**June 2014**

# AgForce submission

Senate Inquiry –
Adequacy of the Australian and Queensland Governments' efforts to stop rapid decline of the Great Barrier Reef

AGFORCE

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## Introduction

AgForce is the peak lobby group representing the majority of beef, sheep and wool, and grain producers in Queensland. The broadacre beef, sheep and grains industries in Queensland generated around $4.5 billion in gross farm-gate value of production in 2012/13. AgForce exists to ensure the long term growth, viability, competitiveness and profitability of these industries. Our members provide high-quality food and fibre products to Australian and overseas consumers, manage more than 50% of the Queensland landscape, and contribute significantly to the social fabric of rural and remote communities.

Beef cattle grazing is the major land use area in reef catchments with over 33.7 million hectares across the six catchments draining into the Great Barrier Reef Lagoon. This represents 12,550 grazing enterprises according to the Australian Bureau of Statistics 2010 survey[1].

Broadacre dryland cropping areas vary from year to year depending on seasonal growing conditions. Each year, there is approximately 345,000 hectares sown to cereal and oilseeds by approximately 1,080 grain enterprises.

The majority of producers use productive, profitable land management practices that sustain the environmental values of agricultural land and work within the constraints of a variable tropical climate. ReefPlan has been a catalyst to expedite voluntary benchmarking systems across agricultural industries to demonstrate adoption levels of best management practices (BMP) to government and community. A similar BMP framework to myBMPCotton has been used in the central Queensland grain and grazing industries. Over time, the aggregated industry data from these BMP frameworks and the ongoing commitment of producers to best management practices will demonstrate environmental stewardship and an active commitment to catchment health and reduced runoff. Grains BMP[2] and Grazing BMP[3] have been developed in partnership between industry and the Fitzroy Basin Association NRM Group and Queensland Department of Agriculture Forestry and Fisheries and is currently being rolled out to producers across the Fitzroy and Burdekin catchments, soon to be extended into the Burnett Mary catchment.

Both the Australian and Queensland Governments have invested over $375M since 2009 for reef management. Of this government investment, $96M was distributed by six NRM groups across 5,500 water quality devolved grant projects and matched with $157M cash and in-kind expenditure

[1] Australian Bureau of Statistics, 2010. 4619.0.55.001 Land management practices in the Great Barrier Reef Catchments, Final, 2008-09.
[2] Grains BMP program https://www.grainsbmp.com.au/home.aspx
[3] Grazing BMP program http://www.bmpgrazing.com.au/#&panel1-1

by land managers[4]. Queensland Government provided $1.8M funding for development and implementation of Grazing BMP and Australian Government provided $0.2M for Grains BMP development. AgForce is not certain of the total government budget for Paddock to Reef modelling and monitoring, however there were 100 Full Time Equivalent (FTE) government and scientific positions working on the reef Source Catchments model during 2009 to 2010 (Chris Chinn, Department of Premier and Cabinet, *pers.comm*.).

It is timely to review governments' significant investment and governance measures to determine if this effort will stop the decline in water quality within the Great Barrier Reef. AgForce Queensland offers the following suggestions in response to the Senate's call for submissions on the adequacy of the Australian and Queensland Governments' efforts to stop the rapid decline of the Great Barrier Reef.

[4] Reef Rescue 2008-2012 Programme Report, Reef Alliance internal report.

## Summary Recommendations

**1. Government funding has expedited reef science**

AgForce congratulates the Australian and Queensland Governments' for the combined investment of $375M into ReefPlan activities from 2009 to 2013. This substantial funding by government and other stakeholders has resulted in major advances in ecological science, Global Information System (GIS) monitoring and catchment modelling. There has been substantial involvement of Regional Natural Resource Management Groups in implementing ReefPlan actions, along with industry partnerships.

**2. Recommend single searchable database for all reef reports and publications**

AgForce recommends that improved accessibility to reef reports and publications be implemented by hosting them on a searchable database such as the National Environmental Research Program (NERP) Tropical Ecosystems or ReefPlan websites. There is no single repository for reef reports and manuscripts funded through ReefPlan. From an industry perspective, it is difficult to know where to look for relevant reef reports apart from searching on Google and through email networks. The disconnect between reef research and development (R&D) and industry R&D has impeded uptake of practice change in agriculture. Without accessible research, this disconnect will continue. Future reef research on land management practices should confer and build on existing reports, not duplicate previous industry and catchment reports and be readily accessible to new and existing stakeholders in reef and agriculture.

**3. Increased community involvement in regional monitoring of runoff to foster ownership and awareness**

Increased regional involvement of land managers and community in sub-catchment monitoring of runoff to validate modelled trends would foster ownership, awareness and involvement in actions to improve catchment health. Currently a major component of reef science is done remotely on computers in research and government institutions, with limited connect to land managers. Improved connect between modelling scientists and land managers would also increase the understanding of scientists about the complexities of co-managing productivity, economical and environmental outcomes on agricultural land within a variable tropical climate.

**4. Recommend review of pesticide runoff science by independent pesticide environmental toxicologists.**

In some cases, reef scientific work has not considered other existing science in regards to agriculture and pesticide environmental toxicology. The adequacy and transparency of reef pesticide runoff science is therefore subject to question by industry. There have been instances where incorrect assumptions and toxicity impacts have been used for pesticide modelling such as:-

(a) Two herbicides (hexazinone and tebuthiuron) modelled for runoff from cropping areas, which are not registered nor used in cropping.
(b) Whole grazing land use catchment area used for calculating annual herbicide runoff loads where application area would be less than 0.16% of the grazing area and only applied every seven to twenty years.
(c) End of catchment herbicide runoff values added together across five herbicides for comparison to water quality trigger values, where all five herbicides were never detected occurring together in runoff.
(d) Herbicide exposure concentrations that could impact on corals and marine organisms are at least five times greater than any detected herbicide concentrations monitored in end of catchment watercourses. Impact on algal and coral photosynthesis is reversible and only occurs during periods of exposure to these elevated herbicide exposure concentrations. AgForce considers herbicide detection does not infer impact on marine organisms.

AgForce is concerned that reef pesticide science, at times, has resulted in false claims about detected levels of pesticide runoff causing impact on marine organisms in coastal receiving waters. The pesticide model is unique to the reef and does not consider all the pesticide properties considered by national runoff models used by the Australian Pesticides and Veterinary Medicines Authority (APVMA).

In regards to pesticide runoff modelling, a recommendation by AgForce to this review is government conducts an independent scientific review of the reef pesticide science by using independent expert pesticide environmental toxicologists. This would help target limited government funding towards factors that actually do impact on inner shore reef health such as sediment plumes after flood events, rather than hypothetical factors arising from reef modelling such as pesticide runoff to reef health. Rather than modelling, ongoing temporal monitoring of pesticide concentrations along reef catchments and comparison to Great Barrier Reef Marine Park Authority Water Quality Trigger Values will ensure the risk of herbicide impact to reef ecosystems remains negligible.

**5. Reef science should build on existing industry science about grazing management practices**

In the early stages of ReefPlan (2009 – 2011), there was disconnect between reef scientists and previous grazing land management research and development conducted by organisations such as Meat and Livestock Australia, CSIRO and Queensland Department of Agriculture Forestry and Fisheries (QDAFF). This resulted in "reinventing the wheel" in catchments such as the Burdekin. For the grazing industry, reef grazing science did not build on existing applied knowledge of grazing management and known zones of high risk for soil erosion, from reviews conducted in 2004. Government funding efficiency could improve by focusing on-ground activities within 10 to 20 per cent of grazing land in poor condition with erodible soils. These sites were previously identified by land condition satellite imagery analysis tools such as VegMachine®[5]. Instead, ReefPlan developed a model that required GIS information on land management practices, a data layer that did not exist. Industry has always remained adamant that grazing land condition, not grazing management practices, determine the risk of sediment runoff. Now we see government scientists eventually realising the value of monitoring fractional ground cover satellite imagery as an indicator of grazing land condition, which is where industry R&D was heading towards, five years ago.

**6. Reef management requires governments to be proactive to informing public debate on reef issues through a range of media platforms (i.e. social licence to operate)**

Both governments have recently felt the impact of social licence on management decisions relating to natural resources. Social media and advocacy campaigns such as "Fight for the Reef" and "Save our Reef" have diverted government, industry resources and time into managing community concerns. These community concerns are often influenced by misconstrued or incorrect information arising from advocacy campaigns. Social science and marketing expertise needs to be utilised by the government, resource and agricultural industries to communicate shared values and social trust along with the science. Future decisions about long term reef management by government need to be based on facts and evidence and not influenced by advocacy campaigns.

[5] VegMachine® ground cover monitoring software http://futurebeef.com.au/resources/vegmachine/

**Final Comment**

The Great Barrier Reef is a complex ecosystem influenced by interactions between catchment runoff and large-scale natural events. Marine water quality is influenced by currents, winds and waves as well as rainfall pattern and river loads. Over time, new technology and science will help us understand the main network of factors contributing to reef health which may extend beyond current highlighted factors such as over-fishing, agricultural land use, coastal development and port dredging.

AgForce recommends priority monitoring activities and cost-effective management actions continue for factors affecting reef resilience. The focus should be on factors which humans can change, whereas global impacts such as major natural disasters (floods, cyclones, wildfires) are beyond government and land managers' control.

AgForce, in representing the interests of broadacre agricultural industry, places trust in the Australian and Queensland Governments' alongside independent expert reef panels to ensure future reef management efforts align to the major factors affecting reef health and resilience

**BACKGROUND INFORMATION to SUMMARY RECOMMENDATIONS**

**1. Government funding has expedited reef science**

The $375M government investment into the last five years of ReefPlan to manage reef health and resilience has created an intense partnership network of activity. Activities ranged from policy to catchment modelling, monitoring, research and development through to incentive payments to producers to improve land management practices for water quality outcomes. Queensland Government introduced Reef Protection regulations which are now being reviewed and possibly phased towards greater emphasis on industry self-regulation through Best Management Practice programs. Inviting industry bodies to the Reef Partnership Committee has provided opportunity to openly discuss reef governance between government, Regional Natural Resource Management Groups, conservation groups and industry. There have been many advances and some challenges associated with ongoing ReefPlan management.

**2. Recommend single searchable database for all reef reports and publications**

Government investment into reef management has generated hundreds, if not thousands of reports, scientific publications, web-based tools and other materials. Published reports are scattered over many websites and scientific journals. From an industry perspective, it is difficult to know what relevant reports exist and where to find them. Any future reef science should build on to existing reef knowledge and not duplicate previous work. AgForce recommends government linking the vast array of reef reports to one searchable database portal for current and future research, development and extension. Current web portals such as the National Environmental Research Program Tropical Ecosystems and ReefPlan only link to a small portion of reef reports and publications.

The disconnect between reef R&D and industry R&D has resulted in some previous research not being considered and/or being duplicated. For example, a three year industry study by Hall *et al* (2014) across northern Australia comparing continuous, rotation and cell grazing systems showed similar pasture and soil ecological responses across all grazing systems and that seasonal conditions was the major factor of influence[6]. A ten year study by Bartley *et al* (2014) on improving grazing land condition by reducing stocking rates and rotational wet season spelling on goldfield country in the upper Burdekin catchment indicated timescales of ten years or more are required to meet

[6] Hall T, McIvor J, Reid D, Jones P, MacLeod N, McDonald C and Smith D. 2014 'A comparison of stocking methods for beef production in northern Australia: pasture and soil surface condition responses'. The Rangeland Journal, Vol 36, pp161-174.

ReefPlan water quality targets[7]. Improved networks with industry R&D from the initial stages of ReefPlan 2009 and 2013 would improve opportunities for research extension. There needs to be improved research priority setting with industry corporations such as Meat and Livestock Australia and CSIRO Flagship clusters. Two-way extension between scientists and land manager end-users is an integral component of successful R&D. Producers are managing complex business enterprises within a variable climate. Reducing runoff from the farm is one of many factors considered by a producer when deciding on the best cost-effective and profitable practices to produce food and fibre. AgForce awaits implementation of the 2014 ReefPlan Extension and Education Strategy, after the third Queensland Government review, to improve the awareness and uptake of relevant reef science.

### 3. Increased community involvement in regional monitoring of runoff to foster ownership and awareness

Due to advances in computer and remote sensing technology, a large proportion of ReefPlan science is done through computers. There has been very little interaction between reef scientists and producers who are managing the main proportion of the reef catchment areas. Regional NRM Groups and a few nodes of government extension staff with government resourcing have provided the main conduit of ReefPlan information to producers. The Queensland Government *Reefocus* extension pilot project[8] did successfully engage land managers, industry extension staff, consultants, agribusiness resellers and community in reef catchment health in the Herbert and Johnstone catchments. Localised groups focused on improving business performance and land use runoff through farm visits, field tours, workshops, training and e-technology discussions. AgForce recommends similar pilots could be aligned to hotspot catchments where there are high levels of sediment and nutrient runoff. Community involvement in regional water quality monitoring through farm visits fosters ownership and awareness of runoff issues along with commitment to work towards improving catchment health. These forums also provide an excellent opportunity for reef scientists to engage with producers to cross-share knowledge and understanding.

AgForce commends the Australian and Queensland Governments' continued support, funding, resourcing and expediting the development and implementation of Best Management Practice (BMP) programs in the broadacre grains and grazing industries. These programs use a similar

[7] Bartley R, Corfield J, Hawdon A, Kinsey-Henderson A, Abbott B, Wilkinson S and Keen R. 2014. 'Can changes to pasture management reduce runoff and sediment loss to the Great Barrier Reef? The results of a 10-year study in the Burdekin catchment, Australia. The Rangeland Journal, Vol 36, pp67-84.
[8] Reef Plan Extension and Education Strategy – pilot project *Reef*ocus Extension (2012) (internal report).

framework to myBMP Cotton and CaneBMP. BMP programs enable producers to benchmark their land management practices against industry standards and identify areas for continuous improvement to their enterprise. BMP's focus on business profitability, productivity and environmental stewardship, therefore practices that relate to agricultural runoff to the reef are addressed within BMP benchmarking. As more producers complete the BMP modules, there is increasing rigour in the aggregated industry benchmarking data on farm practices. This data can be used to confirm government and community confidence in producers demonstrating a high level of care for their land and animals. AgForce recommends the ongoing support of government to the BMP programs rather than considering imposing additional Reef Protection regulations.

**4. Recommend review of pesticide runoff science by independent pesticide environmental toxicologists.**

In protecting the Great Barrier Reef, limited resources should be directed to the activities that will provide the best protection for reef health and improved water quality. A 27-year survey of 214 reefs has identified the main causes for the 0.53 per cent annual decline in coral cover are tropical cyclones (48 per cent), predation by crown of thorns starfish (42 per cent) and sporadic coral bleaching (10 per cent) (De'ath *et al* 2012)[9]. River runoff carrying land use pollutants mainly affects inner shore reefs within 60km of the coastline which is only 15 per cent of the total GBR reefs (De'ath *et al* 2012). Impacts include increased macroalgal cover and reduced biodiversity and recruitment of coral species due to elevated nutrients and turbid water. Therefore AgForce questions government expenditure into pesticide studies and grants, where there is no scientific evidence that trace concentrations of pesticides detected at end of river catchments or inner shore waters have any toxicological impact on marine organisms, sea grass or mangroves. This view is supported by the Diuron Environment Assessment Report published by the Australian Pesticides and Veterinary Medicines Authority (2011)[10]. The main risk to off-target impact from pesticides is possibly in watercourses directly adjacent to the pesticide application area, if there was a heavy rainfall event soon after application. The purported risk to coastal receiving waters is questionable.

[9] De'ath, G, Fabricus, KE, Sweatman, H & Puotinen, M 2012, 'The 27-year decline of coral cover on the Great Barrier Reef and its causes' *Proceedings of the National Academy of Sciences of the United States of America*, vol 109, doi.10.1073/ 1208909109, http://www.pnas.org/content/early/2012/09/25/1208909109.full.pdf+html?sid=280502c3-9b59-4127-8f99-5544c716cad2

[10] APVMA (Australian Pesticides and Veterinary Medicines Authority) 2011, *Diuron environment assessment.* APVMA, Canberra http://www.apvma.gov.au/products/review/docs/diuron_environment.doc

### 4.1 Pesticide runoff modelling

Contrary to reef scientist opinion, trace detection of residual, soil-applied herbicides used in agricultural and other land uses in reef water quality monitoring does not infer impact on marine organisms. Uncertainties in predicting runoff from site of application towards watercourses and potentially towards inner shore reef waters include chemical characteristics, site specifics (soils, slopes, distance between edge of application area and receiving waters), timing of application and intensity of rainfall. The APVMA estimate runoff of herbicides using the internationally recognised REXTOX model used by the Organisation for Economic Co-operation and Development (OECD)[11]. The REXTOX model considers rainfall, runoff water, slope, pesticide degradation and mobility, buffer zones, interception and retention of the pesticide by crops/weeds and sediment transport of the pesticide. ReefPlan water quality scientists have departed from using the internationally recognised OECD REXTOX model for determining exposure to herbicide runoff risk and environmental toxicity. Temporal monitoring of detected concentrations of pollutants should be compared to the ANZECC (Australian and New Zealand Environment Conservation Council) water quality trigger values which indicate thresholds where 95% or 99% of organisms are considered safe to exposure. The highest incidence of pesticide detection in watercourses is within river freshwater during a flood plume. There is very little evidence of pesticide detection on the inner or outer reefs. Detection of herbicides near water quality trigger values has been interpreted as 'toxic impact' rather than an alert to continue monitoring trends in herbicide runoff. ReefPlan scientists extrapolate catchment herbicide loads (kg) by multiplying detected herbicide runoff (micrograms per litre) by agricultural land use area within a sub-catchment (hectares) by river water discharge (gegalitres). This method results in a gross over-exaggeration of catchment loads for pesticides.

### 4.2 Tebuthiuron herbicide

One example of over-exaggeration of catchment loads is tebuthiuron. ReefPlan load modelling estimated 7000kg of tebuthiuron entered reef marine waters between 2010 to 2011[12]. The woody weed and woody regrowth herbicide, tebuthiuron, is applied to less 1.6% of the grazing land use area and only applied once every 7-20 years. Changes in catchment woody vegetation cover is monitored annually by the Queensland Government through the Statewide Landcover and Trees

[11] Probst et al. 2005, 'Scenario-based simulation of runoff-related pesticide entries into small streams on a landscape level', *ScienceDirect - Ecotoxicology and Environmental Safety.* http://www.sciencedirect.com/science.

[12] Turner R, Huggins R, Wallace R, Smith R and Warne M. 2013. Total suspended solids, nutrient and pesticide loads (2010-2011) for rivers that discharge to the Great Barrier Reef Catchment Loads Monitoring 2010-2011. Department of Science, Information Technology, Innovation and the Arts, Brisbane. http://www.reefplan.qld.gov.au/measuring-success/paddock-to-reef/assets/2010-2011-gbr-catchment-loads-report.pdf

Study (SLATS)[13]. It is difficult to understand the ReefPlan methodology for herbicide load and yield where entire sub-catchment grazing land use is considered in the modelled formula. This would infer no woody vegetation would be left on grazing land use areas, which is not correct. Label restraints prevent application on sloping land and within 100m of watercourses. Voluntary aerial application environmental stewardship programs conducted by DowAgrosciences, one of the main suppliers of tebuthiuron, do not aerially apply this product between November and March when the risk of storms and runoff are high.

Tebuthiuron is only registered for use in pasture. The 2010-11 Loads Monitoring Report made the wrong assumption that tebuthiuron was also registered for 'hay and silage' and modelled cropping land use area within their estimated catchment loads and yields of this herbicide. AgForce recommends that government consider reviewing this pesticide work by an independent pesticide environmental toxicologist. AgForce can provide more background information to this technical issue, if requested.

### 4.3 Diuron herbicide

ReefPlan scientists claim diuron to be one of the most prevalent and toxic herbicides detected in reef water quality samples (Devlin and Lewis 2011)[14]. Impacts on marine corals have only been reported at exposure concentrations of 10µg/L or more (APVMA 2012)[15] which is five times more than the maximum diuron concentration detected by Lewis *et al* (2009)[16] which was 1.7 µg/L for a short period during a river flood plume. The APVMA Diuron Review Findings Report (2012) also noted from a study by Negri et al. (2005)[17], that coral organisms made full recovery after cessation of exposure to diuron. Full recovery occurred within one day when exposure was less than 10µg/L

[13] Queensland Government (2010). Land cover change in Queensland 2008–09: a Statewide Landcover and Trees Study (SLATS) report, 2011.Queensland Government, Brisbane, http://www.qld.gov.au/environment/land/vegetation/mapping/slats/

[14] Devlin, M and Lewis, S. 2011. Advancing our understanding of the source, transport and impacts of pesticides on the Great Barrier Reef and in associated ecosystems: A review of MTSRF Research Outputs, 2006-2010. http://www.rrrc.org.au/publications/pesticides_review.html

[15] APVMA (Australian Pesticides and Veterinary Medicines Authority) 2012. Diuron review findings report. APVMA, Canberra. http://www.apvma.gov.au/products/review/docs/diuron_review_report.pdf

[16] Lewis, SE, Brodie, JE, Bainbridge, ZT, Rohde, KW, Davis AM, Masters BL, Maughan, M, Devlin MJ, Mueller, JF and Schaffelke, B. 2009. 'Herbicides: A new threat to the Great Barrier Reef'. Environmental Pollution vol. 157(8-9), pp. 2470–2484.

[17] Negri, AP, Vollhardt, C, Humphrey, C, Heyward, A, Jones, R, Eaglesham, G and Fabricus,K. 2005. 'Comparative effects of herbicides on photosynthesis and growth of tropical estuarine microalgae'. Marine Pollution Bulletin, 51, pp 370-38.

and within seven days when exposure was 30µg/L. Exposure trials by Cantin (2007)[18] for two to three months at 10 µg/L diuron concentration are not conditions experienced in reef watercourses. Toxicity endpoints for diuron also confirms no observable effect on algae and diatoms below 10µg/L and effect on 50% or more of test species occurs at concentrations above 10µg/L. AgForce questions governments' concern about herbicide impacts to reef marine organisms when basing decisions solely on ReefPlan science and not using other sources of pesticide science. This issue has been raised previously by AgForce with a number of reef scientists.

### 4.4 Herbicide additivity

Several water quality studies in the Great Barrier Reef have expressed run off concentration of the Photosystem II (PSII) residual herbicides as PSII herbicide equivalents (Lewis et al 2011[a])[19]. This new, novel method assumes (a) herbicides from a similar group act additively, (b) all herbicides are present in the water column during an exposure period and (c) no aquatic species variability to pesticide exposure is considered. Scientists using this method allocated diuron a potency of one, rated other PSII herbicides relative to this diuron potency and summed their concentration residues together.

Pesticide additivity is only relevant if all five PSII herbicides occur in the water column at the same time. Lewis et al (2011[a]) only found 51% of the 184 passive samples collected over three years with two or more herbicide residues present. The eco-toxicity end point for converting detected herbicides to atrazine or diuron equivalents has also been challenged by expert environmental scientists working with pesticide risks. Another complicating factor to this summative approach is that aquatic plant species have variable responses and sensitivities to specific herbicides and organisms generally recover after short exposure events (Cedergreen et al 2008)[20].

This is a new novel method being employed and therefore caution needs to be applied to the ReefPlan model and any interpretations.

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[18] Cantin N E, Negri A P and Willis B L. 2007. 'Photoinhibition from chronic herbicide exposure reduces reproductive output of reef-building corals', Marine Ecology Progress Series 344: 81–93.

[19] Lewis, SE, Schaffelke, B, Shaw, M, Bainbridge, ZT, Rohde, KW, Kennedy, K, Davis, AM, Masters, BL, Devlin, MJ, Mueller, JF and Brodie,JE 2011[a], 'Assessing the additive risks of PSII herbicide exposure to the Great Barrier Reef', Marine Pollution Bulletin, vol.65(4-9), pp. 280-291.

[20] Cedergreen, N, Christensen, A, Kampe,r A, Kudsk, P, Mathiassen, SK, Streibig, J and Jenson, H. 2008. 'A review of independent action compared to concentration addition as reference models for mixtures of compounds with different molecular target sites,' Environmental Toxicology and Chemistry, vol. 27, no.7, pp. 1621-1632

## 5. Reef science should build on existing industry science about management

Through modelling of land use areas, reef scientists indicated the largest contributor of "new" suspended sediment and nutrients to the Great Barrier Reef Lagoon is agriculture. Other factors are not considered as important to reef water quality, such as resuspension of existing sediment in coastal waters; contribution of sediment and nutrient from other catchment sources such as urban areas, old and new mining sites, conservation areas and tropical rainforests.

### 5.1 Ecology of Crown of Thorns Starfish (COTS) outbreaks

From an industry viewpoint, the ecology of Crown of Thorns starfish is still being determined. Does government have adequate science to confirm nutrient runoff is the real cause for COT outbreaks or are there other cumulative causes? Skeletal remains in reef sediment have shown native COT predators have been around for 8000 years. Previous marine studies linked incidence of fishing to COT outbreaks and was one of the main reasons to increase no-fish zones to 33% of the marine park area. In 2010, Dr Laurence McCook Great Barrier Reef Marine Park Authority said 'Outbreaks of COT starfish are less frequent on no-take reefs'[21]. A 2011 manta tow survey by the Australian Institute of Marine Science (AIMS)[22] showed only 2% of reefs were subject to COTs outbreaks. A few previous COT outbreaks on isolated outer reefs were beyond the zone of sediment & nutrient run off impact along the 60km zone of inner shore reefs. AgForce suggests further scientific studies by AIMS on factors affecting COT larval survival should be completed before investing additional government funds in managing fertiliser regimes and nutrient runoff from agricultural land and other catchment sources.

### 5.2 Reef Strategic Assessment

The Reef Strategic Assessment is a comprehensive snapshot of all known reef science that can be used to plan future coastal development and manage activities of major impact to reef health. It is difficult to ascertain why Matters of National Environmental Significance were incorporated and linked into this assessment of reef management. Industry places trusts in the experts in organisations such as the Great Barrier Reef Marine Park Authority (GBRMPA) to make informed decisions on how to balance future economic development with ecosystem values. AgForce is uncertain how the GBRMPA Coastal Ecosystem Framework will be used as a future policy instrument

[21] McCook L, 2011. http://www.australiancoralreefsociety.org/laurence-mccook-scientist-commentary
[22] AIMS 2011 manta tow survey http://www.aims.gov.au/docs/research/monitoring/reef/ltm2011-11-12.html

to limit development and agricultural activities along the Queensland coastline. The link to existing land use policy planning instruments used by local and state government is also unclear.

### 5.3 Governments' open and transparent consultation with community and industries

Reef scientists have focused on research, preparing scientific publications in journals and influencing reef policy. There has been limited "knowledge transfer" of this reef science back to community and land managers. Scientific information needs to be re-packaged into fact sheets or web sites of key points along with evidence of economic benefit for wider use by affected land managers and regional communities.

When government is considering the broader community's view on reef management, the quality of community views in the context of where they have gathered their information needs to be considered. Government needs a system of weighting to distinguish between thousands of e-petition letters from an advocacy campaign versus a handful of producers who live on the land, make their livelihood from the land and have cared for the land for three to five generations.

Government has run a good process of transparency when calling for community submissions on the draft strategic assessment, Reef Trust and this inquiry. However there has been no obvious pathway for community and industry to provide feedback to reef modelling methodologies, model assumptions and collation of information on management practices for reef report cards. AgForce has raised concerns and issues direct with authors and editors of conference proceedings after publication of some reef science. There has been limited feedback or re-consideration of methodologies used in reef science. The result is disengagement by the grazing and grains industries in the ReefPlan process due to lack of understanding, lack of "information transfer" and challenges to the modelling used in Source Catchments.

## 6. Reef management requires governments to be proactive to informing public debate on reef issues through a range of media platforms (i.e. social licence to operate)

There is emerging discord with Great Barrier Reef science and management. Over the last ten years, reef campaigns by environmental non-government organisations have undermined scientific integrity and public trust[23] [24] [25] and created anxiety about reef management. Substantial government resources are tied up in responding to these social licence challenges from environmental groups which spread rapidly through social media to the wider community. Resources such as the joint government's Environmental Taskforce and launch of the "Reef Facts" government website are two examples of government response to this emerging social licence from community. Trust and communication of values between all reef stakeholders and the wider community is now at jeopardy. Intertwined with science are other agendas of politics, activities of environmental non-government organisations, market transformation and integrity of some scientists as they battle for diminishing research funds. Acceptable, productive and affordable changes in land management practices require scientific certainty by land managers and government before adoption occurs[26].

There are similarities between the advocacy campaigns to stop coastal development and transform agricultural practices in reef catchments to the 2012 advocacy campaign that resulted in banning the super trawler Abel Tasman in Australian waters[27]. In this case, community pressure through social licence outweighed the best available science in government decision making.

There are studies that demonstrate impacts of social licence on farming and food production from the United States of America. The Centre for Food Integrity[28] was established in 2007 to build and communicate consumer trust and confidence in the food supply chain. Best practices are highlighted and stakeholders engaged on issues of concern to consumers. Similar to government launching the Reef Facts website, the Centre for Food Integrity launched "Best Food Facts" website[29] to bring community and consumers direct together with information from food production experts so consumers could make informed decisions.

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[23] Marohasy, J & Johns,G 2003, *WWF says 'Jump'! Governments ask 'How high?'* Occasional paper. Institute of Public Affairs, Melbourne. http://www.ipa.org.au/publications/547/wwf-says-'jump!'-governments-ask-'how-high-

[24] Fight for the Reef campaign http://fightforthereef.org.au/

[25] World Wildlife Fund http://www.wwf.org.au/what_you_can_do/do_it/fight_for_the_reef/

[26] Brodie, J & Waterhouse, J 2012, 'A critical review of environmental management of the 'not so Great Barrier Reef', *Estuarine, Coastal and Shelf Science,* vol. 104-105, pp. 1-22.

[27] ABC News, 11 September 2012. 'Government to legislate to stop super trawlers' http://www.abc.net.au/news/2012-09-11/government-to-legislate-to-stop-super-trawlers/4254626

[28] Centre for Food Integrity http://www.foodintegrity.org/about-us

[29] Best Food Facts http://www.bestfoodfacts.org/

Moving forward, AgForce suggests government needs to explore how to improve communication about facts and factors affecting reef health to the wider community, so they can make informed decisions about the Great Barrier Reef. One area of reef management being questioned by broadacre agriculture, CropLife Australia and other associated crop and land protection industries is the integrity of reef herbicide runoff science. This is leading to distrust and disengagement from the partnerships formed under the Australian and Queensland Governments' ReefPlan for reef water quality protection. A leading water quality expert, Dr Jon Brodie and Juliette King from World Wildlife Fund published a joint scientific paper[30] that challenged the APVMA regulation of pesticides and promoted the World Wildlife Fund agenda to ban pesticides for reef safety. The credibility of peer-reviewed science is questioned by industry when statements such as "GBR is Australia's best documented case of contamination of an ecosystem by pesticides" are published[8]. The negative publicity about herbicide impacts on the Great Barrier Reef undermines community trust in the safe use of pesticides.

AgForce, in representing the interests of broadacre agricultural industry, places trust in the Australian and Queensland Governments' alongside independent expert reef panels to ensure future reef management efforts align to the major factors actually affecting reef health and resilience.

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[30] King, J, Alexander, F & Brodie J 2013, 'Regulation of pesticides in Australia: The Great Barrier Reef as a case study for evaluating effectiveness', Agriculture Ecosystems and Environment, Vol 180. pp54-67. http://www.sciencedirect.com/science/article/pii/S0167880912002526