEC for Agriculture, Conservation, Environment and Land Affairs*:[74]

[T]he constitutional right to environment is on a par with the rights to freedom of trade, occupation, profession and property entrenched in ss 22 and 25 of the Constitution. In any dealings with the physical expressions of property, land and freedom to trade, the environmental rights requirements should be part and parcel of the factors to be considered without any a priori grading of the rights ...The balancing of environmental interests with justifiable economic and social development is to be conceptualised well beyond the interests of the present living generation. This must be correct since s 24(b) requires the environment to be protected for the benefit of 'present and future generations.

3. Duty to exercise a precautionary approach

The Department of Agriculture and the Registrar under Act 36 of 1947 are required to exercise a precautionary approach when making regulatory decisions that may significantly affect the environment, as required by the environmental management principles set out in the National Environmental Management Act 107 of 1998 (NEMA).

The duty to exercise a precautionary approach to administrative decision making is a principle of SA's framework environmental legislation, the NEMA, as well as a principle of international law, and is accepted throughout the world. The NEMA is legislation designed to give effect to the environmental rights in section 24 of the Constitution. Its purpose is stated as follows:

To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of State; to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment; and to provide for matters connected therewith.

73. 1999 (2) SA 709 (SCA) at 719C – D.
74. 2004 (5) SA 124 (W).

Section 1(1) of the NEMA defines 'environment' in broad terms as 'the surroundings within which humans exist' and that are made up, *inter alia*, of '**chemical properties ... that influence human health and well-being**'. [75]

The NEMA principles apply to all the actions of organs of state that may significantly affect the environment and therefore apply to the actions of the Registrar in reviewing the continued registration of 2,4-D.[76] The umbrella-nature of the NEMA principles is emphasised in section 2(1)(c), which stipulates that the principles must 'serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of this Act or any statutory provision concerning the protection of the environment'. Of these principles, the most important for the purposes of this submission are the 'precautionary principle' in section 2(4)(a)(vii) and the 'preventive principle' in section 2(4)(a)(viii).

The preventive principle seeks to minimise environmental damage as an object in itself, and requires action to be taken at an early stage, if possible before damage has actually occurred.[77] The precautionary principle aims to provide guidance in environmental management decision-making where there is scientific uncertainty.[78] Most important, the principle permits a lower level of proof of harm to be used in decision-making whenever the consequences of waiting for higher levels of proof may be very costly and/or irreversible.

Both the precautionary principle and the preventive principle have acquired the status of international law norms,[79] and are thus also binding on the State as such. Under section 39(1) of the Constitution, international law must be considered when the rights in the Bill of Rights are interpreted, in this case the right to a healthy environment (section 24 of the Constitution). Section 39(2) of the Constitution of the Republic of South Africa, 1996 directs that when any legislation is interpreted, the result must be a construction that promotes 'the spirit, purport and objects of the Bill of Rights'. Thus when the Registrar under Act 36 of 1947 is called upon to interpret the meaning of the precautionary principle, in this case while regulating agricultural chemicals that can adversely impact on the environment and public health, he must lean in favour of promoting the Bill of Rights and in particular the right to environment.

The core of the precautionary principle was enunciated in Principle 15 of the Rio Declaration from the 1992 UN Conference on Environment and Development:

Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[80]

The Precautionary Principle as a NEMA principle is formulated as follows:

(3) Development must be socially, environmentally, and economically sustainable.
(4)(a) Sustainable development requires a consideration of all relevant factors including the following....
(viii) [T]hat a risk-averse and cautious approach be applied, which takes into account the limits of current knowledge about the consequences of decisions and actions.

75. The full definition of 'environment' in section 1 of NEMA reads:
'the surroundings within which humans exist and that are made up of - the land, water and atmosphere of the earth; micro-organisms, plant and animal life; any part or combination of (i) and (ii) and the interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being'.
76. NEMA section 2
77. P. Sands Principles of International Environmental Law 2ed (Cambridge: Cambridge UP, 2003) at 246-279. See, especially, the European Commission's Communication on the precautionary principle, which recognizes it to have been 'progressively consolidated in international environmental law, and so it has since become a full-fledged and general principle of international law'. COM 2000(1), 2 February 2000, available at http://europa.eu.int/comm/dgs/health_consumer/library/pub/pub07_en.pdf). at 246-247.
78. In 2000, the European Commission Communication on the Precautionary Principle stated:
The precautionary principle applies where scientific evidence is insufficient, inconclusive or uncertain and preliminary scientific evaluation indicates that there are reasonable grounds for concern that the potentially dangerous effects on the environment, human, animal or plant health may be inconsistent with the high level of protection chosen by the EU.
79. For a compilation of the international conventions incorporating the precautionary principle see: P. Sands Principles of International Environmental Law 2ed (Cambridge: Cambridge UP, 2003) at 246-279; European Commission's Communication on the precautionary principle, which recognises it to have been 'progressively consolidated in international environmental law, and so it has since become a full-fledged and general principle of international law'. COM 2000(1), 2 February 2000, available at http://europa.eu.int/comm/dgs/health_consumer/library/pub/pub07_en.pdf).
80. UN General Assembly, Report of the United Nations Conference on Environment and Development (Rio de Janeiro, 3-14 June 1992) Annex I, A/CONF.151/26 (vol. I), available at http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm

The precautionary approach therefore has two components – firstly potential significant impact; and secondly scientific uncertainty. A decision maker, when considering administrative action which has these characteristics must fulfil the requirement of consideration of a cautionary approach, notwithstanding the limitations of scientific uncertainty. This applies specifically to deciding whether to review the continued registration of 2,4-D.

At the same time, there are several other NEMA principles that are also relevant to and must therefore inform, the exercise of regulatory powers under the Fertilizers, Farm Feeds, Agricultural Remedies, and Stock Remedies Act. These include:

- Section 2(2): 'Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably';
- Section 2(4)(a)(viii): '[T]hat negative impacts on the environment and on peoples' environmental rights be anticipated and prevented, and where they cannot altogether be prevented, are minimised and remedied';
- Section 2(4)(c): 'Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons';
- Section 2(4)(e): 'Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle';
- Section 2(4)(g): 'Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge';
- Section 2(4)(i): 'The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment';
- Section 2(4)(j): 'The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected';

The precautionary principle has been incorporated into many international instruments in increasingly far-reaching terms. Many conventions now commit their parties to prevent harm to human health and the environment, even if scientific evidence is inconclusive. For example, addressing the issue of hazardous substances, the parties to the 1992 Watercourses Convention agreed to be guided by the precautionary principle by virtue of which action to avoid the potential transboundary impact of the release of hazardous substances shall not be postponed on the ground that scientific research has not fully proved a causal link between those substances, on the one hand, and the potential transboundary impact, on the other.

Similarly, the 1992 OSPAR Convention provided for preventive measures to be taken when there are 'reasonable grounds for concern...even where there is no conclusive evidence of a causal relationship between the inputs and the effects'; while the 1992 Baltic Sea Convention provided for preventive measures 'when there is reason to assume' that harm might be caused 'even when there is no conclusive evidence of a causal relationship between inputs and their alleged effects'.

In the case of 2,4-D, there has been much debate over the extent to which it can be proven to cause several health impacts. The precautionary principle renders this debate irrelevant provided the requirements for its application are met, and in this submission, this has been amply demonstrated to be the case. 2,4-D definitely poses a threat of significant potential harm to health and the environment and there is a degree of scientific uncertainty in this regard, as has been demonstrated in the paragraphs above.

There is increasing support in state practice for an interpretation of the precautionary principle that shifts the burden of proof onto the party who wishes to carry out an activity to prove that it will not harm human health or the environment.[81]

It is submitted that such an approach should be adopted by the Department in considering the future registration of 2,4-D in SA, such that an onus is imposed on the registration-holders to show that 2,4-D use is not harmful to human health or the environment. This approach is congruent with the principle of responsibility in the NEMA, section 2(4)(e) (cited in full above), and is of particular importance where

81. See, for example, the European Community's 1991 Urban Waste Water Directive, 91/271 article 6(2); and the 1992 OSPAR Convention, Annex II, article 3(3)(c).

there is significant scientific evidence suggestive – as in the case of 2,4-D – of harmful effects to humans and the environment. Moreover, this approach takes necessary cognisance of the vulnerability and limited knowledge of the risks associated with 2,4-D among persons directly affected by its use.

In addition, the precautionary approach, read with the preventive and protective principles and the relevant constitutional provisions, imposes a responsibility on the regulatory body – that is the Registrar (Act 36 of 1947) – to monitor the effects of 2,4-D and to ensure that its registered uses do not cause harm to the environment or human health.

In assessing the risks of 2,4-D use in terms of the precautionary approach, it is submitted that the following associated principles and considerations must be taken into account:[82]

- Recognition of the disease burden suffered by black South Africans, particularly farm workers and rural communities;
- The substitution of harmful pesticides with suitable, less harmful alternatives, including agro-ecological methods, and holistic approaches to control pests, weeds, and diseases (viz the 'substitution principle'); [83]
- Regulation on the basis of the most vulnerable groups affected, for example, pregnant women, the unborn foetus, and the newly born child;
- Reliance on a full data set including long-term, cumulative effects before pesticides are released into the environment. This requirement acknowledges the problem of ongoing low-dose exposures to combinations of chemicals and cumulative effects of small doses;
- Recognition of the experiences of workers and communities with regard to adverse effects of pesticides;
- The right of those using or exposed to pesticides to know what it is they are exposed to, and the hazardous properties of the pesticide. Without such knowledge they cannot take precautionary measures themselves to avoid potential harm; and
- The right of popular participation in decision-making regarding pesticide regulation, including active participation in national pesticide committees.

4. Duty to act positively to prevent reasonably foreseeable harm

The State's legal duty to take positive steps to prevent reasonably foreseeable harm from 2,4-D exposure arises by virtue of the State's prior conduct. By having registered 2,4-D as an agricultural remedy for sale, distribution, and use in SA, the State has created a source of danger of harmful exposure to 2,4-D – a danger that the State is obliged to take steps to guard against. The 'prior conduct doctrine' has long been part of South African law,[84] although it has been incorporated into the broader 'legal convictions of the community' test for a legal duty articulated in the *Ewels* case.[85] In *Minister of Safety and Security v Van Duivenboden*,[86] the Supreme Court of Appeal held that the *Ewels* test for a legal duty 'must necessarily now be informed by the norms and values of our society as they have been embodied in the 1996 Constitution'. [87]

It is submitted that the legal convictions of the community require the State functionaries concerned to take all reasonable steps to prevent harm from exposure to 2,4-D. This 'legal conviction' is informed by, and indeed reflected in, the provisions and norms of the Constitution, the environmental management principles contained in the NEMA and international law, and the particular responsibility of the Registrar to act 'in the public interest'. This duty arises particularly because it is the State's prior conduct – namely by registering 2,4-D as an agricultural remedy for sale, distribution, and use in SA – that has created a source of danger of exposure to 2,4-D and consequent potential dangers to health, particularly for farm workers and children. (see Section 2 above).

82. Adapted from Briefing Paper of Pesticide Action Network (PAN) International on the Precautionary Principle at 6.
83. The substitution principle is included in the new European Community Regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). All companies applying for authorisation of chemical substances are required to provide an analysis of alternatives considering their risks and the technical and economic feasibility of substitution.
84. Halliwell v JMC 1912 AD 659; Municipality of Bulawayo v Stewart 1916 AD 357; CTM v Clohessy 1922 AD 4; De Villiers v JHB Municipality 1926 AD; Moulang v PE Municipality 1958 (2) SA 518 (A); Administrator, Cape v Preston 1961 (3) SA 562 (A).
85. Minister van Polisie v Ewels 1975 (3) SA 590 (A).
86. 2002 (6) SA 431 (SCA).
87. At para 17.

Conclusion and requests

The ACB is of the view that sufficient evidence exists that 2,4-D must be classified as a highly hazardous pesticide and for it to be banned along with other pesticides that are highly hazardous.

Noting that due process must be followed, we request the following:

The Registrar is asked to institute a review in terms of section 4 of Act 36 of 1947 into the continued registration of 2,4-D. In this review, interested and affected parties must be afforded an opportunity to make submissions advocating for the cancellation of the registration or the restriction of the uses to which 2,4-D can be put.

All information furnished to the Registrar in its decision to authorise and renew the authorisation of 2,4-D shall be made available to members of the public, with the sufficient opportunity given to consider this information to enable informed public participation.[88]

88. *Heatherdale Farms v Deputy Minister of Agriculture* 1980 (3) SA 476 (T) (486F-G). It has long been recognised that a fair decision-making procedure requires (among other things) that a person 'must be put in possession of such information as will render his [or her] right to make representations a real, and not an illusory one'. Hoexter points out that there is 'a crucial link between the amount and type of information disclosed to an affected person and the quality of his or her opportunity to make representations'. Hoexter, Administrative Law in South Africa, at p371, referring to by the Constitutional Court in Bengwenyama Minerals v Genorah Resources 2011 (4) SA 113 (CC) paras 69-74.