2014
PROJECT CATALYST
GROWER FORUM

WITH THANKS TO OUR PROJECT PARTNERS AND SPONSORS:

CELEBRATING FIVE YEARS OF PROJECT CATALYST 2008 - 2013

Welcome

Project Catalyst Grower Forum 2014

A warm welcome to the many growers, partners, collaborators and sponsors of the 2014 Project Catalyst Growers Forum. 2014 marks a milestone five years for Project Catalyst and we are proud to report the program continues to grow from strength to strength.

As those who have been involved since the program's inception in 2008 are aware, Project Catalyst initially started with a foundation group of just 15 innovative farmers. In 2014, there are now more than 75 sugarcane producers involved in Catalyst projects who are trialling cutting-edge agricultural practices across the Mackay Whitsunday, Burdekin and Wet Tropics regions. The combined area of the group under improved and A-class management is now 204,345 hectares.

These sugar producers are leading the way to find effective and sustainable solutions for more productive farming. Locally, their efforts continue to significantly reduce the environmental footprint of sugar production on our natural assets, including the iconic Great Barrier Reef.

Over the five years of the project the following reductions in runoff from farm has been recorded: reduction of particulate nitrogen by 25 tonnes p/annum; reduction of particulate phosphorus by 12 tonnes p/annum; reduction of dissolved inorganic nitrogen by 22 tonnes p/annum; reduction of filterable reactive phosphorus by 4 tonnes p/annum and reduction of pesticides leaving the farm by 190 kg p/ annum.

Improved techniques also offer avenues for farmers to be more financially sustainable. Project Catalyst farmers have the opportunity to learn how to use advances in technology, innovation and thinking to essentially use less (e.g. reduce inputs and labour) for the same or a greater return.

At its heart, Project Catalyst is concerned with innovation and finding ways to do what we do, better. This unique partnership continues to connect our sugar producers with leading organisations nationally and around the world to break new ground in sustainable agriculture.

Our keynote speakers and guests in 2014 include leading global and Australian researchers, industry partners, economists and sustainability experts. We hope you enjoy the forum and that it provides food for thought for a rewarding year ahead.

Robert Cocco

Chief Executive Officer
Reef Catchments Limited

Keynote presenters

David W. McLaughlin

Vice President and Managing Director, Agriculture, WWF (US)

As Managing Director and Vice President: Agriculture for the World Wildlife Fund based in Washington, DC, David McLaughlin leads WWF's work on key agricultural commodities. These duties include coordinating WWF's efforts on Global Commodity Roundtables, and working directly with major US corporations developing and implementing supply chain sustainability strategies.

Since joining WWF US in 2008, David has led the corporate engagement efforts on agricultural commodities. These activities include developing a biofuels scorecard for the World Bank, evaluating the feasibility of planting palm oil on degraded lands in Indonesia, developing and leading a due diligence process on Cargill's palm oil supply chain in Indonesia, and helping leading US Brands develop and prioritise sustainability strategies around key commodity sourcing through the use of risk assessment methodologies developed by WWF.

Prior to joining World Wildlife Fund in 2008, Mr. McLaughlin worked 28 years with Chiquita Brands in Latin America in a variety of financial, production and senior management positions in both palm oil and banana production operations, as well as managing Chiquita's banana operations in Costa Rica, Panama, and the Ivory Coast. Mr. McLaughlin led an 8 year effort developing and implementing Chiquita's strategy on environmental and social performance in Chiquita's agricultural production and sourcing operations in Latin America, Africa, Philippines and Australia.

Mr. McLaughlin has lived in Latin America for more than 40 years and has a BA in Government from Connecticut College and an MBA from Babson College with an emphasis in international finance.

Dr David Cropley

University of South Australia Associate Professor (Engineering Innovation)
Deputy Director of the Defence and Systems Institute

Professor David Cropley became involved in creativity research by accident. As a young lecturer in an engineering department, he was given the task of helping to develop a new, first-year course that, among other things, focused on engineering creativity and innovation.

As he delved into the field of creativity, with its roots in psychology, it became clear to David that engineering and technology were intimately concerned with many of the same issues. If creativity is the engine-room of innovation, and innovation is the driver of modern economies, then it made sense that developing the ability to be creative was a vital element of tackling a broad range of technological problems in a modern society.

Now a recognised expert in creative problem solving, David also holds a degree in Applied Physics & Electronics and a PhD in Measurement Systems Engineering. He was a scientific consultant for the ABC TV Documentary *Redesign My Brain* and is author of a wide range of papers exploring the connections between creativity, activity and improved efficiencies.

With a highly diverse range of experience, both in life and research, David shines a new light on any industry and shows us how to harness creativity for everyday thinking to find solutions that are truly innovative.

Forum Agenda 2014

Monday February 24 - Field Day Lou Raiteri's Farm

Lou Raiteri's Farm 206 Up River Road, Proserpine (just north of Proserpine)

9:30 am - 10.00 am	Registrations taken, coffee and tea available
10:00 am - 10:15 am	Introduction and overview of day
10:15 am – 11:15 am	Soil Health Workshop with Dr Pamela Pittaway
11:15 am – 11:45 am	Carbon Farming trial update x 2 with John Markley, Farmacist
11:45 am – 12:10 pm	Jayson Dowie (Farmacist) & Lou Raiteri - Trial overview and discussion
12:10 pm – 1:00 pm	Trial visit with more information from Jayson and Lou
1:00 pm	Lunch
1:30 pm	Depart for Hamilton Island

Your next ferry times:

- **Shute Harbour**
  - 3:10pm arrive 3:40pm (direct)
  - 4:35 arrive 5:30pm (via Day Dream Island)

- **Abel Point Marina**
  - 3:35pm arrive 4:35pm (Direct)

6:30 pm - 8:00 pm	Welcome function drinks & nibbles at Catseye Beach

Tuesday February 25 - Grower Forum Hamilton Island

Convention Centre The Auditorium, Hamilton Island

8:00 am	Welcome (Will Higham, Reef Catchments)
8:20 am	David McLaughlin, Vice President, Agriculture WWF US
8:50 am	Michelle Allen The Coca-Cola Foundation
9:05 am	**WORKSHOPS** • Soil + Nutrient management workshop • Herbicide management workshop • Water Quality Improvement Messaging workshop ***NB: Break into groups as indicated by your assigned colour.** (Workshops will rotate during the day so you won't miss out on a topic.)
9:15 am	SESSION 1
10:10 am	Interval - MORNING TEA
10:30 am	RETURN to SESSION 1
11:25 am	SESSION 1 – end
11:35 am	SESSION 2
12:30 pm	Interval - LUNCH
1:30 pm	RETURN to SESSION 2
2:25 pm	SESSION 2 – end
2.:5 pm	SESSION 3
3:35 pm	Interval - AFTERNOON TEA
3:50 pm	RETURN to SESSION 3
4:45 pm	RETURN to SESSION 3
5:40 pm	CLOSE

WORKSHOP ROOMS
Refer to Map overleaf

- The Auditorium (ground floor)
- Meeting Room 1&2 (upstairs)
- Meeting Room 3&4 (upstairs)

6:30 pm	Pre-Dinner Drinks on the Outrigger Lawns
7:00 pm	Official Forum Dinner at the Outrigger Restaurant

MAP ONE - HAMILTON ISLAND

ACTIVITIES

RETAIL

RESTAURANTS & CAFES

BARS

TAKEAWAYS & SNACKS

FACILITIES

ACCOMMODATION

MARINA PRECINCT

Tuesday February 25 - FORUM DINNER

Outrigger Restaurant Hamilton Island

6:30 pm	Pre-dinner drinks on the Outrigger Lawn
6:50 pm	Guests be seated
7:00 pm	Welcome to the region, Rob Cocco (Reef Catchments)
7:15 pm	Entrée
7:40 pm	MC Chat with Corrine Hendrikse Presentation "Celebrating 5 years of Project Catalyst"
8:00 pm	Main Course
8:45 pm	Keynote speaker: Dr David Cropley – Innovation Investigation
9:30 pm	Dessert
10:00 pm	MC signoff – End to formalities
11:00 pm	Close (exit venue)

After function venue options:

- **Reef Lounge** at the Reef View Hotel is open until midnight
- **Marina Tavern** (15min walk) open until late

Wednesday February 26 - INNOVATION BREAKFAST

The Auditorium Convention Centre Hamilton Island

Please check out of your room prior to breakfast if you are departing on this day.

8:00 am	Arrive
8:15 am	Welcome and overview
8:30 am	Breakfast served
9:30 am	Innovation workshop begins – led by Dr David Cropley ***NB: Break into groups as numbered on your name tag 1, 2 or 3.**
12:00 pm	Close

Your next ferry times:

- **Shute Harbour**
  - 2:25 pm - 3:45 pm via Hamilton Island Airport & Long Island Resort
  - 4:00 pm - 4:30 pm Direct
  - 5:00 pm - 5:30 pm Direct
  - 5:30 pm - 6:35 pm via Long Island Resort

- **Abel Point Marina**
  - 12:50 pm - 2:00 pm via Day Dream Island
  - 1:40 pm - 3:00 pm via Hamilton Island Airport Day & Dream Island
  - 5:10 pm - 6:20 pm via Day Dream Island
  - 5:10 pm - 6:00 pm Direct on Seaflight

WITH THANKS TO OUR PROJECT PARTNERS AND SPONSORS:

Global agriculture

Article extract - David W. McLaughlin World Wildlife Fund, Washington, U.S.A

Sugarcane

Palm oil

Timber, pulp and paper

Land, Food, and Biodiversity

Agriculture currently occupies over 40% of Earth's land area and consumes 70% of available freshwater. Production systems have increased food output in recent decades by improving crop yields. These increases have had consequences such as reduction in the quality of species' habitats through changes in land use, fragmentation of natural land cover, and depletion of soil and water resources. Growth of the human population, projected to exceed 9 billion by 2050, and economic development in many emerging markets such as Brazil, China, India, and Indonesia will require food production to increase 70% beyond 2011 levels. Indeed, per capita demand for food products is increasing because the economies in highly populated countries such as China and India are growing. Additionally, there is an increasing reliance on agriculture to provide not only food and fiber for this growing population, but energy and renewable materials such as plant-based packaging materials.

All this means that pressure to increase conversion of land from natural land cover to agriculture will continue to grow. At the same time, levels of food security, malnutrition, and food emergencies are on the rise as weather events and social and economic disruptions reduce food availability. As a result, we are entering a period of demand-driven agriculture. This period will be marked by increased food prices, periodic shortages, market volatility, regional water scarcity, and the conversion of tropical lands to agriculture to meet society's needs for food, clothing, and fuel. Land and water are becoming scarce resources. Overlay these realities with the potential effects of climate change on agricultural production and it is clear we are also entering a period of uncertainty in agriculture.

Production areas may very well shift, and indeed some agriculture sectors have already begun this migration due to scarce water resources and increasing regulatory requirements regarding water use. Although many stakeholders are discussing production practices—organic versus conventional, smallholder versus large corporations, genetic modification technology versus natural breeding—the real challenge will be to minimize land conversion. Effects on biological diversity can be mitigated through efficient use of land, water, and agricultural inputs. The use of degraded lands, improved irrigation technology, proper use of inputs such as fertilizers, and better management practices can increase yields on existing cultivated areas. Balancing the use of land and water with the need to conserve biological diversity will be among the greatest challenges that confront society.

Overall, the food price index of the Food and Agriculture Organization (FAO) increased 37% between May 2010 and April 2011, but cereals and grains have increased 69% in the same period. Food security has quickly become a dominant global concern. The global food production system has become much more fragile because interruptions to supply due to weather or other factors

that reduce local production can have a global effect. In 2010 wheat production was reduced by drought and high temperatures in Russia, low temperatures in China, and heavy rain in Canada, and drought in Brazil and Argentina increased soybean and corn prices by 50% (Giovis 2011).

Although some may argue that these reductions in production are temporary and that agricultural production has always been subject to variations in weather, these arguments fail to recognize contemporary supply interruptions have a far greater effect on global food availability. Global commodities are interdependent, and food stocks are at historically low levels while demand continues to increase. In addition, these circumstances have triggered changes in producing countries' export policies to ensure sufficient domestic supply. These policy changes, which further tighten global markets, may encourage production of a particular commodity in a region where climate, soil, and water are insufficient for sustained production. These choices may lead to conversions of land cover and inefficient use of land resources and inputs while alleviating local shortages of food. Increasingly, protected areas and national parks are being downsized or degazetted to make room for agricultural and other economic uses (Mascia & Pailler 2011). The Brazilian Forest Code, which protects the Amazon from deforestation, is currently being reconsidered by the Brazilian Congress to free up land for soy and beef production.
Currently, Brazil and Indonesia account for roughly 50% of carbon emissions from land use change. These emissions result from the production of five commodities responsible for the majority of conversion of natural land cover to agriculture: palm oil, timber, pulp and paper, soybeans, and beef (California Environmental Associates 2010). The concentration of land-use change in these two countries offers significant opportunity because efforts can be tightly focused and have significant positive outcomes if successful.

The expansion of palm-oil production illustrates how unrestrained expansion of cultivation can affect viability of native species (extirpations have occurred due to habitat loss) and release large amounts of greenhouse gases. Since 2006, global production of palm oil has increased 34.6%, from 37.3 million t to 50.3 million t. Most of this expansion has occurred in Indonesia, through extensive conversion of tree and peat forest on the islands of Sumatra and Borneo. During this period, palm oil became the leading global edible oil, driven primarily by increased consumption in India and China. The industry's production area in Indonesia expanded from 4.3 million ha to 7.5 million ha between 1995 and 2011. Growth continues at a rate of roughly 300,000 ha/year. The effects on tree and peat forests have been dramatic, and even national parks, such as Tesso Nilo National Park in Sumatra, have been planted with oil palm, which has removed habitat for elephants (Elephas maximus sumatrensis), tigers (Pan- thera tigris sumatrae), and rhinoceroses (Dicerorhinos sumatrensis). Despite this massive expansion and the current global economic recession, prices for palm oil are at record high levels and global available stocks are at historical lows, indicating strong future demand.

There are alternative courses that the palm-oil industry can take to meet growing global demand without converting natural land cover. Although palm oil is the highest yielding edible oil crop on a per hectare basis (yield per hectare is 10 times greater than the second-most produced oil, soybean), there still are significant opportunities to improve yield, primarily through improved management practices. The current average yield in Indonesia is 3.8 t/ha, but when the average yield is compared with the yields of some of the more efficient individual producers, it is not unreasonable to estimate a yield potential of 7.0 t/ha. Yields of 11.0 t/ha have been reported from new hybrids. Palm oil can be produced profitably on a wide range of soil types, and plantations can be established on the alang-alang (Imperata cylindrica) grasslands that regenerated after the forest fires and extensive uncontrolled land clearing that took place in the late 1990s. Just through planting on alang-alang areas and improving yields, palm oil could provide economic development benefits without the undesirable ecological effects that have greatly tarnished this commodity (Fairhurst & McLaughlin 2009).

> "The real issue is not about the commodity being produced, but rather *how* it is being produced... related to land-use planning, governance and law enforcement, productivity, and market drivers."

Palm oil can be a sustainable crop, have minimal effects on biological diversity, sequester carbon, produce jobs, and offer attractive financial returns. Nevertheless, the industry and the governments of Indonesia have not chosen to pursue policies that could improve the global reputation of this key commodity. The case of palm oil highlights many of the key agricultural effects and challenges society faces and must address to limit effects of the rising demand for agricultural products from a growing and more affluent population.

Among the key factors that have enabled the palm oil industry to expand are lack of governance, enforcement, and accountability of both local and national governments. In Kalimantan, Indonesia, some 5.3 million ha of concessions were granted to develop palm-oil plantations, but of these concessions, only 900,000 ha were actually planted. The development permits were a mechanism to extract timber. Good governance and law enforcement are essential to ensure rational development policies.

Although agriculture will expand, it is possible to help define the conditions under which this expansion will occur. The palm-oil case suggests the real issue is not about the commodity being produced, but rather how it is being produced. There are key lessons from this experience related to land-use planning, governance and law enforcement, productivity, and market drivers.
Credible and effective land-use planning can guide sustainable growth. For example, the Brazilian government has developed and mapped the zones where the Brazilian sugarcane industry can and cannot expand, taking into consideration agronomic, environmental, and social criteria. These zones are reflected in federal legislation and are tied to both public and private lending policies (Embrapa 2009). Although the land-use planning process may be cumbersome and difficult, it offers a long-term path and clarity on land use for both the nongovernmental organizations and industry.

> "Food companies are rapidly becoming aware of the importance of sustainability of production of agricultural commodities to their supply chains."

The absence of governance and legal enforcement is perhaps the greatest enabler of environmental change. The absence of enforcement has been identified as a key driver of extensive deforestation.

Crop yield (also) needs to be a key sustainability indicator. Although there are trade-offs between yield, inputs, and agricultural practices, many opportunities exist to increase yield through improved varieties, reduced waste, and improved fertilization practices, harvesting, and overall crop management.

(For example) If the palm-oil industry were to adopt the use of these high-yield hybrids for all future expansion and were to use these same hybrids in their replanting programs (if palm-oil plantations are not re- planted every 25 years, they become too tall to harvest), the amount of land required to meet the growing demand would be reduced substantially.

Productivity has huge effects on the efficient use of land and water, livelihoods, and financial viability. Thus, productivity is critically important for smallholder agriculture where livelihoods are strongly affected by low yields. Food companies are rapidly becoming aware of the importance of sustainability of production of agricultural commodities to their supply chains. To establish production standards and industry practices, they are actively participating in forums such as the Roundtable for Sustainable Palm Oil, Roundtable on Responsible Soy, Better Sugar Cane Initiative (Bonsucro), Roundtable for Responsible Biofuels, and the Better Cotton Initiative. Efforts are underway to create global standards on beef production through the Global Roundtable for Sustainable Beef. Many of the leading companies are also analyzing their own environmental impacts and taking measures to mitigate and reduce them. This requires engaging companies in the supply chains to improve environmental performance and understanding of the issues and concerns present in the countries or regions where they source their commodities. Although some companies may be taking these actions to maintain or improve their reputations, most are concerned about availability of long-term supply. These market forces have been helpful in encouraging producers to certify their operations because sustainability is increasingly being demanded by U.S. and European markets and customers. Due to the highly variable nature of agricultural supply chains and shifting trade flows, sustainability of each commodity needs to be evaluated separately. Given the shift in trade flows and economic development in countries such as Brazil, China, and India, sustainability considerations need to become mainstream among companies and consumers in these important markets to achieve the required changes in production practices. This will be a key challenge in the future.

This extract was taken from Land, Food, and Biodiversity: DAVID W. McLAUGHLIN, World Wildlife Fund, 1250 24th Street, Washington, D.C. 20037, U.S.A., email david.mclaughlin@wwfus.org Published in Conservation Biology, Volume 25, No. 6, 1117–1120 ©

Innovative problem-solving

Why creativity matters - Dr David Cropley, UniSA

The question *"Why is Creativity Important?"* is a very sensible one for businesses, organisations and individuals to ask. It is, however, a question to which the answer can be rather elusive and unsatisfying, especially to pragmatic individuals and organisations that are dealing with the day-to-day realities of practical, business-oriented problem-solving. While it is true that creativity is a vital component of human activity that enriches our society and our lives, industry sectors like agriculture can at times have more pressing needs that make it difficult to prioritise innovative thinking.

However, creativity is important to business – whether banks, ship builders, fast-food restaurants or farmers – because it is the means by which these organisations find new and effective solutions to the new problems that they face every day. Albert Einstein is reported to have said that *"we can't solve problems by using the same kind of thinking we used when we created them"* and this captures the essence of the value of creativity perfectly. A simple example is found with climate change and carbon emissions. It is probably not sufficient to address this problem merely by changing from coal-fired power stations to clean-coal systems, because that solution is still based on the same kind of thinking that created the problem in the first place. The only real solution to reducing our dependence on non-renewable fuels is to find alternatives, not just to use less of the same fuels.

The challenge in these situations is that creativity, and creative problem-solving, is hard work! It's tempting to believe, and some pundits encourage the view, that all you need is a little brainstorming or some coloured hats, and your problems will all be solved. However, this fails to address the other factors that play a role in creative problem-solving – the personal properties of the individuals involved and the organisational climate, to name just two.

The ability to be creative, and to find the novel solutions needed to tackle the challenges we face in a sector like agriculture, should be thought of as a habit. Like other good habits, we need to understand what is required, and we need to work on developing these habits. The good news is that the science of creativity has done a great deal of work on these questions. There is an extensive body of knowledge about what makes people, teams and organisations creative, and how to turn this knowledge into practical outcomes.

An important starting point in that process is problem-definition. A mistake we often make is that we identify and solve, not the real problem, but only a symptom of the real problem. This can happen because frequently the symptom is more immediately visible, and may even deliver a short-term result. However, this is like taking aspirin for a toothache. There is no doubt that the aspirin will make it hurt less, but it's clear that the tooth is still decayed.

Agriculture currently faces a wide array of problems and challenges, and more keep coming. These come from a variety of sources, and may be, for example, brought about by changes to government regulation, changes to international markets, natural disasters, new technology and more. What is clear is that, with creativity, new solutions can be found to these new problems. They may not be obvious – indeed, they almost certainly won't be – but the science of creativity has put us in a good position to find them. Like the parcel delivery company UPS then, the solution to reducing their fuel bill and carbon emissions may be as simple – and effective – as programming their GPS devices to avoid turning across traffic. A few minutes per day sitting idling at intersections may not seem a lot for one van, but multiplied by their international fleet becomes very significant. Similarly, a 5% reduction in drag on your aircraft may not seem to matter much, but when an international airline reduces their fuel bill be 3 or 4% as a result of installing winglets – the turned-up ends on aircraft wings – the savings can run into millions of dollars, not to mention a handy reduction in carbon emissions.

Finding novel and effective solutions to the problems faced in agriculture begins with understanding the science of creativity – those personal properties, processes and organisational factors that can either stimulate, or inhibit, our ability to generate engage in effective problem-solving.

Field Trip Case Study

Lou and Betty Raiteri

Quantifying the effects of microbial additions to sugarcane soils on crop productivity.

Block pre-application (early in morning).

Trials were implemented in four major districts within the Australian sugarcane industry to identify and objectively measure the effects of microbial additions under different sugarcane systems, climatic conditions and soil types that may lead to the positive impacts of sugarcane growth, soil health, and economic benefits. Each region was tasked with a specific trial relevant to growers in the region.

	Mackay	Proserpine	Burdekin	Herbert
	Reduced Nutrition	**Effect of different feedstocks**	**Accelerated trash breakdown**	**Effect on parasitic populations**
Treatment 1	100% Nutrition (Control)	100% Nutrition (Control)	No Trash + No Biology (Control)	No Biology (Control)
Treatment 2	100% Nutrition plus Biology	100% Nutrition + Mill Mud	No Trash + Biology	Biology @ 150 L/ha
Treatment 3	70% Nutrition	100% Nutrition + Biology	Trash + No Biology	Biology @ 300 L/ha
Treatment 4	70% Nutrition + Biology	100% Nutrition + Mill Mud + Biology	Trash + Biology	NIL

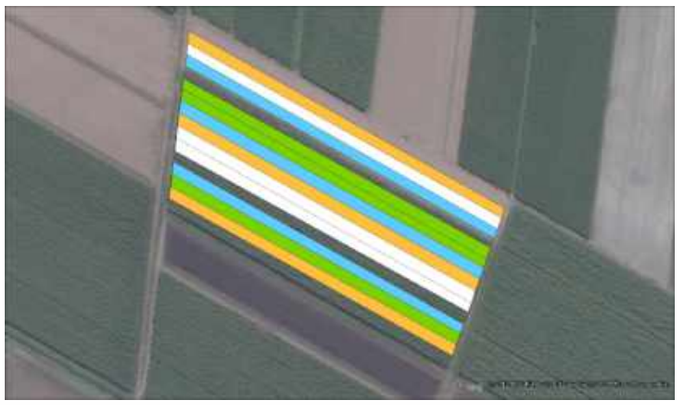
The Proserpine trial was designed to investigate whether or not an available feedstock such as mill mud, in conjunction with applied biology, could sustain higher populations of microbes and what effects might be observed or expected. This trial was applied on Lou Raiteri's farm in Proserpine on the 16th of September 2013.

Treatment	Description
1	100% nutrition (160N, 114K, 18S) - Control
2	100% nutrition + mill mud banded at 100 t/ha
3	100% nutrition + biology applied at 180 l/ha
4	100% nutrition + mill mud + biology

Measurements involve:

- Yield, CCS, tonnes of sugar produces
- Profitability
- Changes in soil chemistry over time
- Changes in soil physical properties over time
- Changes in biological populations over time
- The effect of different feed-stocks on biology

Trials are funded under the SRA GGIP project scheme.



Biology being loaded.

Lui setting up applicator.

A big thanks to Lou and Betty Raiteri for hosting the 2014 Project Catalyst Field Trip.

Sugar Research Australia

Case Study 2

Gerry and Barbara Deguara, Eton

Australian Government

Reef Catchments Action On The Ground Carbon Farming Trial

Gerry Deguara, Project Catalyst grower, Eton.

Assessment of banded surface applied mill mud as a component of a seasonal nutrient program in sugarcane.

Site Location: Eton
Coordinates: Latitude -21.21733
Longitude
148.95261 (WGS 84)
Soil profile class: Marian
Aus Soil Classification: Brown Chromosol
Variety: KQ228
Crop Class: 1st ratoon

Trial objectives

- Assess the potential of mill mud banded at relatively low application rates as a total seasonal nutrient program in ratoon sugarcane
- Assess the potential of incorporating banded mill mud applications at low rates as part of seasonal nutrient program for sugarcane
- Compare sugarcane yields from mill mud based seasonal nutrient programs with standard industry endorsed '6 Easy Steps' nutrient programs

Introduction

Mill mud is a by-product of the sugar milling process and traditionally applied at rates in excess of 150 wet tons / ha. To address water quality issues in the Central cane growing region mill mud is now banded at 50 tons/ha with modified truck applicators. The Deguara family have developed a 3 row, tractor drawn mill mud applicator which is capable applying mill mud at an application rate of 50 ton/ha. With a GPS equipped tractor, mill mud can be accurately applied between dual row sugarcane (50cm apart) in a 2m row configuration. The Deguara family have adopted controlled traffic farming with all machinery set at 2m wheel centres. Tillage operations have been reduced where possible to conserve organic carbon and improve soil health. Incorporating mill mud into a seasonal nutrition program is seen as a means to potentially reduce granular urea inputs and optimise nutrient cycling through enhanced soil health. Gerry traditionally applies a liquid Dunder blend (potassium source) fortified with urea to provide the crops nitrogen requirements.

Methods

Deep EC mapping patterns derived from a Veris 3100 soil survey and satellite yield ratio mapping were utilised to assess paddock variability and select the most appropriate bed to establish the trial (Figure 1).Four years of satellite yield estimation data was transformed into the yield ratio mapping surface using Mapinfo® software. Yield estimation point data for the block was converted into a yield estimate ratio by dividing the actual value for each point by the site average of yield data for those years where the cane class matched Plant, 1st or 2nd ratoons.

The trial design incorporates 4 nutrient treatment programs with 3 replications per treatment). Randomised replicate plots are block length (370m) and 6 metres wide (3 x 2m row spacing).
The trial paddock has had a history of mill mud applications generally applied during the fallow phase of crop cycles. Soil analysis validated high phosphorus levels and indicated potassium requirements of 85 kg/

ha, sulphur levels were moderate with applications requirements of 10 kg/ha. The four nutrient treatments in the trial are designed to assess the potential of mill mud applied at low rates to mineralize sufficient nitrogen to achieve comparable yields to a standard '6 Easy Steps' nutrient program (Table 1).

Table 1: Detail of nutrient treatments and nutrients applied on a per hectare basis

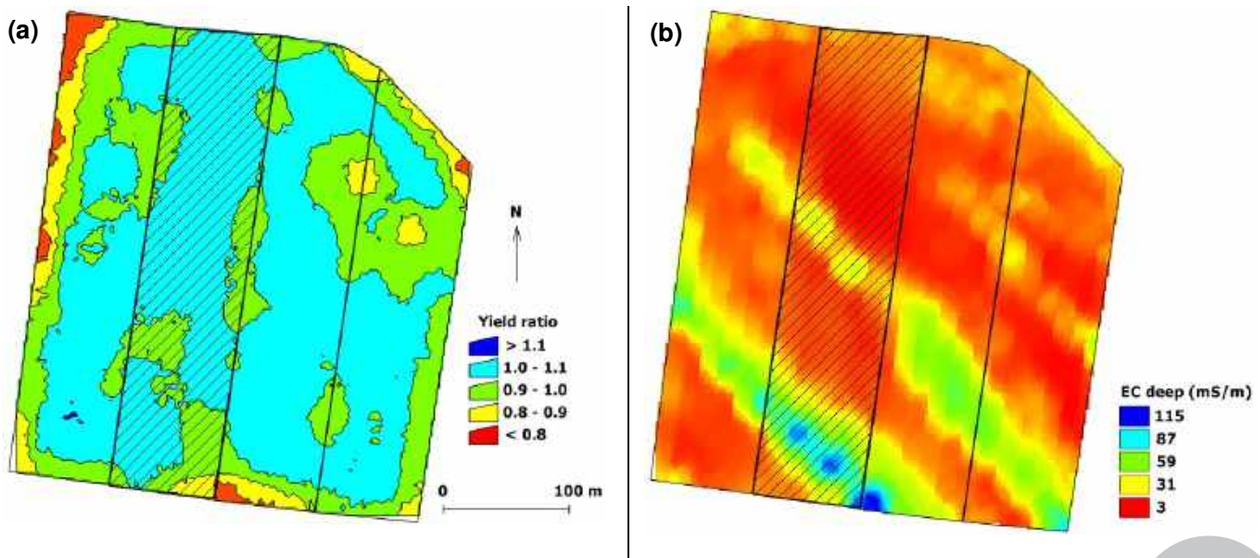
Treatments	Rate	Total nutrients applied (kg/ha)			
		N	P	K	S
1: Mill mud	50 tons/ha Mud	**25**	**25**	**15**	**10**
2: Mill mud plus Dunder based 'Liquid one shot' (LOS)	50 tons/ha Mud	25	25	15	10
	2.9 m^3 LOS	138		78	12
	Total T2	**163**	**25**	**93**	**22**
3: Mill mud +Urea	50 ton/ha Mud	25	25	15	10
	293 kg/ha Urea	135			
	Total T3	**160**	**25**	**15**	**10**
4: 'Six Easy Steps'- 'Liquid one shot'	3.4 m^3 LOS	**161**		**92**	**14**

The mill mud treatments were applied on the 13 November 2012 with the balance of the nutrients applied on the 1 December 2012. The trial paddock was irrigated on 3 occasions between the 19

November and 18 January 2013 with an average application of 30mm/per irrigation delivered via a centre pivot.

Leaf sampling regimes from all plot replicates were conducted on the 12 February 2013 and re- sampled on the 4 April. BSES leaf sampling protocols were followed with 30 leaves collected from 30m of row for each replicate along the southern headland of the trial. Leaf samples were refrigerated on site at 6° C and oven dried at 60° C for 24 hours prior to dispatch to BSES laboratories. On the 4 April soil biology samples were extracted from two of the '6 Easy Steps' replicate strips (rows 8 and 32) and two of the Mill mud plus LOS replicate strips (rows 11 and 29). Samples were refrigerated on site and forwarded to T. Pattison (Senior Nematologist, DAFF, South Johnston Research Centre) for soil health analysis.

Figure 1. (a) Satellite yield ratio mapping layer showing selected location of trial (hatched area) (b)Deep EC surface layer



Results and discussion

Cane on this site was harvested on October 11 2013.

Discussion Points

- As expected, due to insufficient Nitrogen needed to maintain satisfactory plant growth, the cane and sugar yield for treatment T1 (mud only) is significantly lower than other treatments on this site. However it is worth noting that T1 cane and sugar yields are similar to the regional average.
- Continuation of the mud only application (T1) will determine what (if any) impact on yield from the availability of residual Nitrogen from the previous mud application.
- Cane and sugar yields for treatments T2, T3 and T4 are significantly higher than the region average.
- Results to date indicate reducing nitrogen applications in association with alternative nutrient sources (T3 and T4) has no impact on cane and sugar yields when compared to the industry standard application (T2).
- Leaf N% results across all treatments in April were marginally below the accepted industry threshold.
- Treatment T4 provides a marginally higher return to the grower than other treatments.
- Soil organic carbon levels at the site will continue to be monitored to identify trends.
- Failure to reduce Nitrogen application when used in conjunction with alternative nutrient sources has the potential to reduce water quality, increase Nitrous Oxide emissions and enhance the vigour of weeds.

Mill mud spreader.

Results

Soil and Leaf analysis

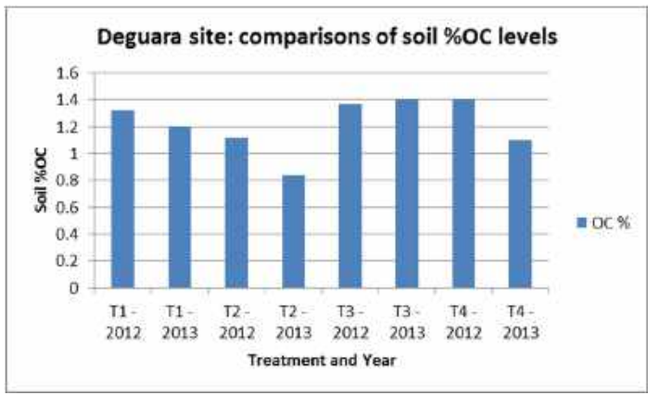


Figure 2 - Deguara site Average %OC (2012 and 2013)

Project Catalyst farm visit to David Cox's farm in Ayr.

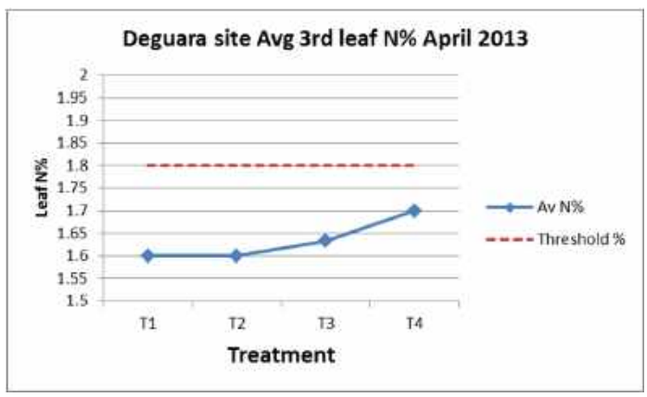


Figure 3 -Deguara site 3rd leaf N% analysis.

Harvest Results – October 11 2013

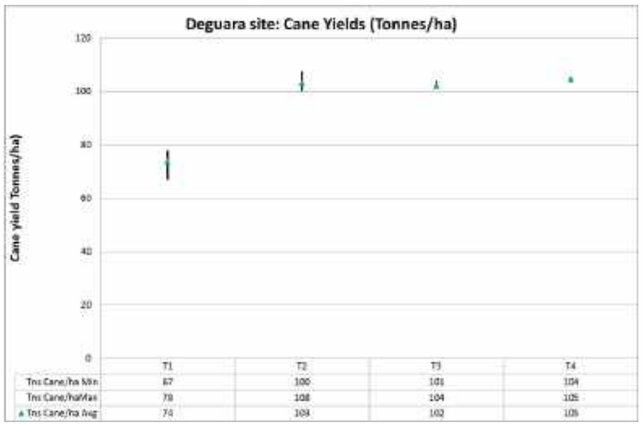


Figure 4 - Deguara site Cane yields (tonnes/ha) showing the average achieved per treatment and the spread between replicates (min to max).

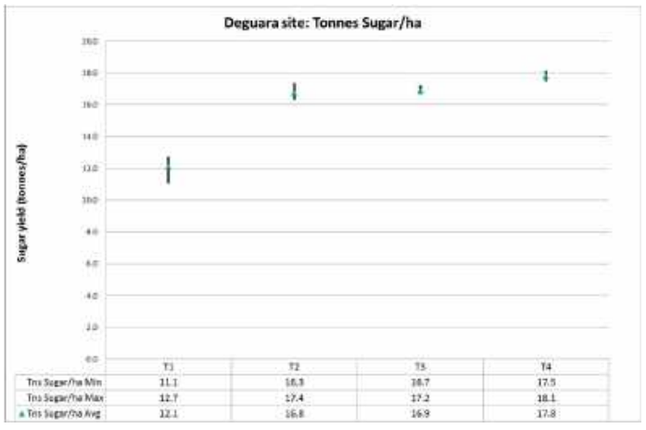


Figure 5 - Deguara site Sugar yield (t/ha) – showing the average achieved per treatment and the spread between replicates (min to max)

Figure 6 - Deguara site $/ha return (excluding irrigation and other fixed costs

Banded Mill mud.

Case Study 3

Werner family, Septimus

Australian Government

Reef Catchments Action On The Ground Carbon Farming Trial

Assessment of sub-surface applied mill mud as a component of a seasonal nutrient program in sugarcane

Dennis Werner, John Hughes and John Werner.

Site Location: Septimus
Coordinates: Latitude -21.23503
Longitude 148.77019 (WGS 84)
Soil profile class: Gargett
Aus Soil Classification: Yellow-gleyed podzolic soil
Soil profile class: Dunwold **Aus Soil Classification:** Grey Sodosol
Variety: KQ228 **Crop Class:** 1st ratoon

Trial objectives

- Assess the potential of incorporating banded mill mud applications at low rates as part of seasonal nutrient program for sugarcane
- Assess the potential for mill mud to supply organic nitrogen and other macronutrients while reducing granular nitrogen inputs

Introduction

The study site paddock of 3.04 hectares has been under sugarcane production for approximately 20 years. The block was planted to the variety KQ228 in August 2010. The plant cane crop was harvested in August 2011 and the 1st ratoon crop was harvested on the 28 June 2012. Mill mud is a by-product of the sugar milling process and traditionally applied at rates in excess of 150 wet tons /ha. To address water quality issues in the Central cane growing region mill mud is now banded at 50 tons/ha with modified truck applicators. The Werner family have developed a single row mill mud applicator with the capacity to sub-surface band apply the product at reduced rates of 30 ton/ha. Sub-surface application banded on either side of the stool would mitigate potential loss through run-off. In addition sub-surface placement of the product would facilitate nutrient cycling of nutrients through beneficial soil organisms. The growers were considering the option of applying banded mill mud as a component of an annual nutrient program for sugarcane. The anticipation is to improve nitrogen (N) use efficiency through controlled release of N through mineralisation via the mill mud application with a corresponding reduction of granular urea inputs.

Methods

To determine the variability in crop growth of the trial block, four years of satellite yield estimation data was transformed into a yield ratio mapping surface using Mapinfo® software. Yield estimation point data for the block was converted into a yield estimate ratio by dividing the actual value for each point by the site average of yield data for those years where the cane class matched Plant, 1st or 2nd ratoons. Patterns in the yield ratio map enabled the positioning of the trial area within the block in where there was the least variability in crop growth (Figure 1).

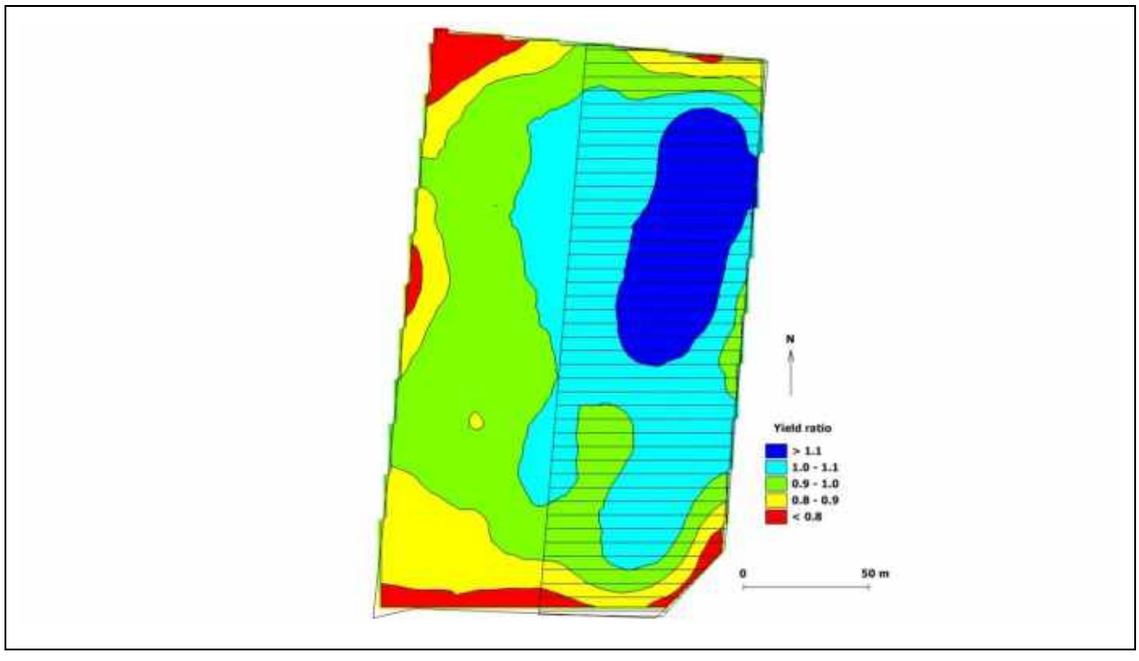
The trial design incorporated two nutrient treatments with 4 replications. Randomised treatment strips are block length and 6 x 1.8m rows wide. The mill mud was applied on the 15 November 2012 with the balance of the nutrients applied as a granular side-dressing on the 22 November. The granular side-dressing on the conventional nutrient treatment was applied on the 20 November 2012. Table 1 summarises the application of nutrients to each treatment.

Table 1: Breakdown of nutrients applied with the mill mud nutrient program and the conventional granular fertilizer program

Treatments	Rate (kg/ha)	Total nutrients applied (kg/ha)			
		N	P	K	S
T1: Mill mud program	32,700	25	25	15	10
Mill mud banded plus Granular side-dressing (N-26.95%, K-17.9%, S-2.4%)	480	129	0	86	12
	Total T1	**154**	**25**	**101**	**22**
T2: Conventional program Granular side-dressing (N-21%, P-3%, K-17%, S-6%)	750	**158**	**23**	**128**	**45**

The block was irrigated with 40mm on the 28 November. Leaf sampling of treatment replicates was conducted on the 12 February 2013 and the 4 April 2013 respectively. BSES leaf sampling protocols were followed with 30 leaf samples from each strip extracted from the 2nd and 4th row of the plot. Leaf samples were refrigerated at 4° Centigrade prior to being oven dried at 60° Centigrade for 48 hours. Samples were forwarded to BSES for analysis.

Figure 1 - Satellite yield ratio mapping layer showing location of trial in section of paddock with the least variability in crop growth



Results and discussion

Cane on the trial site was harvested on July 30 2013.

Discussion Points

- Cane and sugar yields for both treatments are significantly higher than the region average.
- There is no difference in cane and sugar yields between treatments.
- Results to date indicate reducing nitrogen applications in association with alternative nutrient sources (T1) has no impact on cane and sugar yields when compared to the industry standard application (T2).
- There has been a small increase in %OC levels in T1 soils between 2012 and 2013.
- Soil organic carbon levels at the site will continue to be monitored to identify trends.
- Failure to reduce Nitrogen application when used in conjunction with alternative nutrient sources has the potential to reduce water quality, increase Nitrous Oxide emissions and enhance the vigour of weeds.

Results

Soil analysis

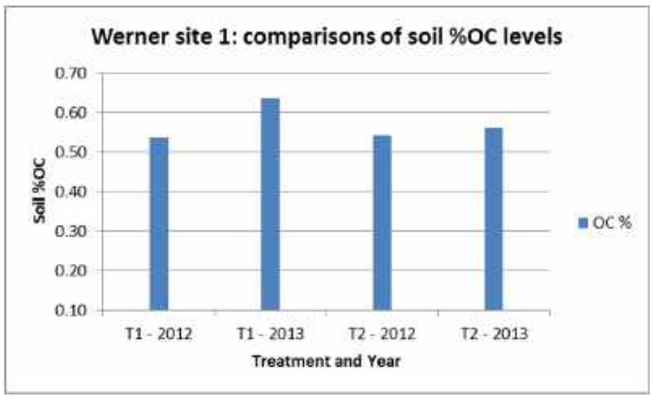


Figure 2 - Werner site 1 Average %OC (2012 and 2013)

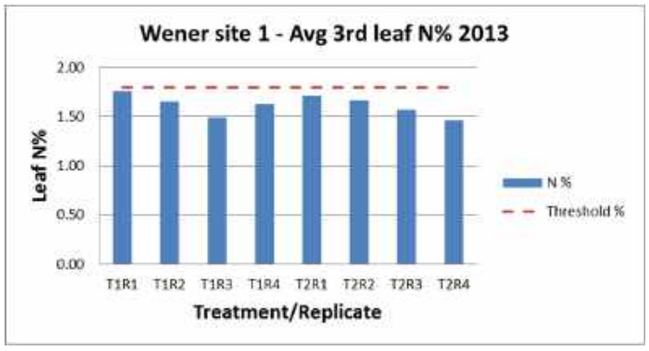


Figure 3 – Werner site 1 – Leaf N% analyses

Harvest Results – July 30 2013

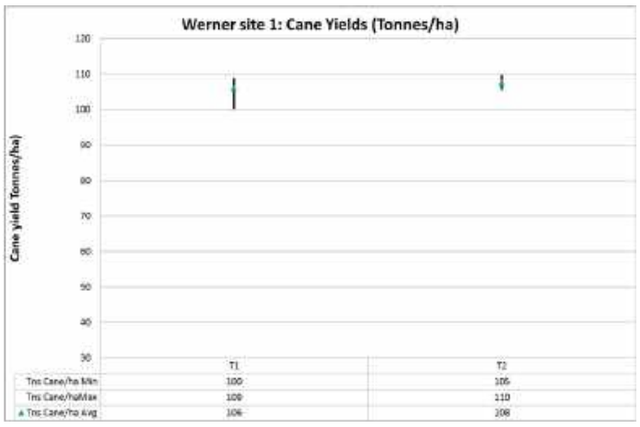


Figure 4 - Werner site 1 Cane yields (tonnes/ha) - showing the average achieved per treatment and the spread between replicates (min to max)

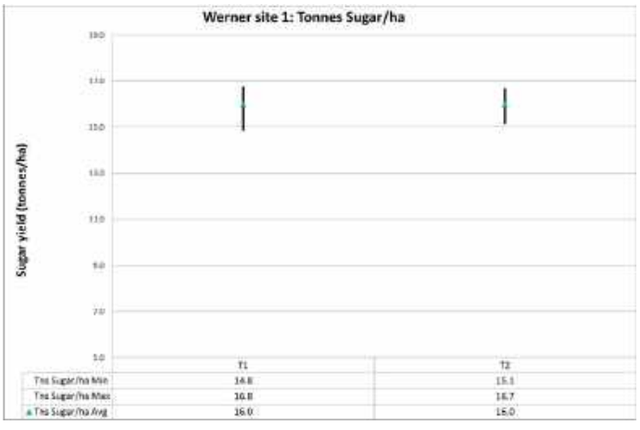


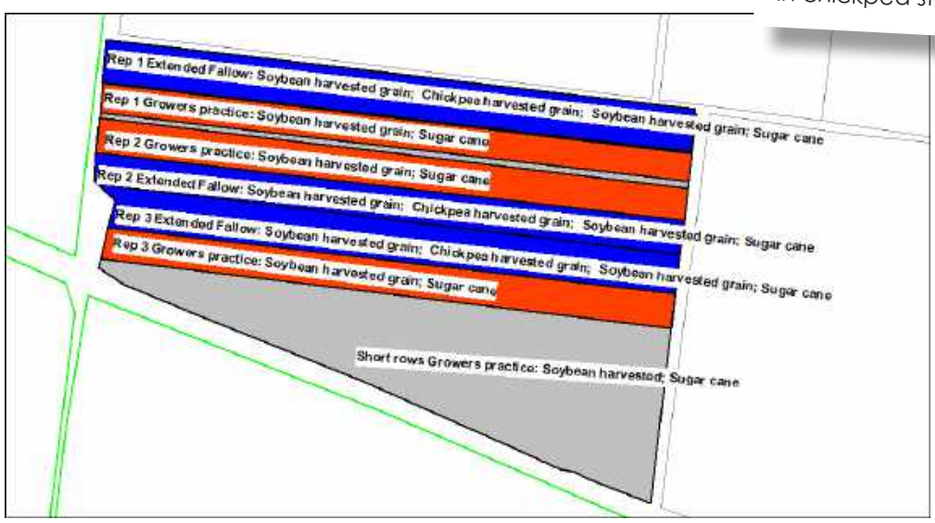
Figure 5 - Werner site 1 Sugar yield (t/ha) - showing the average achieved per treatment and the spread between replicates (min to max)

Case Study 4

Gerry Deguara - Exploring the Benefits of Extended Fallows

Gerry Deguara and family from Eton North, sandy creek catchment consider that extending the current fallow length in the sugar cane crop cycle may lead to benefits to soil health and subsequent cane yields. With results of improved plant cane yield of 30% and first ratoon of 8% attained in a previous extended fallow trial by Plane Creek Sustainable Farmers group, Gerry hopes to gain similar improvements. Results from the Sugar Yield Decline Joint Venture also highlighted that extending the fallow length to include a 5 year pasture phase gave improved soil health and cane yield benefits. However, a pasture phase is not suitable during a sugar cane crop cycle due to management and financial constraints. Gerry seeks to improve the economics of extending his fallow by growing cash grain crops.

Gerry Deguara and Natalie Fiocco (Farmacist) in chickpea strip planted 31/05/13



The trial site had soybean planted across the whole paddock in December 2012. That soybean crop was then harvested in May 2013, then a strip trial was setup and chickpea was planted in strips strait back into the soybean beds. Sugar cane was planted in the remaining strips in August 2013. The chickpeas were harvested in October 2013 and soybean replanted into the same beds in November 2013. In 2014 the soybean strips plan to be harvested and replanted to sugar cane.

Chickpea Harvest data

	yield (t)	t/ha
Replicate 1	0.826	1.05
Replicate 2	0.74	1.25
Replicate 3	1.12	1.42
Total	2.686	1.24

Results so far:
The soybean crop harvested May 2013 yielded 2.5t/ha for the whole 5.7 ha paddock. The chickpea crop averaged 1.24t/ha across the 3 replicates.

Soybean crop planted November 2013

Organic carbon

Development of a UV absorbance test for monitoring soil humic substances

Dr Pamela Pittaway
Senior Research Fellow, National Centre for Engineering in Agriculture, University of Southern Queensland

The decline in the concentration of organic carbon in cropping soils on the Darling Downs over the last 50 years is associated with a decline in soil structure and in soil fertility. In North Queensland, organic carbon levels have also declined, but a consistent relationship between sugar cane yield decline and soil organic carbon has not been conclusively established. Soil organic carbon includes rapidly recycled green plant residues, along with tougher, more resilient plant residues which over time, become soil humus. Distinguishing between these different forms until now has been costly, requiring expensive laboratory instruments.

Experience with aquatic humic substances and compost extracts indicates microbially processed compounds that have undergone humification, strongly absorb ultraviolet (UV) light at a wavelength of 253.7 nm. We have adapted this method for soil extracts, to determine if this test can be used to indicate the health status of sugar cane soils. Results from air-dried soil samples provided by growers attending a workshop in Mackay indicate grassy headlands that have not been cultivated have the highest concentration of dissolved organic carbon (DOC), with the highest proportion of humified organic carbon (Table 1: UV absorbance and SUVA, calculated by dividing UV absorbance by DOC). The UV field method only detects UV absorbance (pink shaded column), but can be undertaken on freshly collected soil samples under field conditions. The equipment needed to undertake UV field testing is in photo 1.

Soil type	UV $_{253.7\ nm}$ abs. units	Dissolved Org C (mg/L)	SUVA (mg/L/m)	% oven-dry moisture
Baumann chicken manure paddock	1.31	5.5	24.2	2
Hunter organic bananas with compost	3.08	6.4	48.4	7
Hunter slashed headlands	**4.22**	**6.3**	**67.2**	**17**
River silt Burdekin	2.08	4.9	43.1	2
Ahern riverbank 50 yr cane, millmud 2011	2.48	6.3	38.6	4
Ahern org pumpkin millmud 2012	2.34	6.2	37.6	2
Attard Nth Eton 3151-2-1-3	1.51	7.6	20.0	1
Attard Eton 3151-2-1-2 **	2.10	7.3	28.8	3
Attard Nth grass 3079-7-2 **	**3.10**	**7.9**	**39.3**	**5**
Attard Nth Eton 3151-2-1-4	1.28	4.3	29.8	1

** Asterisks are soils treated for 5 years with fish, seaweed and molasses

Table 1: Summary table of UV lab method results for Mackay and Burdekin grower soil samples.

Field UV method data is restricted to the UV absorbance data (shaded in red).

Both the grassy headland soils that had not been cultivated had the highest air-dry moisture content, highest UV absorbance and the highest proportion of the total dissolved organic carbon (DOC) that was humified (Specific UV absorbance or SUVA, calculated by dividing UV absorbance by the DOC).

Figure 1: Components of the field UV method testing kit. From front left to right, 47 mm diameter, 45 µm glass fibre filter paper discs, 40 mL measuring cup, 47 mm filter disc holder, one teaspoon measure, one capped plastic container for shaking the solution, one 60 mL syringe for forcing the liquid through the filter, and a sealed plastic bag for pulverising the soil sample. Portable UV spectrophotometer is at the rear.

Biography

Dr Pamela PIttaway

Qulifications:
Ph. D. Botany/Agriculture, La Trobe University, Melbourne Victoria
1978 B. Sc. (Botany/Zoology) Hons, Botany La Trobe University

During her PhD candidature Pam investigated the influence of soil type and climate on eucalyptus dieback associated with the soilborne disease Phytophthora cinnamomi. Postdoctoral research at the Waite Institute Adelaide University on the susceptibility of wheat to root disease further stimulated her interest in plant, soil and microbial interactions. Lecturing in Introductory Entomology, Microbiology and Integrated Pest Management at Roseworthy (SA) and Gatton (Qld) Agricultural Colleges expanded Pam's interest in interdisciplinary scholarship and research. Since joining the NCEA in 1997, Pam has collaborated with engineers and primary producers on alternative strategies for managing agricultural organic waste, and with water resource managers on the impact of aquatic humic substances on artificial monolayers and water quality. Pam has extended her research on aquatic humic substances to develop a test for soil humic substances, as an index of soil health.

Key research areas include

- Soil health and thermophilic composting
- Biology of natural aquatic microlayers

In support

Project Catalyst 2008 - 2014

2014 marks the milestone 5-year anniversary of Project Catalyst. Much has been achieved thanks to the unique partnerships and networks the project has helped establish.

To date, Project Catalyst growers have provided major water quality benefits to the Great Barrier Reef through significantly improved farm practices. Over the five years of the project (2008 – 2014) the following reduction of chemical, nutrient and sediment runoff from farms into freshwater tributaries and estuaries which connect to the Great Barrier Reef basin have been recorded:

- Reduction of particulate nitrogen by 25 tonnes per annum
- Reduction of particulate phosphorus by 12 tonnes per annum
- Reduction of dissolved inorganic nitrogen by 22 tonnes per annum
- Reduction of filterable reactive phosphorus by 4 tonnes per annum
- Reduction of pesticides leaving the farm by 190 kg per annum

This year, Project Catalyst partners and sponsors revisit their involvement in the project and reflect on the importance of innovation for the sustained future of the agricultural sector.

Thank you and congratulations to all growers, partners, sponsors and collaborators who have been involved in Project Catalyst – your support and participation are what continues to drive the project's success and significant achievements to date.

The Coca-Cola Foundation

Project Catalyst Partner

Michelle Allen, Public Affairs & Communication Manager

Rob Cairns WWF. Catalyst grower David Morselli (Ingham) and Michelle Allen, Coca-Cola.

Why are you interested in innovation in agriculture & how important do you believe innovation is for the future of this sector?

At Coca-Cola, agricultural products are ingredients in almost all of our beverages, so the health of our business depends on a healthy agricultural supply chain. While we don't have direct control over agricultural practices, we do have an opportunity to encourage and promote innovation to develop more sustainable practices throughout our supply chain. This opportunity includes working with many valued partners around the globe. In Australia we are proud to partner with and support the Project Catalyst growers, WWF, Reef Catchments, NQ Dry Tropics and Terrain.

Agriculture is at the heart of the sustainability challenge. In an era marked by scarcer resources, greater demand, and price volatility, water, food and energy demands increasingly intersect with business, communities and farmers. A healthy agricultural supply chain is essential to the future well-being of the communities in which we operate and is critical to the future success of our business.

Sustainability and social responsibility are not public relations initiatives, or compliance check-offs, or nice-to-dos.

"In a world …
where populations are growing,
where natural resources are stressed,
where communities are forced to do more with less, and
where consumers' expectations are expanding,
innovation in agriculture is key."

Why have you chosen to be involved in Project Catalyst and what benefits do you perceive?

Climate change and land-based pollution are significant threats to the Great Barrier Reef.
While Project Catalyst cannot directly influence the risk posed by climate change, it can assist in minimising land-based pollution by reducing water quality stressors, helping to ensure the Reef has the greatest possible resilience to adapt to increased temperatures from Climate change. At Coca-Cola we saw a clear opportunity to work with like-minded local growers to support them in addressing the issue of poor water quality emanating from farming in the GBR catchments.

With an initial grant from The Coca-Cola Foundation, Reef Catchments, and WWF launched the pioneering partnership which became known as Project Catalyst. The overall aim of Project Catalyst was to foster farmer innovation to create sustainable solutions for the community of Australian sugarcane farmers and the Great Barrier Reef.

Importantly, the innovation is grower led, so growers are instrumental in developing sustainable techniques that will form the best practice of tomorrow and help improve profitability and productivity. The precision agriculture methods being used under Project Catalyst are tested, scalable and paving the way for the best practice of tomorrow.

We look forward to continuing this groundbreaking partnership for the good of the sugar cane industry and sugar cane communities in Australia and the preservation of one of our nation's greatest natural treasures, the Great Barrier Reef.

The Coca-Cola Foundation

Michelle Allen,
The Coca-Cola Foundation

WWF-Australia

Project Catalyst Partner

Dermot O'Gorman, CEO
Rob Cairns, Program Manager – Sustainable Agriculture

WWF-Australia CEO Dermot O'Gorman.

Why are you interested in innovation in agriculture & how important do you believe innovation is for the future of this sector?

Queensland's Great Barrier Reef is the world's largest coral reef system, home to thousands of unique species including six of the world's seven species of threatened marine turtles. The Reef is recognised globally as a World Heritage natural site of outstanding universal value.

The Great Barrier Reef faces challenges from climate change, over-fishing, shipping and coastal infrastructure, but one of the greatest threats today is agricultural pollution. WWF-Australia is working with others on innovation and to promote wider adoption of sustainable agricultural practices by the sugarcane industry that can improve water quality and help save the Reef.

Innovation is the key and all practices ultimately must prove to be good for farmers and good for the Reef.

"Innovation is critical to improving the sustainability of sugar production, and therefore to securing the future of the sector."

WWF-Australia has been a partner in project Catalyst since day one and is working with others to trial innovative practices and improve the sustainability of sugar production at the grower level. Project Catalyst brings together sugarcane growers, natural resource management groups, WWF and The Coca-Cola Foundation – who all share an interest in sustainable sugar production and protecting the Great Barrier Reef.

Project Catalyst provides funding, technical advice and extension support to sugarcane farmers who are trialling more sustainable agricultural practices.

Most importantly, the project has helped farmers find new ways to reduce pollution while also improving their business.

Project Catalyst farmers have found new ways to use less fertiliser and herbicides, while maintaining or even improving their profitability and yields. The result is higher economic returns and better water quality on the Reef.

Why have you chosen to be involved in Project Catalyst and what benefits do you perceive?

WWF realises that no one person or organisation can solve this problem by themselves. We need to work together like never before and Project Catalyst has shown the value and power of a diverse group of stakeholders working together on issues of common interest and concern.

Dermot O'Gorman, CEO of WWF-Australia, believes that Project Catalyst is making a real difference.

"Project Catalyst shows that it is possible to dramatically reduce the impact from land-based pollution while maintaining a viable agricultural sector," Mr O'Gorman said.

"Project Catalyst has shown the value and power of a diverse group of stakeholders."

Reef Catchments has been involved in Project Catalyst since it first began five years ago.

Reef Catchments

Project Catalyst Partner

Robert Cocco, CEO
Belinda Billing, Project Officer - Water Quality

"We understand when it comes to improving agricultural practices, growers are the real drivers of both change and opportunity."

Why are you interested in innovation in agriculture & how important do you believe innovation is for the future of this sector?

At Reef Catchments we view innovation as the key to driving improvements that benefit both business and our environment. Both are critically important – when achieved, this balance will underpin a vibrant economy, sustainable industries and a healthy population.

It's not environment at the expense of economics, and not economics at the expense of the environment. Innovation is about finding ways to achieve outcomes for all involved, essentially challenging our thinking and our practices to learn how to do what we do, better - more effectively, productively and sustainably.

Reef Catchments' role and responsibility each year and over many years is to coordinate, integrate and align efforts to sustainably manage natural resources at the landscape level. We partner with our local landholders and community to harness the knowledge, enthusiasm and resources of those who are on-the-ground everyday.

We understand when it comes to improving agricultural practices, growers are the real drivers of change and opportunity. We provide the landholders in the Mackay and Whitsunday region with the tools and expertise they need to manage both their business and the natural resources we all rely on. Natural resources are crucial to our region's character and constitute a large part of our identity and what it is to be a local resident – NRM affects the whole community.

Why have you chosen to be involved in Project Catalyst and what benefits do you perceive?

Project Catalyst supports and celebrates the work of forward-thinking Australian cane farmers who are at the fore of truly innovative practice that also protect our region's natural assets for the future.

The actions to date of the landholders involved in Project Catalyst have directly improved water quality to the iconic Great Barrier Reef, while also helping increase farm productivity and profitability.

Reef Catchments provide both financial and technical support to these farmers who are leading the way in the adoption of cutting-edge farm management – essentially, learning to do more with less.

Project Catalyst is a unique partnership that connects sugar producers with leading organisations nationally and globally to break new ground in sustainable agriculture and Reef Catchments is proud to continue to be a part of that.

Reef Catchments Solutions

REEF CATCHMENTS

NQ Dry Tropics

Project Catalyst Partner

Scott Crawford, CEO
Colleen James, Program Coordinator Sustainable Agriculture

Why are you interested in innovation in agriculture & how important do you believe innovation is for the future of this sector?

NQ Dry Tropics works closely with land managers in the Burdekin Dry Tropics region to encourage best management practices for water quality, production and environmental outcomes.

As the leading natural resource management body for the region, NQ Dry Tropics places a very high importance on innovation to the future of the agriculture sector.

The company's Sustainable Agriculture innovations program addresses this issue, providing innovative farmers with opportunities to trial their practice ideas with the assistance of technical experts.

NQ Dry Tropics Sustainable Agriculture projects have contributed to a significant shift in management practices across the region's agriculture sector. Focusing on the reduction of nutrient, sediment and pesticide losses off farm, NQ Dry Tropics, partners and industry have achieved significant results in reducing the impacts of agriculture on the Great Barrier Reef. These outcomes wouldn't have been possible without the commitment of project partner Farmacist.

To continue these achievements, the innovations program provides the opportunity to identify and investigate potential practices which contribute to these outcomes while also addressing economic and environmental challenges.

"With a thriving cane industry and more than 650 canegrowers in the region, NQ Dry Tropics sees innovation as key to enabling large scale, high impact, positive change."

Why have you chosen to be involved in Project Catalyst and what benefits do you perceive?

NQ Dry Tropics has been working with farmers to better manage their natural resources for more than 10 years. Project Catalyst provides a valuable opportunity to contribute further to the promotion of better practices for environmental, water quality and production outcomes.

There are many forward thinking farmers in the Burdekin Dry Tropics agriculture industry who actively trial new and innovative practices. Project Catalyst offers these innovators the opportunity to work with technical experts, collaborate with like minded farmers, share ideas and experiences and, most importantly, affect change.

The project not only fosters local collaboration, but provides the opportunity for pioneering farmers from other regions to share ideas and experiences with innovation on their farm.

NQ Dry Tropics sees landholder access to technical advice and guidance as a major benefit to our organisation's involvement in Project Catalyst, allowing trials to be a measured and replicated in order to drive innovation beyond individual farms. This benefits the entire industry.

Overall, Project Catalyst has the potential to drive industry-scale changes through trialed and proven practices. This is critical to the health of the Great Barrier Reef and the cane industry as a whole.

NQ DRY TROPICS

An automatic water sampling set up on a cane farm in the Herbert.

Michael Waring

Terrain NRM
Project Catalyst Partner

Carole Sweatman, CEO
Michael Waring, Precision Planning Coordinator (PC)

"Fundamental changes (may be) required in the way we go about the business of managing land for the production of food and fibre."

Why are you interested in innovation in agriculture & how important do you believe innovation is for the future of this sector?

Agriculture in the Wet Tropics is an essential part of our economy and lifestyle. However, there are many challenges facing agriculture in the far north, including rising input and transport costs, pervasive tropical pests and weeds and for some industries diminishing return on investment. In addition, science shows that many agricultural practices are having detrimental effects on our soil and stream health, as well as the condition and resilience of the Great Barrier Reef. Farmers are increasingly called upon to minimise these impacts.

These challenges to both our food and fibre production as well as the health and resilience of our natural systems will be further compounded with the impacts of climate change. Things are not going to get easier.

Mainstream industry is constantly improving current practices to increase efficiency and productivity, as well as reduce impacts on our natural resource base. Alongside this, some farmers are trying new, innovative approaches, that may offer radical solutions to increasingly thorny problems. The immense challenges that farmers will face in the coming decades may require some fundamental changes in the way we go about the business of managing land for the production of food and fibre as well as the wellbeing of our ecosystems. Supporting real innovation in agriculture is therefore essential to ensure a resilient and healthy future landscape in this region.

Why have you chosen to be involved in Project Catalyst and what benefits do you perceive?

Terrain recognises the important role that regional NRM bodies should play in supporting farmer-led innovation. Our current 5-year Strategic Plan highlights the emphasis Terrain will place on supporting innovation aimed at decreasing the impact of agriculture on the water, soil and biodiversity assets of our region, while maintaining, and where possible enhancing, productivity. Our broad Innovation Program focuses on working with a wide range of industries in the region to help progress a promising idea through the key stages of the innovation cycle – from invention, through testing, verifying, extending to early adopters and finally integration of successful innovations into mainstream practice.

Terrain has a range of mechanisms for supporting innovation in the region, including through regional base level funding from the Australian Government and the Australian Government Reef Water Quality Project (formerly Reef Rescue).

Project Catalyst aligns extremely well with Terrain's broader innovation program, value adding to our other innovation efforts. Importantly, it enables us to provide agronomic, technical and scientific support to a selection of inspiring cane farmers in the region who are trialing truly innovative practices that have the potential to result in improved reef water quality outcomes. The project also provides a fantastic foundation for inter- and cross-regional partnerships and information exchange. Farmers, families, communities and the Great Barrier Reef all stand to benefit from these initiatives.

terrain
NATURAL RESOURCE MANAGEMENT

Bayer CropScience

Project Catalyst Major Sponsor

Tim Murphy
Territory Sales Manager

Jacqueline Applegate, Chair, Bayer Group Australia & NZ
Tim Murphy, Territory Sales Manager

Why are you interested in innovation in agriculture & how important do you believe innovation is for the future of this sector?

Bayer is research-based enterprise with core competencies in healthcare, agriculture and high-tech materials. As an inventor company, our products and services improve the quality of life for people, plants and animals.

Bayer CropScience, the agriculture subgroup of Bayer, offers leading brands and expertise in seeds and plant biotechnology, crop protection and non-agricultural pest control. We work together with growers and partners along the entire food chain to improve efficiency and profitability in our challenging environment.

Our spirit of innovation means we don't stop searching for better solutions that help increase yields, strengthen crop resilience and improve food quality on an ever-decreasing amount of arable land. This great tradition is also our commitment to the future – entirely in line with our mission: Science For A Better Life.

Innovation is a key way to address sustainability and food challenges that exist at the beginning of the third millennium so it's imperative that the sugar industry to looks to new and innovative ways of production. While we at Bayer have always been proud of the performance of our products, our greatest pride comes from working and learning with growers so that, together, we can boost the productivity and sustainability of the sugar industry.

Why have you chosen to be involved in Project Catalyst and what benefits do you perceive?

Bayer CropScience works with forward-thinking and progressive growers who look to the future.

"We know that these growers are not content with yesterday's solutions."

Tim Murphy from Bayer CropScience (right) with Tony Crowely and Rob Sluggett (Farmacist)on a Project Catalyst soybean block near Mackay.

They are constantly searching for the next step, the next innovation, the next technological advancement – and the team at Bayer shares this passion.

Bayer CropScience is proud to partner with the Project Catalyst Group which consists of some of the most innovative growers in the Australian sugar industry. Already benefits have been seen by both Bayer and growers from the partnership.

For Bayer, we've had the privilege of working with growers who are concerned about current production techniques and who are looking for ways to change. Examples range from growers who are looking for a more effective way of controlling perennial grasses in crops with new highly effective herbicides, to those wanting to learn more about the increased accuracy in the application of Confidor® Guard to cane blocks.

Over the years Bayer CropScience has worked with growers from Project Catalyst and we have assisted many growers in changing current practices to new innovative techniques that have provided solutions to their problems.

"Our greatest pride comes from working and learning with growers so that, together, we can boost the productivity and sustainability of the sugar industry."

John McGillivray
Agri Services Business Manager

Wilmar
Project Catalyst Major Sponsor

Garry Mulvay, Executive General Manager Wilmar Bioethanol
John McGillivray, Agri Services Business Manager

Precision application.

"The global market realities are increasingly demanding higher standards of stewardship in agricultural supply chains. We embrace those challenges and responsibilities."

Why are you interested in innovation in agriculture & how important do you believe innovation is for the future of this sector?

Productivity enhancements through sustainable practices is essential for the future of the sugarcane industry and its stakeholders.

Innovation suggests finding better ways of doing things. Wilmar is intimately associated with production and processing of sugar.

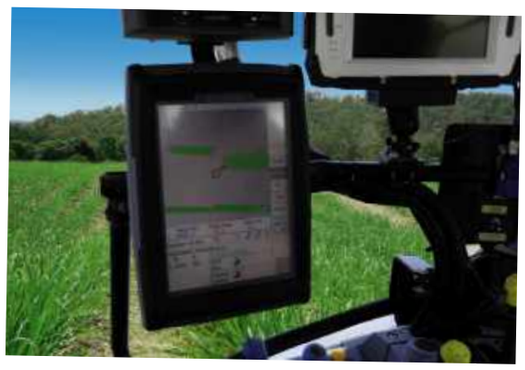
There are significant benefits for us and our stakeholders, of finding better and sustainable methods of producing and processing sugar and of raising productivity of the industry as a whole.

Why have you chosen to be involved in Project Catalyst and what benefits do you perceive?

Wilmar is a vertically integrated sugar business, operating along the length of the supply chain.

The global market realities are increasingly demanding higher standards of stewardship in agricultural supply chains. We embrace those challenges and responsibilities

Project Catalyst seeks to bring together stakeholders who share interests in sugar production and environmental sustainability. Wilmar seeks to contribute and learn from its involvement with Project Catalyst and fulfil its responsibilities as a significant player in the Australian sugar industry.



GPS Tracking.

Syngenta

Project Catalyst Major Sponsor

Mike Mack, CEO
Peter Arkle, Head of Corporate Affairs - Australasia

Why are you interested in innovation in agriculture & how important do you believe innovation is for the future of this sector?

With strong demand growth for Australian sugar around the world, and a growing focus on agricultural sustainability including under BONSUCRO, innovation will be crucial in allowing Australian growers to capture emerging opportunities and to prosper in the years ahead.

Syngenta is a global leader in grower-focused innovation, investing over US$1.4billion in agricultural research and development annually. In Australia, we are focused on leveraging the best of our global biotechnology and crop protection innovations to deliver crop solutions that enable growers to better manage risk, improve farm productivity and to realise their crop's potential.

Building on a strong portfolio of cane solutions including GRAMOXONE, DUAL GOLD, GESAPRIM, KRISMAT and MODDUS, we are excited to be launching new and innovative herbicide chemistry into the Australian market in the near future, that will offer Australian canegrowers new control options.

Innovation, and a deep commitment to product stewardship and sustainability will be essential in ensuring the future success of the Australian cane industry. Syngenta looks forward to partnering with growers, including through Project Catalyst, to help realise the exciting opportunities that await this great sector of Australian agriculture.

Peter Arkle, Syngenta

Project Catalyst farmer Tony Bugeja (left) with Chris Dench, Belinda Billing (Reef Catchments) and Sarah Iddles (Syngenta).

Why have you chosen to be involved in Project Catalyst and what benefits do you perceive?

Syngenta has recently come on-board as a Project Catalyst partner, and we are truly excited about the opportunities that await.

We are proud to be a global leader in grower-focused innovation – however we also recognise that innovation only matters when it is taken up on-farm to drive productivity, enhance sustainability and improve grower returns.

Project Catalyst brings together leading growers, with the support of a wider network of like-minded partners, to encourage innovation to enhance water quality in GBR catchments, while also encouraging efficient, productive and profitable farming. It is this triple bottom line approach that makes Catalyst unique.

We have recently outlined our commitment to driving sustainable agriculture globally through the Good Growth Plan. The Good Growth Plan incorporates six commitments, outlining how we, with the support of partners, will drive sustainable agriculture and help address critical challenge the world faces in feeding a growing population through to 2020.

We look forward to exploring how our partnership with Project Catalyst can align with the wider goals of the Good Growth Plan. It is through initiatives such as Project Catalyst, and the Good Growth Plan, that we can demonstrate the sustainability of modern agriculture, secure our social licence, and realise the market opportunities that will await growers in the years ahead.

syngenta

Farmacist

Project Catalyst Partner

John Markley , Project Manager

Why are you interested in innovation in agriculture & how important do you believe innovation is for the future of this sector?

Farmacist is an agricultural consulting company that specialises in developing and extending innovation to our agricultural clients. Innovation is essential to the continued success of all industries, including agriculture.

For the sugarcane industry to remain viable innovation in production techniques to improve yield, reduce costs and improve environmental sustainability is essential. Innovation requires investment in R&D and investment in the human resources of the industry ie the "growers" to help bring their ideas and skills to develop innovative practices.

Farmacist is proud to work with Project Catalyst and innovative sugar industry growers. Our business seeks to encourage and foster knowledge sharing between our dedicated staff and the many innovative and like minded growers that contribute to the success of Project Catalyst.

Why have you chosen to be involved in Project Catalyst and what benefits do you perceive?

Farmacist is proud to play a role in Project Catalyst, working with innovative growers trialing and evaluating new technologies for farming sugarcane.

The benefits of the project are many - Project Catalyst provides tremendous opportunities for growers from different regions throughout the sugar industry to communicate and share ideas. It also brings into the mix key researchers, key consumers of sugar such as Coca Cola, environmental groups such as WWF and the supporting NRM bodies to genuinely share ideas and developed shared visions.

Together, the participants of Project Catalyst have formed a common bond to improve the environmental footprint that sugar cane production has on freshwater quality and the subsequent impact on the Great Barrier Reef.

Project Catalyst has achieved some valuable outcomes – numerous new farming techniques have been evaluated and proven for adoption amongst the wider industry, inputs of environmentally sensitive herbicides and fertilisers has been reduced and a greater appreciation of the impact of farming practices on the environment and in particular the Great Barrier Reef has been a learning experience for all involved.

Peter McDonnell

FARMACIST

John Markley

"Innovation is essential to the continued success of all industries, including agriculture."

Jayson Dowie

Evan Shannon

Robert Sluggett

Tony Crowley

Natalie Fiocco

The viability of innovation

Economic support to Project Catalyst

Megan Star
Manager Strategic Projects, Department of Agriculture, Fisheries and Forestry (Economics)

Project Catalyst aims to reduce the environmental footprint that sugarcane production has on freshwater quality and the Great Barrier Reef. To do this, Project Catalyst focuses on the adoption of cutting edge practices in the sugar industry. To achieve water quality improvements, these cutting edge practices focus on soil health, farm production efficiency and precision planning.

What is economics?
Economics is pivotal to understanding sustainability, business viability and explores the trade-offs between making different decisions, using a dollar value. Growers in Project Catalyst are making decisions that alter their management practices, farm equipment, business performance, and ultimately their viability. Economic analysis develops their understanding of how much their innovation or technology may affect their business performance and long term sustainability.

Why is economics important?
Economics is an important aspect for growers, natural resource management bodies, industry organisations and government organisations as it allows an understanding of the relevant costs and benefits of an action at a farm level, industry level, and policy level.

To ensure the long term sustainability of the individual farmers and the sugar industry long term profitability and economic viability is critical. Completing an economic analysis with growers allows them to understand if their Project Catalyst innovation or technology improves their profitability, business resilience and subsequent management implications. It is this information that often results in growers further innovating, adjusting practices, and strategically thinking about the long-term direction of the farm.

Economically viable innovations and technologies increase the rate of adoption by growers and often have spill over effects to an industry level, when large shifts occur. Particularly, where there are large capital investments, and major production system adjustments, the impact on farmers, contractors, mill operators and processing must be considered. For example the shift to GPS and wider row spacing has required an adjustment by contract harvesters, planters, and fertiliser applicators.

> "It's always been hard to innovate in such a low profit industry it has been hard spending the capital... innovation has made us stay on the farm if we had not adopted any innovations then we wouldn't be farming anymore"
>
> - Gerry Deguara, Project Catalyst grower

The profitability and economic implications of the technologies and innovations at a farm level provides insights for NRM groups into potential adoption by growers outside the group, efficient allocation of future funds, targeting of further extension, targeting of incentives, incentive mechanisms, future monitoring and evaluation. The economic viability of an innovation is a key factor in adoption as growers are only able to adopt technologies/innovations that improve water quality if they also increase profits and/or reduce exposure to either/both weather risk and price risk. The identification of innovations or technologies that are not economically viable for the farmer, but have significant water quality improvements allows the NRM groups to identify why the innovation is not being widely adopted and improve policy mechanisms to increase adoption. If the innovation is economically viable this presents an opportunity to provide extension and education to increase adoption of growers outside Project Catalyst.

What are we looking for?

Economic analysis looks in detail at the innovation or technology to determine the viability of the investment, or in other words, to determine if the small on-going benefits are sufficient to cover the cost of the initial capital investment. The productivity (subsequent increase in yields) or the efficiency (subsequent reductions in inputs) is also explored to understand how the innovation affects the whole production system.

The economic analysis results in a number of key indicators for the grower to understand the change in profitability: the interest rate required to break-even if loans are required; the time until break-even will be achieved; and the benefit to cost ratio.

Catalyst grower Tony Bugeja and Brooke Edwards (formerly DAFF) at the annual Project Catalyst Forum.

Often as a grower's understanding of the innovation/ technology increases, further components of the production system will be adjusted/modified to improve sustainability further. This potentially creates a flow on effect and allows the increased profits to be available for further on-farm innovations and technologies to be trialled.

Risk is a key aspect in adoption of a new innovation or technology. There are two main types of risk, weather risk and price risk, which the grower has little control over yet impact significantly on the viability of the any new innovation or technology. To understand the robustness of the innovation/ technology an analysis is completed with numerous scenarios of price and yield to account for the possibilities a grower may face in any given year. This provides the grower with a deeper understanding of the innovation/technology with less appealing prices and/or cane yield.

Over time the support that growers seek varies, with different economic analyses completed and built on to achieve a new level of economic understanding, in a similar fashion to the changes in agronomic support a grower requires over time. Initially many growers seek information about their technology or innovation and its impact on the production system, which usually contributes to a great level of understanding of the business indicators and how their farm business is performing overall. Further to this they may seek a greater understanding of the level of economic change that is required to achieve business goals.

Rob Sluggett, Project Catalyst Farmer and Agronomist (Farmacist).

"We have no desire to push practices that send people broke, the trick is how do we do it in a way that is economic? sustainable? and good for everyone?

- Rob Cairns, WWF

Case Study 5

John and Helen Pastega

Helen and John Pastega, Project Catalyst growers.

John and Helen Pastega were determined to reduce the quantity of chemical applied to their cane, to improve the water quality outcomes and to improve their own sustainability.

Having purchased an air assist sprayer the Pastega's were keen to understand the required time frame for the reduced chemical costs to cover the capital outlay of the sprayer, and what was the benefit over time relative to initial cost of the sprayer?

The Pastega's had previously purchased and installed GPS units into their tractors, and recorded tractor operation and application data using AgDat. So economic analysis of the new air assist sprayer was required to assist them quantify the benefits of their investment. The benefits included both a reduction in chemical costs and also the time required for application reduced due to the increased speed at which John could travel. The new sprayer improved chemical strike rate and reduced the quantity of sprays required.

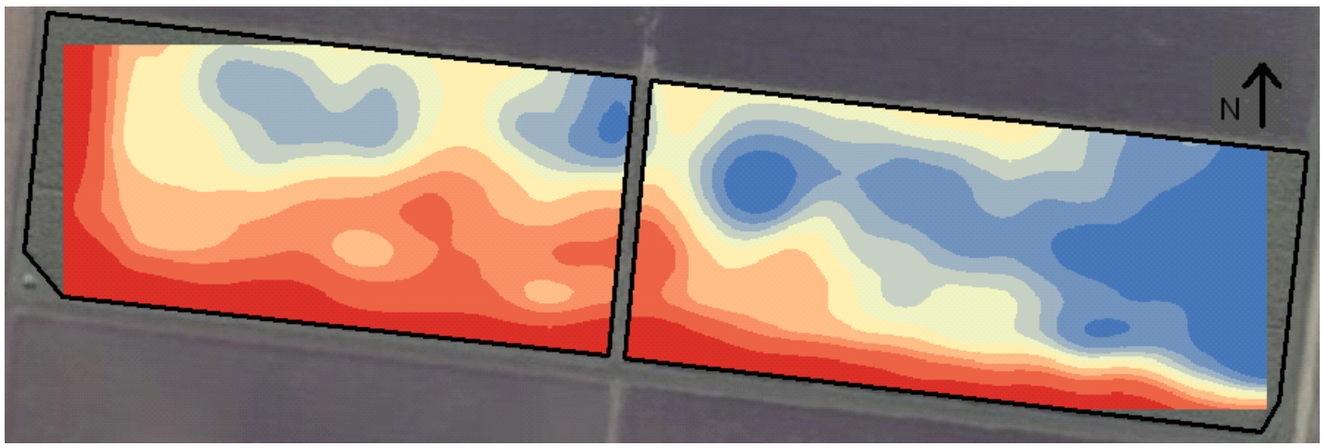
This investment resulted in 5% increase in the gross margin at the time of analysis with a five year pay back period. The improved spray efficiency also reduced their exposure to price and yield risk.

The Pastega's saw the opportunity to better understand their whole of business economic situation

Pastega's current economic analysis exploring variation within farm blocks.

and completed Profit Probe analyses over several years. Although Helen and John have always kept excellent financial records it was a different way of using their data to view the business. This identified that although they had purchased a new overhead irrigator, their return on assets were low due to inability to use it effectively as a result of mechanical issues. It also provided some strategic insights for improving their gross margin ratio to improve overall business viability.

These insights created an interest in John to better understand the differences in gross margin at a block level rather than at the typical property level. John's most recent economic analysis has looked at the available data for calculation of block level gross margins. This has highlighted the blocks with the highest gross margins, and provides additional information to decide where management could be modified to improve the long term viability of the business.



Aspired understanding of total gross margin (over crop cycle) variation within block.

"The Pastega's were keen to understand the required time frame for the reduced chemical costs to cover the capital outlay of the sprayer."

Air assist sprayer.

Case Study 6
Neil and Michelle Walpole

Evaluating Variable Rate Fertiliser Application

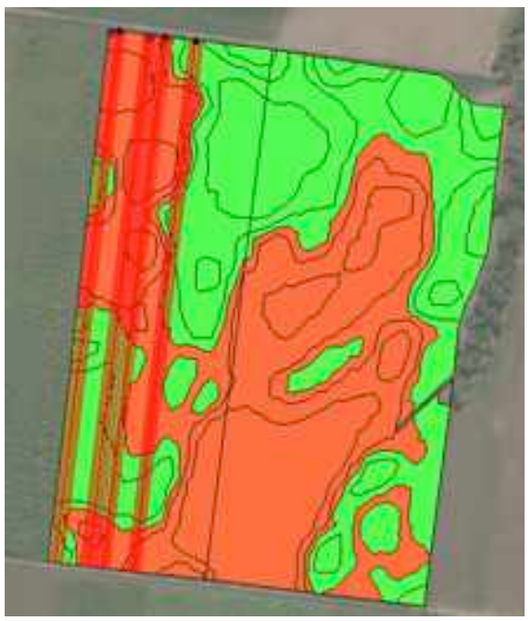
Neil Walpole – happy with the early results of his VR fertiliser trials.

Neil and Michelle Walpole grow sugarcane on 180ha in the Koumala district of the Plane Creek Mill Area. Their farms are located in the lower end of the Rocky Dam Catchment and have a mix of soils from choice black earths and creek loams to sodic duplex country.

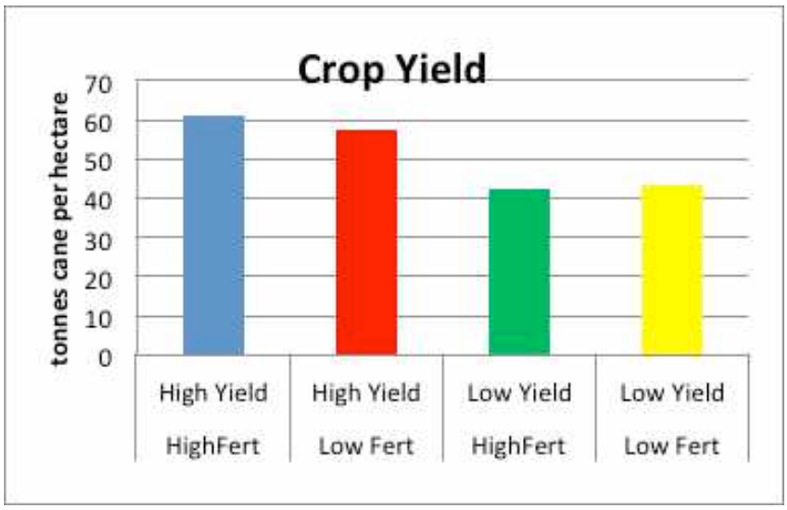
The sodic soils occur on the leased farm, which is has no irrigation. Neil has been utilising variable rate application technology for about 3 years. Initially, Neil applied variable rate lime on his fallow blocks, using EC Mapping and targeted soil sampling to guide the applications. It was a natural progression for Neil to move to variable rate application of fertilisers, initially targeting blocks where high sodium levels severely impacted yield.

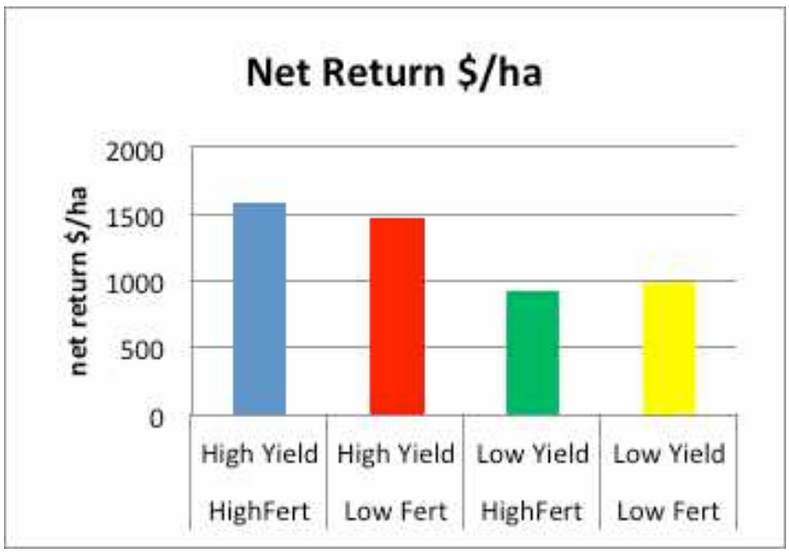
Neil has established a new trial to evaluate the performance and economics of variable rate fertiliser application on fields where the yield variability is more modest. The trial was established in a block of 1st ratoon KQ228. The plant cane yielded 115 t/ha. The block was EC Mapped in the fallow and soil tested by zone. There is limited yield mapping data available for the Plane Creek district – so the treatment map has been based on Neil's knowledge of the yield variability in the field and the EC map and soil testing results. The field was broken up into two zones – a high yielding zone where the soil has a lower clay content and has better drainage and a lower yielding zone where sodium levels are higher and drainage is restricted in wetter seasons.

Treatment applications were simply two fertiliser rates, high (160 kg N/ha) and low (150 kgN/ha), applied in strips along the field traversing the high and low yield zones. This effectively gives four treatments – High fertiliser rate on high yield zone, Low fertiliser rate on low yield zone, low fertiliser rate on high yield zone and low fertiliser rate on low yield zone. The trial was harvested on 5th August 2013, with sections out of each treatment harvested into the Farmacist weigh bin. Yields were calculated from these weights and ccs for each treatment was just assigned from the mean ccs for the field.



Variable Rate Application Map – red areas low yield zone, green areas high yield zone. Red strips show the areas applied with high N treatment.





The results of the 2013 harvest were interesting. The highest yield was achieved in the High Yield High Fertiliser treatment, although it was not statistically significant to the lower fertiliser treatment. There was a distinct difference in yield between the high and low yield zones. Overall, crop yield was disappointing due to the exceptionally dry early summer period experienced.

The trial has been reapplied and we are looking forward to another harvest in 2014.

"Initially, Neil applied variable rate lime on his fallow blocks, using EC Mapping and targeted soil sampling to guide the applications. It was a natural progression for Neil to move to variable rate application of fertilisers, initially targeting blocks where high sodium levels severely impacted yield."

Case Study 7

Chris and Sonya Hesp, Mulgrave

Chris Hesp has a long history of innovative involvement, focused on water use efficiency and quality management.

Split nutrient application through an overhead irrigation system.

Overview

Chris and Sonya Hesp farm 600ha in the Mulgrave area of the Burdekin. This trial is being done with Burdekin grower Chris Hesp with support from Farmacist. Chris is a member of Project Catalsyt and Mulgrave Area Farmers Innovative Action Group (MAFIA), a group of young farmers dedicated to trialing innovative practices on their farms. This trial was supported by Project Catalyst with agronomic advice from Farmacist.

The issues being addressed

- **Tailoring N application to growth demand**
  When we apply nutrients required for a crop in one hit the plant is not able to use everything that is applied, this results in losses that have environmental impacts in our waterways, the Great Barrier Reef and N20 is known to be a potent green house gas. The losses of product also result in loss of income and a reduction in crop productivity.
- **Applying N as crop needs it**
  The trial works to find the best times to apply nutrients, when the crop is looking for nutrition so can use what is provided. This is done through an overhead irrigation system.
- **Reduce Losses / Increase efficiency**
  By getting the timing right and putting on what can be used losses to run-off , deep drainage and de-nitrification should be able to be minimised.

Solution

The trialled solution uses an overhead irrigator to apply multiple applications of nutrients to the crop. The trial seeks to find the ideal time to apply and the most effective nutrient mix.

Lateral overhead system used to apply EasyN© to the crop as part of the split application trial.

What were the results?

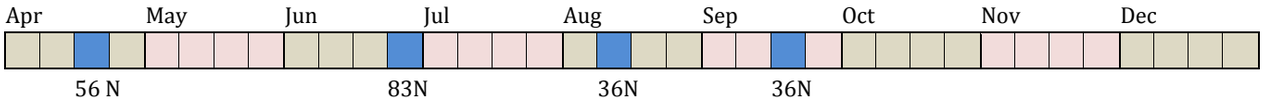
- Chris Hesps trial was compared against all other Q183 plant cane results for the Mulgrave productivity group.
- In 2013, for the Mulgrave group, the average tonnes of cane per hectare cut for Q183 plant cane was 111.4 t/ha
- Using targeted N applications through his overhead irrigation system when the crop needed it the most, Chris attained a yield of 158.9 tonnes of Cane per hectare.
- Using this strategy, Chris achieved an extra 47.5 tonnes per hectare, which is a production increase of 42.6% compared against his productivity group.
- This trial not only shows productivity increases associated with targeted N applications, but it also reduces N losses, improves WQ and is a win/win for both the grower and the environment in which he is a steward.
- Economic analysis showed that even without a production increase the split in trial would provide an economic improvement due to a decrease in fertiliser costs and a small decrease in labour costs.

Application

What was applied?

Application	Date	Product	N	P	K	S
Planting	20/04/2012	DAP	56	62	0	5
TopDress	23/06/2012	Custom Blend	83	0	83	42
Application 3	10/08/2012	Easy N	36	0	0	0
Application 4	20/09/2012	Easy N	36	0	0	0
Total			***211***	***62***	***83***	***47***

When was it applied?



Case Study 8

Ian Haigh, Ayr

Managing Nutrition within field and Across Crop Classes.

Ian Haigh is on 1.8 m super singles under GPS guidance.

Overview

Ian Haigh has 240 hectares of land under sugarcane production at Brandon, near Ayr. Now that Ian Haigh has upgraded to a GPS controlled traffic farming system he can now move towards using different fertiliser rate within farm block. Ian uses a Variable Rate Nutrient Management (Granular) system, based on yield maps, EM Mapping soil maps, elevation, block history and precision planning. He uses variable rate application equipment including a fertiliser box, which has had Reef Rescue funding support.

This trial is being done with support from Farmacist through Project Catalyst.

The issues being addressed

Ian is always interested in looking at new technology that is practicable and affordable. These blocks have distinctive yield zones and supplying the same amount of nutrient to each zone could be a risk both economically and environmentally.

The two questions being answered in this trial are:

1. Is there a difference in yield based on spatial location within a paddock?
2. If there is difference in yield based on spatial location, will different rates of fertiliser have an effect on yield?

Solution

The solution being trialled has two components to answer the two questions.

Q1: Is there a difference in yield based on spatial location within a paddock?

The block has been EM mapped and yield maps have been created using spatial imaging. The findings are shown in the yield table below.

Treatment	Position	Yield (t/ha)
1	Top	102.31 [b]
2	Middle	118.14 [a]
3	Bottom	125.00 [a]

Q2 If there is differences in yield based on spatial location, will different rates of fertiliser have an effect on yield?

Different fertiliser mixes were applied to the zones as per the tables below, with high, medium and low rates on each yield zone. This way we could measure the difference in yield response to the varied rates across the three measured zones.

Treatment	t/ha
Bottom @ 200N	118.13 a
Bottom @ 180N	122.60 a
Bottom @ 160N	138.87 a
Bottom @ 140N	120.40 a

Treatment	t/ha
Top @ 200N	110.37 a
Top @ 180N	100.00 a
Top @ 160N	101.47 a
Top @ 140N	97.40 a

Treatment	t/ha
Middle @ 180N	121.48 a
Middle @ 160 N	110.73 a
Middle @ 140 N	118.86 a

What were the results?

Mapping and soil tests showed that the yield differences were due to changes in soil type within the block. Applying various rates to the three zones showed that there were other factors other than nutrition limiting the cane yield. These results show us that we could have easily reduced N rates in this last ratoon as there is more important yield limiting factors at play here besides nitrogen. Since adopting this technology Ian has been able to expand it to variable rate gypsum.

Treatment	N Rate	t/ha
1	200 kg/ha	115.67 a
2	180 kg/ha	125.20 a
3	160 kg/ha	118.90 a
4	140 kg/ha	114.25 a

Ian's fertiliser application machinery.

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