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Cleaning up runoff onto the Great Barrier Reef: how art and science are inspiring farmers to help

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Cleaning up runoff onto the Great Barrier Reef: how art and science are inspiring farmers to help

Abstract

The most recent report card on the Great Barrier Reef's water quality highlighted major changes that need to be made to meet targets by 2018. Sediment and pollutant runoff from land use have increased 2-3 fold since 1850, largely driven by agricultural land clearing and grazing, while fertiliser used in sugar cane farming contributes to nitrogen runoff.

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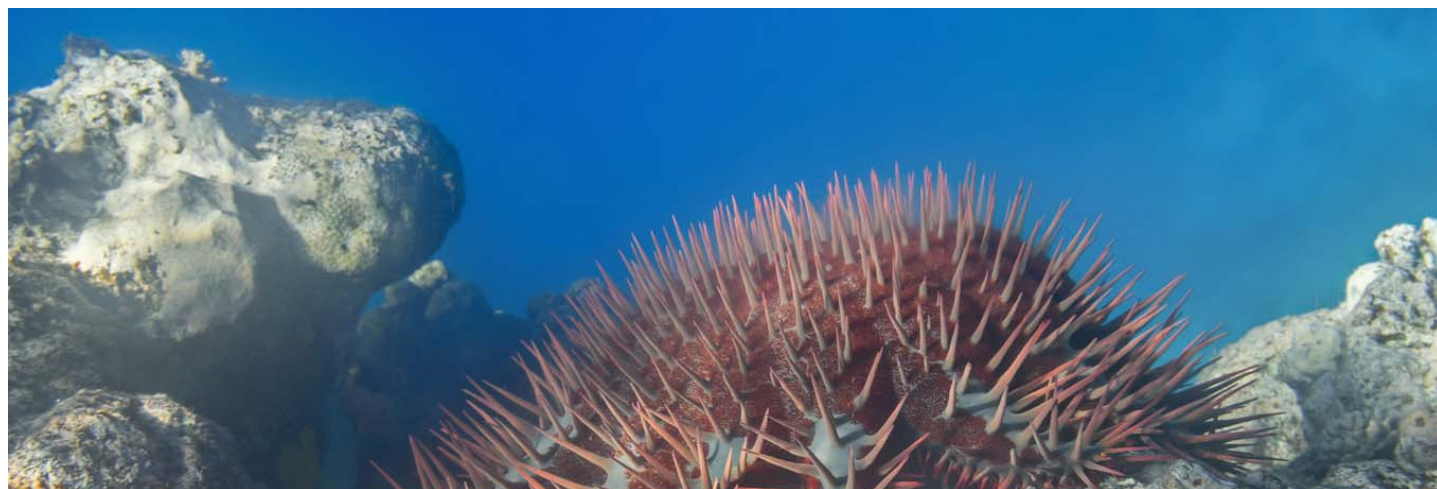
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Coral-eating crown-of-thorns starfish are helped by nutrient runoff. Crown of thorns image from www.shutterstock.com

The most recent report card on the Great Barrier Reef's water quality highlighted major changes that need to be made to meet targets by 2018. Sediment and pollutant runoff from land use have increased 2-3 fold since 1850, largely driven by agricultural land clearing and grazing, while fertiliser used in sugar cane farming contributes to nitrogen runoff.

Runoff increases coral's sensitivity to bleaching and disease, shifts the balance between coral and algae, leads to a build-up of pollutants in marine species that are long-lived or high in the food web, and increases the chances of crown-of-thorns starfish outbreaks.

Improving water quality will likely increase the health of reef organisms, and help reefs to bounce back from disturbances.

Government investment plans need to account properly for the total estimated value of the Great Barrier Reef and past progress in reducing runoff. An estimated A\$500 million per year is needed to improve management action.

So what's the best way to meet these targets? You won't be surprised to find that scientists are working on the answer. But innovative projects fusing art and science are also appearing in north Queensland.

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The problem of collective action

Like many environmental issues, runoff on the Great Barrier Reef is a classic example of a collective action problem. Collective action is at the heart of this issue in two ways.

First, the alongshore transport of sediment and runoff pollutants by currents means that the effects of managing runoff along one section of coastline may be felt elsewhere. The condition of the reef adjacent to a particular river mouth may not, therefore, necessarily reflect the land management within that river's catchment.

Second, the health of the reef is dependent on other factors, such as bleaching driven by increased sea surface temperatures related to climate change. These are caused by many geographically remote activities (for instance, someone burning coal in London).

Collective action problems can be understood through US academic Garret Hardin's famous "tragedy of the commons" theory. This theory states that self-interested individuals acting rationally may not behave in the best interests of the whole group.

Hardin used the example of a group of herdsmen allowing their cattle to graze a pasture that is running out of fodder. For an individual herdsman, the cost of removing cattle exceeds the benefit of leaving some pasture for the future, unless other herdsmen also agree to remove cattle.

Similarly, it takes an exceptional individual to reduce their runoff impacts, in light of the agricultural benefits to be gained from activities that increase runoff volume and decrease its quality (such as land clearing and use of fertilizers). This is particularly the case when others are not acting to abate their own activities.

Many farmers say that the Reef 2050 target to reduce runoff by 80% by 2025 is not economically viable. But without acting now, our metaphorical common (the inshore Great Barrier Reef) will continue to degrade.

Best environmental practice

Agriculture is a social and cultural activity, just as much as it is a process of environmental engineering, and the push to transform farming practices needs to recognise this. Top down incentive schemes do have some impact, but could there be a better way?

For instance, for sugar cane growers, the Smartcane Best Management Practice (BMP) Guidelines are an attempt by the industry to shift farming practices towards compliance with government directives to reduce run-off impacts on the reef.

The Smartcane BMP guidelines aim to improve farming practices through seven principles:

1. Soil health and plant nutrition management

2. Pest, disease and weed management
3. Drainage and irrigation management
4. Crop production and harvest management
5. Natural systems management
6. Farm business management
7. Workplace health and safety management

As with many corporate social responsibility initiatives, growers who volunteer for Smartcane BMP are required to assess their current practices and set benchmarks for improvement in order to receive accreditation that indicates good environmental practice. There are clear marketing and, in many cases, cost-cutting benefits that motivate farmers to participate.

This has driven some examples of good practice within the farming community. However, as the 2015 report card shows, “only 23% of sugarcane land was managed using best management practice systems”, which is inadequate for achieving the Reef 2050 goal of an 80% reduction in dissolved nitrogen loads from agricultural runoff by 2025.

Motivating farmers

One project which engages with this problem is *Sugar vs the Reef?* by artists Lucas Ihlein, Kim Williams and Ian Milliss. This project is based on the idea that there is a greater chance of influencing farming practices if the desire to improve environmental performance comes from within the farming community. Innovation is celebrated from below by staging public collaborative events to generate dialogue about agriculture’s complex social and environmental interactions.





Innovative Mackay farmers Simon Mattsson and Allan Maclean in a dual crop of sugar cane and sunflowers. The sunflowers shade out weeds, break the sugarcane monocrop by diversifying soil biology, and attract a lot of attention, triggering public discussions about the crucial role of soil health in reducing runoff to the Great Barrier Reef. Photo by Lucas Ihlein

For example, over the next two years, the project will coordinate a collaboration between Mackay Botanical Gardens, sugar cane farmers and community members to plant a dual crop of sunflowers and sugar cane as a highly visible work of “land art”.

This crop - whose cycle of planting, growth and harvesting will exceed the minimum standards of BMP - will stretch over four hectares near the centre of Mackay. Over two years, the project will engage sugarcane farmers, artists, high school students, members of the Australian South Sea Islander community, the Greater Whitsunday Food Network, soil and reef scientists, as well as the Great Barrier Reef Marine Park Authority.

While it is easy to point the finger at agricultural practices as a major cause of poor water quality in the inner waters of the Great Barrier Reef, change will be slow until the complex social factors that shape modern farming are recognised. This requires deeper engagement with the varied cultures of farming.

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