Burdekin Grower Research Update

Marian Davis - Burdekin harvester trials
Ryan Turner - Water quality results from the Burdekin region
Rob Magarey - Pest and disease updates and risks
Julian Connellan - Burdekin nitrogen trial results
George Piperidis - Plant breeding update and research
Barry Salter - Burdekin farming systems research
Andrew Ward - Wrap up and YCS update
Burdekin Productivity Services

Harvesting Project Update
Background

- 3 year project funded by SRA to examine the effect of harvester speed on subsequent ratooning and yield; also seeing if soil type or variety have any impact

- Shed meetings in 2013 identified harvester damage as a major constraint to productivity
6 sites
• BRIA – 2 x Q208, 2 x Q183
• Delta – 1 x Q208, 1 x Q183

At each site
• 3 harvester speeds; 5–11 km/hr
• Replicated 3 times
Measurements

- Year 1 (2014 harvest, plant)
  - At harvest
    - Stool and gap counts on 4 x 10m sections per plot
    - Mill yield and CCS results per plot
    - Data for economic analysis
  - After harvest
    - Shoot, stool and gap counts at 1, 3 and 6/7 months after harvest

- Years 2 and 3
  - Mill yield and CCS
  - Data for economic analysis
  - Shoot, stool and gap counts at 1, 3 and 6/7 months post harvest
Results

- SRA biometricians have analysed the data.
- In this first year harvester speed has had no impact on yield, or shoot, stool and gap counts after harvest.
- Not surprising as fairly conservative speeds were used.

Lots of variation between sites, but not treatments.
## Shoot counts

<table>
<thead>
<tr>
<th>Site</th>
<th>BRIA Q208</th>
<th>BRIA Q183</th>
<th>Delta Q183</th>
<th>BRIA Q208</th>
<th>Delta Q208</th>
<th>BRIA Q208</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoots per 10m</td>
<td>1 month</td>
<td>3 month</td>
<td>6 month</td>
<td>1 month</td>
<td>3 month</td>
<td>6 month</td>
</tr>
<tr>
<td>Site 1</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>
Harvesting costs decrease with speed

Very long rows, 900m, harvesting one way

Very short rows, 230m, harvesting one way

Harvesting Costs ($/ha)

<table>
<thead>
<tr>
<th>Site</th>
<th>Species</th>
<th>$/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BRIA Q208</td>
<td>500</td>
</tr>
<tr>
<td>2</td>
<td>BRIA Q183</td>
<td>400</td>
</tr>
<tr>
<td>3</td>
<td>Delta Q183</td>
<td>300</td>
</tr>
<tr>
<td>4</td>
<td>BRIA Q183</td>
<td>250</td>
</tr>
<tr>
<td>5</td>
<td>Delta Q208</td>
<td>200</td>
</tr>
<tr>
<td>6</td>
<td>BRIA Q208</td>
<td>150</td>
</tr>
</tbody>
</table>

Note: Site 1 and Site 2 for BRIA Q208 and BRIA Q183 are very long rows, Site 3 for Delta Q183 is very short rows, and Site 4 and Site 5 for BRIA Q183 and Delta Q208 are medium-long rows.
Thank-you to the growers and harvesting crews who are involved

Questions?
Water quality results from the Burdekin Basin

Great Barrier Reef Catchment Loads Monitoring Program (GBRCLMP)
World Heritage Area:

- 2300 km long
  - Up to 250 km wide
  - 3000 reefs
  - 900 islands
- Outstanding universal values

http://www.smh.com.au
Long Term Goal

To ensure that by 2020 the quality of water entering the reef from broadscale land use has no detrimental impact on the health and resilience of the Great Barrier Reef.
Reef Plan - Targets

**Water quality targets (2018)**
- At least a **50 per cent reduction** in anthropogenic end-of-catchment dissolved inorganic nitrogen loads in priority areas.
- At least a **20 per cent reduction** in anthropogenic end-of-catchment loads of sediment and particulate nutrients in priority areas.
- At least a **60 per cent reduction** in end-of-catchment pesticide loads in priority areas.

**Land and catchment management targets (2018)**
- 90 per cent of sugarcane, horticulture, cropping and grazing lands are managed using best management practice systems (soil, nutrient and pesticides) in priority areas.
- Minimum **70 per cent late dry season groundcover** on grazing lands.
- The extent of riparian vegetation is increased.
- There is no net loss of the extent, and an improvement in the ecological processes and environmental values, of natural wetlands.
• Objective – To measure progress towards the Reef Plan goals and targets
• A partnership involving over 20 organisations
• Spatial coverage - Over 800,000 km²
• The integration of monitoring and modelling from the paddock to reef scales
• Strong policy–science interaction
• Primary output – Great Barrier Reef Report Card.
The Integrated Paddock to Reef Monitoring, Modelling and Reporting Program
Monitor and report on water quality constituents and annual loads of nutrients, sediments and pesticides exiting 14 “priority” Great Barrier Reef catchments as part of Reef Plan 2013.

Provide high quality data to validate source catchment models that will be used to assess progress towards the Reef Plan water quality targets.
25 monitoring sites for TSS and nutrients
- 14 catchments
- 11 sub-catchments

15 monitoring sites for pesticides for
- 14 catchments
- 1 sub-catchment
Monitoring
• Diffuse rural contaminants
• Event conditions
• Ambient conditions

Samples collected by
• Automated samplers
• Grab sampling
• In-situ turbidity
• Passive samplers
Example water quality monitoring - Tully

<table>
<thead>
<tr>
<th>Catchment</th>
<th>Site</th>
<th>Events</th>
<th>Grab Samples</th>
<th>Auto Samples</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tully</td>
<td>Tully R @ Euramo</td>
<td>9</td>
<td>81</td>
<td>129</td>
<td>210</td>
</tr>
</tbody>
</table>
A simplified load calculation

Water Quality
Sediments, Nutrients, Pesticides

×

River Flow
Dissolved Inorganic Nitrogen load (t)
Managing water quality in Australia

National Water Quality Management Strategy (NWQMS)

1. Australian and New Zealand Water Quality Guidelines (WQGs)

2. State WQGs e.g. Queensland

3. Regional WQGs e.g. Great Barrier Reef
What are trigger values?

Trigger values are the quantitative limits (concentrations) below which there is a low risk of environmental harm occurring and above which there is a moderate to high risk of environmental risk occurring.
What are trigger values (TV)?

Risk of harm occurring

- Low risk
- Moderate to high risk

Action required

- None
- Site-specific investigation or management action

Trigger Values
Why do we have multiple TVs?

Water has many potential uses e.g.
- ecosystem protection;
- drinking water;
- recreation;
- aquaculture;
- irrigation; and
- livestock.

• For each use there are TVs
• TVs for potential uses differ due to variations in organism sensitivities
## Diuron TVs

<table>
<thead>
<tr>
<th>Source</th>
<th>Concentration (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking water</td>
<td>20</td>
</tr>
<tr>
<td>Irrigation water</td>
<td>2</td>
</tr>
<tr>
<td>Ecosystem protection</td>
<td>0.2</td>
</tr>
</tbody>
</table>

### Why do levels differ?
- Humans do not photosynthesize – so toxicity is low
- Generally, crops are larger than aquatic plants (algae) and herbicides may bind to the soil.
- Diuron is a herbicide that blocks photosynthesis.
Consequences of exceedances

• Three rules of thumb
  – the greater the exceedance the more severe the biological effects
  – the longer the duration of consecutive exceedances the more severe the biological effects
  – the more pulses (repeated exposures) the more severe the biological effects
Diuron concentrations over time - Burdekin

**Burdekin River diuron results µgL⁻¹**

- Ecosystem TV
- Irrigation TV
- Detection Limit
- Diuron µg/L
Diuron concentrations over time – Haughton River

Haughton River diuron results ugL\(^{-1}\)

- Ecosystem TV
- Irrigation TV
- Detection Limit
- Diuron ug/L

Graph showing concentration over time from December 2013 to May 2014.
Barratta Creek diuron results ugL$^{-1}$

Suspension 28 Nov 2011

Permit per13874
Allowed phase out

- Ecosystem TV
- Irrigation TV
- Detection Limit
- Diuron ug/L
Atrazine concentrations in Barratta Creek 2013 - 2014

![Graph showing atrazine concentrations and flow over time from 2013 to 2014. The graph includes a line indicating the atrazine trigger value.](image-url)
Diuron concentrations in Barratta Creek 2013 - 2014

![Graph showing diuron concentrations over time.](image)
Atrazine concentrations in Barratta Creek 2014 - 2015
Diuron concentrations in Barratta Creek 2014 - 2015
Diuron concentrations in Barratta Creek August 2014 to January 2015

![Graph showing diuron concentration and flow over time.]
The focus is still on five photosystem inhibitors (PSII):

- Ametryn
- Atrazine and two metabolites - desethyl atrazine + desisopropyl atrazine
- Diuron
- Hexazinone
- Tebuthiuron
Imidacloprid TVs

Proposed ANZECC ARMCANZ 2014 0.1 µg/L (Smith et al)
US EPA Banned
Netherlands Environmental Risk Limits 0.067 µg/L
Canadian water quality guidelines 0.23 µg/L
**Imidacloprid concentration (n334) for the Tully River (ug L⁻¹)**

Mann-Kendall trend test / Two-tailed test (Imidacloprid):

- **Kendall’s tau**: 0.080
- **S**: 4298.000
- **Var(S)**: 422670.667
- **p-value (Two-tailed)**: 0.034
- **alpha**: 0.05

**Graph Details**:
- **x-axis**: Months from Jul/2009 to Dec/2014
- **y-axis**: Imidacloprid concentration (ug L⁻¹)
- **Legend**:
  - Blue diamonds: Imidacloprid
  - Red line: Canadian water quality guidelines
  - Green line: Netherlands Environmental Risk Limits
Maximum Imidaclopid concentration (ug L⁻¹)

- Johnstone
- Tully River
- Herbert River
- Barratta Creek
- Pioneer River
- Sandy Creek
Imidacloprid concentrations in Barratta Creek 2013 - 2014
Imidacloprid concentrations in Barratta Creek 2014 - 2015
To support and inform on-farm innovation for improved management we should consider:

- The wet season’s rainfall (a wet or dry year) will effect in-stream concentration i.e. toxicity
- Regions and catchments are different in their risk
  - Pesticide management should be region specific
- Application of PSII herbicides and timing with rainfall/irrigation are important
  - Can application windows of PSII herbicides be improved?
- Highest concentrations (most toxic) occur early in the wet season
  - How can pesticide management strategies retain pesticides on the paddock to allow degradation?
- Irrigation is likely to cause high concentration runoff during low-flow periods causing high PSII herbicide concentrations in waterways.
  - What adjustments to irrigation management will allow the retention of pesticides on the paddock?
- The greatest risks have been found in small coastal catchments e.g. Pioneer River, Barratta and Sandy creeks.
  - How can tailor pesticide management to best suit these regions?
- Diuron accounts for most of the toxicity
  - How can pesticide management minimize the loss of diuron?
Thank you

This work was funded by the Queensland Government
Further information: www.reefplan.qld.gov.au
Slides beyond here are for information only