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Sugarcane farming and the Great Barrier Reef: the role of a principled approach to change

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ABSTRACT

Nutrient run-off from sugarcane farming practices has been identified as a significant threat to the Great Barrier Reef World Heritage Area (GBRWHA). The load of dissolved inorganic nitrogen (DIN) has increased dramatically in the last decades. This increase has been connected to poor water quality and outbreaks of Crown of Thorns starfish. It is suggested that the current level of the water quality is a failure that can be reversed by a focused regulatory response which meets the timeframe set by government. Considering the historical issues of regulatory capture, we argue that in devising effective regulation the culture of the sugar industry is of critical importance.

Even though in theory it is possible for nutrient trading measures to achieve water quality targets, in the context of the regulation of DIN outfall produced by the sugarcane industry in the GBR catchment area, there are scientific and social barriers that work against such outcomes. We propose a combined instrument approach that involves both incentives and ultimately penalties to meet the timeframes considered necessary to protect the GBRWHA. Importantly such a strategy can be implemented without significant legislative changes.

1. Introduction

Coral reefs are now one of the most endangered ecosystems globally due to a variety of threats including climate change, coastal development and terrestrial runoff (Pandolfi et al., 2003; Spalding and Brown, 2015). While climate change is considered the most serious risk, agricultural pollution threatens approximately 25% of the total global reef area with further increases in sediment and nutrient fluxes projected over the next 50 years (Kroon et al., 2014). Immediate management of anthropogenic pressures to coral reef ecosystems are therefore being prioritised.

The Great Barrier Reef (GBR) is the largest living structure on Earth with an economic and social asset value of AUD56B[1] (Deloitte Access Economics, 2017). The 2013 Scientific Consensus Statement on the Great Barrier Reef (GBR) concluded that 'the greatest water quality risks to the Great Barrier Reef are from nitrogen discharge, associated with crown-of-thorns starfish outbreaks and their destructive effects on coral reefs'. A large proportion of the nitrogen runoff is derived from sugarcane fertiliser loss (Bell et al., 2016), contributing to an estimated 56% of dissolved inorganic nitrogen (DIN) loads in the GBRWHA (Bell et al., 2016), despite only occupying around 1.3% of its area. Although it is well recognised that agricultural production results in negative externalities (Athukorala et al., 2015)[2], the proximity of the reef to the sugarcane farming areas in Queensland exacerbate the seriousness of this problem.

The drive for practice change and technological intervention therefore recognises that past intervention has been inadequate (Bell, 2015). Such past failures highlight not only the political barriers to change but also that effective regulation of water quality should not be solely focused on environmental issues but also consider the economic and social setting in which sugarcane farmers operate. In short, it should be based on sustainable development but achieved through a specialised principled approach to regulation and governance. These principles consider both the impacts of the regulations and those being regulated. They include:

- transparency (both regulation itself and the resulting impacts);
- accountability of the regulators and the regulatees;

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[1] For value of beach recreation for locals in the Great Barrier Reef Marine Park see Prayaga (2017).

[2] For other studies, for example, to show the impacts of excessive tapping of groundwater for irrigation of crops, see Mahanta et al. (2016).

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- congruence - to the maximum extent possible - of the regulation to measurable targets;
- promotion of a positive industry culture to achieve the regulatory targets;
- equity and fairness from the regulated parties' perspectives; and,
- promotion of innovation in a practical and real sense.

The unique character of the sugar industry in Queensland means that the necessary reduction of GBRWHA indirect costs requires a unique and highly specialised solution (Shortle and Horan, 2016). A critical element is a trade-off which relates to the need to preserve the sugarcane industry's sustainability recognising the need to maintain grower/mill interdependency. Therefore, first a regulatory regime is proposed in which the issue of DIN measurement complexity is accommodated through the development of individual farm management/measurement plans that are comprehensively applied and monitored. Second, the consequences of reductions or increases in DIN outflows are subject to a staged application of rewards and enforced penalties. In saying this, measurement of N losses at a farm scale is technically difficult and costly, meaning that regulations and enforcement of them must take this into consideration. As such, reporting and clear adherence to nutrient management plans becomes all the more important.

The third element proposed – the application of penalties, must be sufficient in magnitude to effect appropriate changes to farmer's practices. Underlying this approach is the existing regime based on the adoption of Best Management Practice (BMP) plans by farmers but with the introduction of quasi-market mechanisms which reward efficient farmers (in terms of reducing indirect costs) and penalise inefficient farmers. In such an environment over time efficient farms (in terms of their direct and indirect costs) can be expected to expand their operations with a subsequent contraction in the number of inefficient farmers. We acknowledge that this proposal could potentially lead to an exit of smaller farms, as the costs associated with farming and regulatory compliance generally exceed those relative to the larger scale farming operations.

This paper has a two-part structure. Part one describes the sugarcane farming industry in Queensland, and the problems associated with current practices and existing measures. Part two examines proposed measures associated with nutrient trading. In the second limb of Part two we propose an approach, the elements of which are designed to create a responsive and principled regime incorporating both combined instruments and extension services.

2. Sugarcane farming in Queensland

Sugarcane has been a dominant industry in GBR catchments for over 150 years (Moore, 1974). There are an estimated 4400 sugarcane growers in Australia (Rural and Regional Affairs References Committee, 2015) most of whom are sole proprietors or family partnerships (Rural and Regional Affairs References Committee, 2015). The financial viability of this industry hinges on the cooperative action of the growers and the 24 sugar processing mills (Hildebrand, 2002). The interrelationship between growers and millers is based on raw Sugarcane's rapid quality deterioration if not milled within 16 h of harvest (Mackintosh, 2000). In its raw state, it therefore cannot be sold on either the international or domestic market.

The industry is consequently dependent on the ongoing profitability and operation of the both growers and mills which need to be co-located within a defined area (Hildebrand, 2002). Mills are dependent on a minimum volume of production, and therefore crop yields. In the conceptualization of regulations associated with grower behaviour it is crucial that those regulations do not have a disproportionate impact on yield, but rather nitrogen use efficiency is improved upon.

2.1. The current Australian legal framework

In 2009, amendments to the *Environmental Protection Act 1994* (Qld) (EPA) were introduced and designed to 'reduce the impact of agricultural activities on the quality of water entering the reef'. Prior to 2009 there had been minimal regulation of agricultural practices in the region and the current state of urgency is perhaps demonstrative of this. The 2009 regulations required that growers in 'high risk reef catchments' limit fertiliser application and maintain records to ensure nitrogen and phosphorous application could be monitored and verified (Queensland Audit Office, 2015). In addition, the regulations included a requirement to undertake and record soil test data. The EPA further includes provisions for audits to ensure the required records are kept. The enforcement provisions carry a fine of up to AUD34, 155 which, if they had been strictly enforced, would have provided strong incentive for growers to meet required reductions in fertiliser application.

In addition to the record keeping requirements, farms greater than 70 ha were required to have an Environmental Resource Management Plan (ERMP), and to report yearly on its implementation. The ERMP must 'identify any hazards of the property that may cause the release of contaminants into water entering the reef' which includes 'the application of fertilizer or agricultural chemicals'. Other elements of the ERMP includes performance indicators for improving discharged water, management plans for the application of nutrients to the soil of the property and any other matters which would reduce the quality of water entering the reef. The combination of these requirements has presented challenges for growers given, prior to the commitments being introduced, there had been no restrictions or associated reporting requirements.

Following the development of the Smartcane BMP (Smartcane Best Management Practice), (2015) the Queensland government elected against enforcing the regulations under the EPA (Queensland Audit Office, 2015). While this was attributed to the change in government, the regulations were also widely unpopular with industry stakeholders. The phenomenon of regulatory capture is relevant here (Becker, 1976; Peltzman, 1976), as it appeared that the decision to avoid strict enforcement provisions may have been a direct result of industry sentiment and the resulting pressure. Although this may have appeared a reasonable compromise, the failure of BMPs in terms of grower uptake could have been predicted had the culture of the industry been sufficiently understood and considered.

2.2. The smartcane BMPs

BMPs were introduced as an alternative measure to the formal approach taken in the EPA. They covered all areas of farming practices from soil, nutrients, irrigation, drainage, weeds, pests, disease, crop production, harvesting, farm business, natural systems, workplace health and safety, managing people and the environment (Canegrowers Association, 2010a, 2010b). Within each of the modules, farmers must attempt to reach or exceed the outlined industry standards. They include under the Soil Health and Nutrient Management module, adherence to the Six Easy Steps (6ES) methodology (Schroeder et al., 2010). The methodology is promoted and facilitated by Sugar Research Australia (SRA), an industry-owned company, funded by a statutory levy paid by sugar growers and associated milling businesses. SRA is also directly supported by the Commonwealth Government with matching funds as well as grants from the Queensland State Government. The 6ES methodology has been amended over time, and arguably in its current state there is limited flexibility that appreciates farm and seasonal differences from a grower perspective.

To date, 170 farms have been accredited under the Smartcane BMP program (Canegrowers Association, 2013b). Accreditation initially involves a grower self-assessment as to what extent industry standards are met, module training (including the provision of evidence of diary records, management practices), the certification of meeting/exceeding