CropLife Australia

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Identification of leading practices in ensuring evidence-based regulation of farm practices that impact water quality outcomes in the Great Barrier Reef

1 INTRODUCTION

CropLife Australia is the national peak industry organisation representing the plant science sector in Australia. CropLife's members are the world-leading innovators, developers, registrants, manufacturers and formulators of crop protection products and crop biotechnology innovations. The plant science industry, worth more than $20 billion a year to Australian agricultural production, provides products to protect crops against pests, weeds and diseases, as well as developing crop biotechnologies key to the nation's farming productivity, profitability and sustainability.

CropLife and our members recognise that the Great Barrier Reef (the Reef) is a spectacular, fragile and important World Heritage Area that indirectly delivers over $5 billion annually to the Australian economy. CropLife and our members are committed to protecting the Reef from any potential impact that crop protection products (chemical and biological pesticides) might have.

Before any agricultural or veterinary chemical can be registered for use in Australia, it must first undergo a comprehensive scientific risk assessment by the Australian Pesticides and Veterinary Medicines Authority (APVMA). The APVMA is recognised worldwide as a scientifically competent and technically proficient, independent regulator.

Crop protection products are crucial to modern integrated pest management techniques and systems used by farmers. It is imperative that the regulation of crop protection products in Australia is based on a rigorous scientific method to ensure Australian farmers have access to the innovative tools the plant science industry provides, while protecting the health of both users and the environment. This will improve the ability of Australian farmers to be internationally competitive and productive.

CropLife welcomes the opportunity to provide comment to the Senate's Rural and Regional Affairs and Transport References Committee regarding the identification of leading practices in ensuring evidence-based regulation of farm practices that impact water quality outcomes in the Reef.

CropLife has long advocated for a scientifically sound, risk-based approach to identifying potential risks of crop protection products

The plant science industry provides the innovation and products that are key to the nation's farming productivity and environmental sustainability. Along much of the Queensland coast adjacent to the Marine Park are some of Australia's most important agricultural areas with grazing, horticulture and sugar farming all occurring in water catchments. Crop protection products are used by farmers because they provide safe, effective and efficient ways to protect crops from pests, weeds and diseases. These products also enable other land and environment managers, such as parks and wildlife authorities, to protect Australia's native flora and fauna from noxious weeds and invasive pests. Ensuring that best practices are employed when crop protection products are applied ensures that any risk to the Reef is kept as low as possible.

The Queensland Government's 2018 introduction of risk and evidence-based policy to ensure the protection of aquatic species within the various Reef ecosystems is commended. Determining the risk of pesticide detections by comparing the concentration with Great Barrier Reef Marine Park Authority Water Quality Guideline levels alleviates the previous misconception that the mere presence of a crop protection product equates to damage to the Reef.

A scientifically sound, risk-based approach to identifying and managing potential risks of crop protection products will provide more realistic protection goals for the Reef's aquatic ecosystems. While CropLife commends the introduction of a more risk-based approach to ensuring the protection of the Reef, it is essential that the scientific method behind this approach is sound, transparent and appropriately validated.

Best practice management practices adopted by growers within the Reef catchment are having a positive result

The 2014 Senate Environment and Communications References Committee's Inquiry into *The adequacy of the Australian and Queensland Governments' efforts to stop the rapid decline of the GBR* reported that run-off from crop protection products only poses a low to moderate risk to the Reef and even then, only to inner shore reefs.

While crop protection products may be present in the Reef inshore waters, the pesticide risk baseline value across the Reef is 97 per cent, indicating that overall, crop protection products do not pose a major threat to the health of the Reef. Approximately 66 per cent of the major catchment areas are already either meeting the target of protecting 99 per cent of aquatic species or face a low risk from crop protection products.[1]

Australian and Queensland Government investments in reef management since 2009 and voluntary benchmarking systems across agricultural industries are continuing to assist farmers to identify and implement best practice. This resulted in a 36 per cent overall reduction in the annual average pesticide load across the Reef catchments in 2016.[2] Continued investment in education and extension will continue to pay dividends in this area.

CropLife, along with key farming organisations, will continue to work constructively with the Federal and Queensland Governments to develop workable solutions that will ensure crop protection products continue to have no impact on the Reef.

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1 https://www.reefplan.qld.gov.au/__data/assets/pdf_file/0026/82907/report-card-2017-2018-results-pesticide-risk-baseline.pdf

2 https://www.reefplan.qld.gov.au/measuring-success/report-cards/2016/assets/report-card-2016-detailed-results.pdf

2 A SCIENCE-BASED, TRANSPARENT APPROACH TO DETERMINING RISK TO THE REEF IS REQUIRED

CropLife is pleased that the Queensland Government has replaced the previous loads-based hazard assessment with the more risk-based approach that aims to ensure the protection of at least 99 per cent of aquatic species within the various Reef ecosystems. It is essential, however, that the scientific method behind this approach is transparent, sound and appropriately validated.

Throughout the *Pesticide Risk Baseline Methods* document, reference is made to a more detailed description of the methodology used by the government to assess the potential impact of pesticides on the Reef. The document referred to, however, is listed as "in preparation"[3] and as such, has not yet been made publicly available, rendering any meaningful peer review of that methodology impossible.

Without the ability to review the detailed methodology that is being used to determine potential impacts on the Reef from the use of crop protection products, it is not possible for the industry, farmers, public, or even the Australian Government to have confidence in the monitoring data presented in the *Pesticide Risk Baseline Results*. Nevertheless, CropLife has the following comments regarding the summary of the methodology provided in the *Pesticide Risk Baseline Methods* document.

While the use of the species sensitivity distribution to identify and monitor potential risks to the Reef is supported, the methodology used by the Queensland Government to generate the *Pesticide Risk Baseline Results* at the catchment level are extremely complex. The pesticide risk at the catchment level is determined by combining three different predictive models; the species sensitivity distribution, the Independent Action Model and the Multiple Imputation Model, using 30 spatial variables. Determining any meaningful relevance to real-world scenarios is, therefore, unclear.

The Queensland Government itself acknowledges that confidence in the methods used to calculate the pesticide risk baseline for measuring progress towards the pesticide target of protection of 99 per cent of aquatic species is low. A reliability score of just one out of five was awarded for maturity of the method because not all individual methods used have been reviewed, the combination of methods used have not been reviewed and the relationships used to predict pesticide risk have not been reviewed. Similarly, a reliability score of just two out of five was awarded for the validation of the methods, as, concerningly, the per cent of species protected at the end of catchments has not been validated. A score of just two out of five was awarded for the directness of the approach, as the per cent species protected at the end of catchments is not directly measured. Finally, a score of just one out of five was awarded for measurement error as it is not possible to quantify the error in the multiple data sources used or the multiple steps in the methodology. Any relevance to real world impacts are, therefore, difficult to determine.

[3] Warne MStJ, Neelamraju C, Strauss J, Smith RA, Turner RDR and Mann RM in prep, Development of a pesticide risk baseline to permit reporting progress on reducing the risk posed by pesticides to the Great Barrier Reef, State of Queensland, Brisbane, Australia. Referenced in: https://www.reefplan.qld.gov.au/__data/assets/pdf_file/0026/82925/report-card-2017-2018-methods-pesticide-risk-baseline.pdf

In contrast, the APVMA utilises methodology that has been peer reviewed by the scientific community both domestically and internationally and has undergone extensive public consultation and yet, inexplicably, has not even been considered by the Queensland Government. The APVMA has accessed available data sets for temporal and spatial assessment, which cover approximately 290 waterways in eight natural resource management regions that discharge to the Reef. The APVMA has utilised these data sets to make a number of recently published regulatory decisions relating to chemical reconsiderations. It is unacceptable for the Queensland Government to rely on an unpublished methodology for assessing risk to the Reef, while internationally accepted, published methodologies are available. Continuing to develop and use unique methodologies for assessing and monitoring potential risks to the Reef not only undermines public confidence in Australia's expert scientific regulator, the APVMA, but may also be inappropriately determining risk to the Reef – either by identifying a risk where none exists or vice versa.

Since 2009, the Reef regulations have required that farmers using one of the five registered "PSII herbicides" are trained in chemical usage, keep records and meet additional Reef requirements of use. PSII herbicides are residual herbicides that disrupt photosynthesis and have been identified by the Queensland Government as particularly harmful to the Reef, based only on predictive modelling. Despite these requirements, there has never been any direct evidence that these herbicides have had any negative impact on the Reef. Yet since 2019 the Queensland Government has required farmers to keep records of all agricultural chemicals used on farm and make their records within three days of use. This includes more than 700 crop protection products registered for use in Queensland as herbicides, insecticides and fungicides. Imposing more red tape on farmers despite no evidence that any of these crucial crop protection tools are causing any harm to the Reef is unjustifiable and unwarranted.

3 SCIENTIFIC METHODOLOGY PEER REVIEW

CropLife supports a proper risk-based scientific approach to determining and monitoring potential risks to the Reef. It is imperative, however, that the scientific method used is rigorous, validated, transparent and accepted by the national and international scientific community.

Disappointingly, the methodology used by the Queensland Government is not always clear in the *Pesticide Risk Baseline Methods* document[4] and in some instances, is based on unvalidated, unpublished methods.

Without access to a more detailed description of the scientific method used by the Queensland Government to establish and monitor the presence of crop protection products in Reef catchment areas or determine the likely risk of those products to aquatic species, CropLife has the following concerns.

Conservative assumptions and unrealistic targets

While the core methodology for individual products (single species distribution; SSD) has been internationally accepted, the selected data and resultant end points reflect a series of compounding conservative assumptions leading to unrealistic targets. These targets are, therefore, likely to be un-related to real threats to the Reef or aquatic species in water courses leading to the Reef Marine Park.

The data used by the Queensland Government to establish the potential risk of a particular agricultural chemical is generally restricted to publicly available information. Such data is usually the result of very simple, low cost laboratory studies conducted by public institutes, which often don't meet established, internationally accepted guidelines designed to ensure repeatability. This data set is by definition small.

Narrowing the available data even further, the Queensland Government restricts its assessments to data relating to active constituents, excluding data generated from the use of formulated products. This practice precludes access to the higher tier studies, which are by necessity conducted with formulated products. The end result is that higher tier studies conducted to assess potential risks of products in more real-world conditions are excluded from analysis. It is widely accepted that laboratory-based studies generally yield much more conservative results than studies designed to reflect more realistic field conditions. These higher tier field condition studies expose organisms in a multi-stressor environment that allows for some of the normal mitigating factors, including multiple pathway breakdown, elimination by colloidal binding, dilution, etc.

The 99 per cent target at the inter-tidal zone, i.e. at the mouth of the river, is extremely conservative and is not consistent with other water quality targets. The target for individual products within freshwater, non-pristine systems is a more realistic 95 per cent species protection. These non-pristine river systems have been significantly altered by human interventions and fulfill multiple societal objectives, including not just agricultural production but also irrigation of urban areas, municipal hygiene, stormwater removal and recreational

[4] https://www.reefplan.qld.gov.au/__data/assets/pdf_file/0026/82925/report-card-2017-2018-methods-pesticide-risk-baseline.pdf

uses. While CropLife and our members support measures to ensure the health of Australia's river systems and the Reef, it is unrealistic to expect pristine water quality within these systems. An unrealistic and overly conservative water quality target may discourage farmers from adopting management practices that will reduce any potential impact on water quality within these systems.

Similarly, the location at which the 99 per cent species protection target is being determined and monitored is far removed from the principal protection target, which is the Reef itself. Instead, monitoring is being conducted at various points along the river and creek systems and at the mouth of river systems, at the inter-tidal point. While CropLife acknowledges that the Reef Marine Park begins at the inter-tidal point, it is generally a considerable distance from where the Reef itself begins. Thus, any perceived risk to the Reef based on concentrations of crop protection products identified at the inter-tidal zone would considerably and unnecessarily over-estimate the actual risk to the Reef.

Exposure

The *Pesticide Risk Baseline Methods* document notes that predictive relationships are required to estimate the pesticide risk for the whole of (major) catchment, region and Great Barrier Reef scales. The concentrations and types of pesticides detected reflect the catchment-specific land and hydrological conditions upstream of the monitoring site. The pesticide risk for unmonitored areas is predicted using the relationships between land-use, spatial and hydrological variables in a catchment and pesticide monitoring data. The hydrological variables do not, however, include streamflow, which along with rainfall data, allows for better temporal assessment of results. As both streamflow and rainfall data would be necessary to determine factors such as baseflow and rainfall-induced surface flow rates, it is unclear how the extrapolation for unmonitored streams is being made.

Measurement of surface water flow is also an important component of water quality monitoring projects but is not mentioned in the *Pesticide Risk Baseline Methods*. Flooding, stream geomorphology and aquatic life are all directly influenced by streamflow. Furthermore, run-off and streamflow drive the generation, transport and delivery of many nonpoint source (NPS) pollutants. Therefore, calculation of pollutant loads requires knowledge of water flow.[5]

While the spatial, land-use and hydrological variable used to derive the relationships to predict pesticide risk are listed in Table 3 of the *Pesticide Risk Baseline Methods* document, the values of each variable are not provided, nor are the predictive relationships used to predict risk in non-monitored areas. Subsequently, it is not possible to determine whether this methodology is robust or valid.

Water quality monitoring data is used to set baseline information about the types of pesticides detected, concentrations at which they are present and the period of time they are present. Such data collected over three years has been collected for just 38 of around 970 waterways, accounting for less than 4 per cent of waterways that discharge to the Reef. For many of these waterways, samples were only available for one year. Furthermore, there is no information regarding the number of samples obtained from any given waterway during any particular

5 https://www.epa.gov/sites/production/files/2016-05/documents/tech_notes_3_dec2013_surface_flow.pdf

monitoring period. As the monitoring results are not provided, no verification of the results with respect to stream flows and rainfall patterns leading up to the monitoring events can be undertaken.
The heavy reliance on monitoring results overall is concerning, given the very limited amount of data in context of both space and time. In particular, no attempt has been made to determine the following aspects of pesticide use:

- application timeframe in relation to detection timeframe
- application of multiple pesticides over time and the relationship with detection concentrations
- application during the dry season (including "shoulder" seasons)

In contrast, the national regulator for pesticides and veterinary medicines, the APVMA, has a published, nationally and internationally peer-reviewed methodology available for refining surface water exposure from run-off. This fully predictive model incorporates real world information including spatial variables (soil types, slopes) as well as spatial/temporal variables of rainfall and stream flow.[6,7,8] The requisite data, including full data libraries for rainfall and streamflow, are available for the Queensland horticulture production areas and it is unclear why this national approach was not considered in updating the reef science exposure methods from loads-based targets to risk-based targets. In fact, full stream flow data libraries have been developed for approximately 290 waterways across eight natural resource management regions that discharge to the Reef. The model allows for determination of distributions of predicted concentrations in waterways ranging from low to high flow rates in any given natural resource management region.

Toxicity

The Queensland Government's stated goal is to protect at least 99 per cent of aquatic species at the end of catchments, from the potential risks of 22 pesticides that have been included in the pesticide risk baseline approach. Neither the data used to develop the 99 per cent protection values for each of the 22 pesticides, nor the values themselves, are provided. Without this information, it is not possible to conduct any analysis of the final choice of value or validate the single number used to express pesticide risk (mixture toxicity value).

It is particularly important that individual substance data and the method to determine the 99 per cent protection values are available for peer review. For example, an updated proposed default discharge limit value for protection of freshwater aquatic ecosystems for diuron has been proposed by the Queensland Government's Department of Science, Information Technology and Innovation.[9] This proposed methodology provides a large number of algae and aquatic plant toxicity data and derives the discharge limit value largely following the updated Australian and New Zealand Environment and Conservation Council (ANZECC)

6 https://apvma.gov.au/node/15696
7 https://apvma.gov.au/sites/default/files/publication/32336-methiocarb_-_environment_report_- chem_review_-_publication_version.pdf
8 https://apvma.gov.au/sites/default/files/publication/50116-chlorpyrifos_2019_supplementary_environmental_assessment_report.pdf
9 O. C. King, R. A. Smith and M. St. J. Warne. 2017. Proposed default guideline values for the protection of aquatic ecosystems: Diuron – freshwater. Department of Science, Information Technology and Innovation. Brisbane.

approach. Concerningly, however, it also relies heavily on EC5[10] values, which are not applied in the derivation of ANZECC guidelines (which instead uses either EC10[11] or NOEC[12]) and result in lower values being applied. It would be inappropriate for such an approach to be adopted with no consultation.

10 The concentration of a substance resulting in an effect on 5 per cent of the population
11 The concentration of a substance resulting in an effect on 10 per cent of the population
12 No Observed Effect Concentration; i.e. the concentration at which no effect is observed

4 CONCLUSION

Agricultural chemicals are cost effective, efficient, essential and sustainable tools for farmers to use to control pests, weeds and diseases. They represent a core input for modern farming systems. A streamlined, effective regulatory environment capable of delivering timely risk assessments, approvals and registrations is essential for Australian agriculture.

It is deeply concerning that the detailed description of the methods used by the Queensland Government to determine and monitor potential risks posed by the use of crop protection products to the Reef has not been completed and is not publicly available. A meaningful peer review of that methodology is therefore not possible and reduces confidence in the data presented in the *Pesticide Risk Baseline Results*. Despite not having access to a detailed description of the methodology used by the Queensland Government, CropLife and our members have identified a number of concerns regarding the reliability and scientific rigour of the approach and associated baseline results. The Queensland Government's own alarming admission that confidence in the methodology is low does little to allay those concerns.

It is unacceptable for the Queensland Government to rely on an unpublished methodology for assessing risk to the Reef, in which they have little confidence, while internationally accepted, published methodologies are available and are being used by Australia's expert scientific regulator, the APVMA.

Despite these frustrations and concerns, CropLife is committed to continuing to work with the Federal and Queensland Governments to develop appropriate, evidence-based regulation to protect the Reef from any potential impact arising from the use of crop protection products. Whether at the national or state level, it is crucial that the regulation of crop protection products in Australia is based on rigorous and transparent scientific method. This will ensure not only that Australian farmers have access to the innovative tools the plant science industry provides, but also that any potential risks to the Reef are identified and appropriately managed.

APPENDIX 1: THE PLANT SCIENCE INDUSTRY

CropLife member companies are the innovators, developers, manufacturers and formulators of chemical and biological crop protection products, and agricultural biotechnologies for plant breeding, such as genetically modified crops.

The plant science industry's crop protection products include fungicides, herbicides and insecticides critical to maintaining and improving Australia's agricultural productivity to meet future global food security challenges. Each of these products is rigorously assessed by the Australian Pesticides and Veterinary Medicines Authority (APVMA) to ensure they present no unacceptable risk to users, consumers, the environment and the trade of agricultural produce.

In 1995 it took the assessment of 52,500 compounds to develop one effective crop protection chemical active constituent. It now requires the assessment of more than 140,000 compounds and expenditure of more than $400 million over an 11-year period to bring just one successful crop protection product to the market. More than one-third of this cost directly relates to compliance with regulation and registration requirements. Without access to these tools, farmers could lose as much as 50 per cent of their annual production to pests, weeds and diseases. A Deloitte Access Economics report released in 2018, '*Economic activity attributable to crop protection products',* estimates that up to $20.6 billion of Australian agricultural output (or 73 per cent of the total value of crop production) is attributable to the use of crop protection products.[13]

Consumer safety is CropLife and our members' highest priority. We recognise the importance of gaining and maintaining community trust in our role in the food production supply chain. CropLife and its members are committed to the stewardship of their products throughout their lifecycle ensuring human health and safety, and the responsible and sustainable management of the environment and trade issues associated with agricultural chemical use in Australia. CropLife ensures the responsible use of these products through its mandatory industry code of conduct and has set a benchmark for industry stewardship through programs such as ***drum****MUSTER*, ChemClear® and safety training programs run by CropLife's wholly-owned stewardship and safety organisation, Agsafe.

Crop protection products are crucial to modern integrated pest management techniques and systems used by farmers. Access to fewer crop protection tools would facilitate faster development of resistance among targeted pests, diminishing the efficacy of remaining chemical options. The economic impact of weeds alone is estimated to be over $4 billion each year, with an impact on the environment that is similar in magnitude[14].

The current regulatory system for agricultural chemicals in Australia is scientifically competent, technically proficient and globally recognised. CropLife's only concerns with the current system relate to the APVMA's ability to regulate agricultural chemicals more efficiently. It is imperative that the regulation of crop protection products in Australia is efficient and effective to ensure

[13] https://www.croplife.org.au/wp-content/uploads/2018/04/Deloitte-Access-Economics-Economic-Activity-Attributable-to-Crop-Protection-Products_web.pdf

[14] Australian Weeds Strategy – A national strategy for weed management in Australia. National Resource Management Ministerial Council (2006), Australian Government Department of the Environment and Water Resources, Canberra, ACT.

Australian farmers have access to the innovative tools the plant science industry provides. This will improve the ability of Australian farmers to be internationally competitive and productive.