



Water Bioremediation in the Burdekin

Presented by Peter Cassuben



About MBD



- MBD began as an ambitious start-up ten years ago targeting oil extraction from algae.
- This also marked the commencement of a highly rewarding R&D relationship with JCU and this region.
- And, through our work, a critical realisation that algae always has been and always will be VITAL to our planet's environmental balance, including atmospheric carbon and water quality.
- Both as macro algae (i.e. seaweed) and microalgae.

Our Vision



Today, MBD is a \$200M group of companies that aims to help support the three pillars of sustainable population growth, through:

- MBD Water (water bioremediation, using algae)
- MBD Nutrition (algae products for animal feeds, plant bio stimulants and human nutrition)
- MBD Energy (algae as a future available source of bio-crude oil for select applications)

MBD's focus



- Virtually EVERYTHING we do has a beneficial impact on reduced nutrient levels of water returned to the Great Barrier Reef.
- We have had a TEN year research and development relationship with James Cook University Townsville, and we recently resigned to continue that relationship for a further TWENTY years.
- One of the greatest benefits of acquiring the scientific knowledge to support sustainable water and nutrition technologies is that we are now commercialising that knowhow in major overseas markets – such as Asia.

MBD's focus



- The commercial focus of the company here and in Asia is on WATER and NUTRITION.
- It's a highly synergistic pairing – since our water remediation produces large amounts of algae biomass for various food, feed and fertiliser products.
- Today, MBD employs about 120 people across commercial projects and R&D in:
 - Townsville + Ayr + Guthalungra
 - Vietnam
 - Melbourne

MBD's operations



- Now, MBD's largest , most established activities are centred on the BURDEKIN region and TOWNSVILLE.
- We have just invested \$13M in the construction of Australia's FIRST natural ASTAXANTHIN production facility.
- The farm, near Alva Beach, is now at Stage 1 commissioning.

Natural astaxanthin



Natural astaxanthin is a super antioxidant with high value applications in animal and human nutrition. Uses include:

- As a natural and nutritious alternative to synthetic astaxanthin colourant in prawn production
- As a natural and nutritious alternative to synthetic astaxanthin colourant in salmon farming
- As a super antioxidant for consumption in capsules as a human nutraceutical product

Pacific Reef Fisheries



- MBD has just acquired the major local PRAWN and COBIA producer, Pacific Reef Fisheries.
- Pacific Reef Fisheries is planning a quadrupling of production, made possible by MBD Water.
- Environmental licensing controls require zero net increase of nutrient loads on the Reef.

Pacific Reef Fisheries



At the Alva Beach PRF site, MBD successfully demonstrated HRAPs could:

- Remove waste nutrients from the prawn farm water, enabling it to be recycled or released.
- Enable a healthy, sustainable EXPANSION of prawn farming and local employment without environmental impact.
- Produce large quantities of fast growing seaweed biomass for commercial applications, adding to economic growth.

Pacific Reef Fisheries



- High Rate Algal Ponds (HRAPs) have now been successfully demonstrated at PRF over several years.
- On a commercial scale, much larger and greater numbers of HRAPs will be constructed.
- Seaweed biomass, such as *ULVA*, is harvested and processed daily. Validated applications include animal, plant and human nutrition.



Pacific Reef Fisheries



- MBD and Pacific Reef Fisheries are seeking QLD Government environmental and construction approvals for a quadrupling of prawn production.
- The project utilises a degraded former cattle grazing property at Guthalungra.
- Detailed engineering and construction plans are in development.
- MBD will make a final investment decision – expected to be in the tens of millions of dollars - once all planning and construction approvals have been secured.

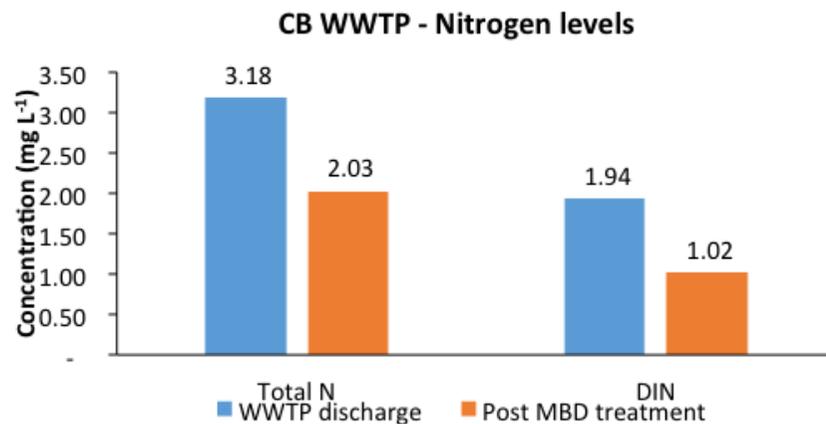


Municipal waste water



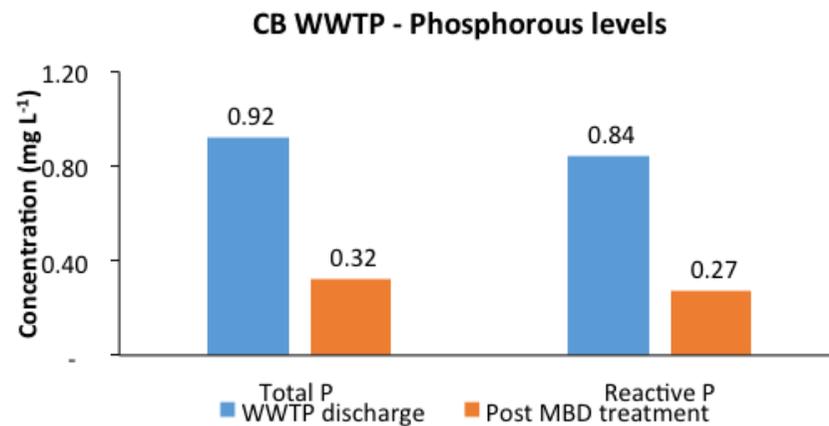
- MBD's JCU R&D team has trialled the use of algae to enhance the capabilities of municipal waste water treatment.
- The Townsville project showed that algae can remove the minute remnant traces of nitrogen and phosphorous – which cumulatively can be very significant.
- A future commercial scale trial, possibly in the Burdekin, will test the merit of retrofitting of municipal waste water treatment facilities to further reduce impacts on the reef.

Municipal waste water



- The tall blue bar on the far left shows normal total discharge of nitrogen to the environment.
- The lesser orange bar next to it shows the reduced level of discharge post MBD treatment.
- The blue and orange bars to the right represent the before and after component of the total made up by Dissolved Inorganic Nitrogen, upon which algae thrive.

Municipal waste water



- The tall blue bar in the on the far left shows normal total discharge of Phosphorous to the environment.
- The lesser orange bar next to it shows the significantly reduced level of discharge post MBD treatment.
- The blue and orange bars to the right show the before and after discharge of Reactive Phosphorous, upon which algae also thrive.



Municipal waste water



- The biomass produced is *Oedogonium*, a fresh water algae.
- Trials undertaken by MBD's R&D team at JCU have shown *Oedogonium* to be suitable for use as animal or fish feed.
- The feed is protein rich, with a high energy content, and reduced methane emissions in cattle.
- The biomass can also be used as a bio stimulant fertiliser for enhanced plant growth.

Agricultural run-off



- One of the extraordinary facts about algae is that world wide there are something like 50,000 different species – virtually one for every kind of water, temperature and contamination type that can be found – including heavy metals.
- Though we don't currently have any heavy metals tailings dam projects underway for government or industry – MBD and JCU have trialled and validated feasible clean-up of heavy metals contaminated tailings dams using our technologies.



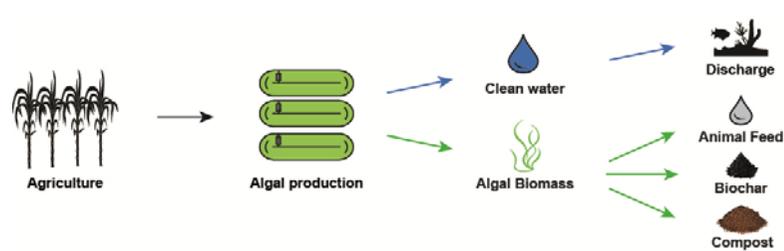
Heavy metals



- However, working with government and industry to help affordably reduce nutrient load on the Great Barrier Reef remains our highest priority.
- The concept of capturing and recycling farm nutrient is compelling, but much more challenging than with aquaculture or municipal waste water treatment.
- Two years ago MBD and JCU explored the feasibility of using High Rate Algal Ponds to capture irrigation nutrient run-off from cane.



Agricultural run-off



- Technically, the process could deliver significantly reduced nutrient run-off to the reef, animal feed, biochar and compost.
- However, due to the sheer size of the cane industry, the scale of HRAPs required would be very considerable – and with that the question of cost and economic viability.



Agricultural run-off



- One 200m² HRAP system would treat about 12% of a 100ha farm's run-off.
- Treating the majority (96%) of a 100ha farm's run-off would require about 1600m² of HRAPs – about 0.16% of the farm area.
- Depending on levels of nutrient concentration in irrigation tailwater, a 1600m² system could be expected to remove about 34% of the dissolved inorganic nitrogen.
- To remove the majority of the DIN (86%) would require an HRAP area of 4,000m² or the equivalent of 0.4% the 100ha farm area.



Future growth



- Due to the sheer magnitude of growth in Asia, MBD is actively pursuing major projects there.
- In Vietnam, for example, the government is committed to growing prawn aquaculture from a \$3 billion a year industry to a \$10 billion a year industry – and recognises it needs affordable water quality solutions such as ours if that growth is to occur without prawn disease and environmental degradation.



Future growth



- But our biggest immediate opportunity for growth is here in the Townsville and Burdekin region.
- MBD already employs more than 120 people, and we expect that number to grow following anticipated granting of the QLD government environmental and construction approvals we need to expand operations to 259ha prawn farm at Guthalungra.
- Together with the existing 98ha site at Ayr, this will make Pacific Reef Fisheries one of the biggest, if not the biggest, prawn producer in Australia.



Future growth



- Our new \$13M natural astaxanthin facility is now being commissioned – and will begin to supply high value product into Australian and overseas markets.
- MBD's commitment, alongside our partners at James Cook University and in business to develop and commercialise exciting new products – such as from the seaweed we grow to clean-up aquaculture water - is very exciting and ongoing.
- And we are hopeful of building a ground-breaking HRAP waste water treatment facility for local government that could pilot environmentally game-changing facilities for Councils all along the Great Barrier Reef.



THANK YOU

