Overview

• Background - agricultural sustainability, bananas & Australia
• Working on the farming system
• The challenges & advances – Australian case studies
• Conclusions
• Acknowledgements
Background - agricultural sustainability, bananas & Australia

- Bio-physical resources – soil, water, climate
- Sustainable banana production
- Economic resources – product sale, consumption
- Social resources – farmers, communities
Background - agricultural sustainability, bananas & Australia

Bio-physical resources – soil, water, climate

Sustainable banana production

Economic resources – product sale, consumption

Social resources – farmers, communities
Wet tropics region: 15-18°S

Cairns

Innisfail

Tully
Production systems

- Each planting has an average life of 7 years
- Continuous ratooning system
- Plantations managed for vehicle access – highly mechanised
- Highly managed inputs for crop nutrition, irrigation, pest & disease management & crop husbandry
Wet tropics region – World Heritage Areas

Great Barrier Reef

Wet Tropics Rainforests
Wet tropics region - cyclones

Tropical Cyclones
1980 to 2006
Methodology – farming system approach

- Inputs
- Sub-systems
  - soil
  - crop physiology
  - pest
  - disease

- Processes

- Outputs
Methodology – farming system approach

Common attributes of systems methodologies

• Clear definition of the problem

• Detailed analysis to understand relationships & interactions linking biophysical & socio-economic factors involved in crop production

• Integrating & multi-disciplinary – ensure key players communicate across professional lines
Why use a farming systems approach?

The nature of the problems is complex
Why use a farming systems approach?

End users are involved in finding solutions
Why use a farming systems approach?

Project teams focus beyond disciplines and professions
Why use a farming systems approach?

- **Bio-physical resources** – soil, water, climate
- **Economic resources** – product sale, consumption
- **Social resources** – farmers, communities

Sustainable banana production
Challenges & advances – nitrogen management
Objectives of the Reef Water Quality Protection Plan are:

• Reduce the load of pollutants from diffuse sources in water entering the reef

• Rehabilitate and conserve areas of the Reef catchment that have a role in removing water borne pollutants
Improving nitrogen management
## Risks with excessive N rates

<table>
<thead>
<tr>
<th>Fertiliser N (kg/ha)</th>
<th>Leached N (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50 (± 40)</td>
</tr>
<tr>
<td>400</td>
<td>240 (± 40)</td>
</tr>
<tr>
<td>600</td>
<td>730 (± 160)</td>
</tr>
</tbody>
</table>

The more nitrogen applied = more lost by leaching
Nutrients move with water

The challenge is to keep
- nitrogen and
- sediment (includes P)
in the paddock.

Prevention is better than cure
Optimising returns from fertiliser

Increasing Nitrate N (kg/ha)

Yield

Environmental concerns

Production concerns

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Improving nitrogen management

Ratoon crop
Yield optimised at 250-300 kg per ha

Ratoon crop
Yields = 3800 – 4400 cartons/ha

Rate of applied N (kg/ha)

Bunch weight (kg)
Improving nitrogen management

Set out to implement the information from nutrition research trial in a commercial setting
Improving nitrogen management

Demonstration trial on 5 hectare planting
Improving nitrogen management

Strategies to implement improved N nutrition

- Setting N targets
- Increase crop uptake
- Match applications to plant growth
- Monitor soil and leaf nutrient levels
- Apply N little and often

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## Improving nitrogen management

### Monitoring crop performance

<table>
<thead>
<tr>
<th>Crop</th>
<th>Ctns/bunch</th>
<th>Ctns/acre</th>
<th>Tonnes/ha</th>
<th>%XL</th>
<th>%L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant</td>
<td>1.4</td>
<td>980</td>
<td>33.8</td>
<td>77</td>
<td>23</td>
</tr>
<tr>
<td>Ratoon 1</td>
<td>2.1</td>
<td>1470</td>
<td>50.7</td>
<td>89</td>
<td>11</td>
</tr>
</tbody>
</table>
Improving nitrogen management

Dissemination and adoption
Improving nitrogen management

Nitrogen application rates reduced **by 45%**
- 525 kg/ha in 1995
- to 291 kg/ha in 2012

Measured nitrogen leaching losses reduced:
- 50 - 109 kg/ha 1992-96
- to <10 kg/ha 2010-12
Challenges and advances – managing tropical cyclone impacts
The synchronisation of cropping

Weekly production figures for north Queensland

- Cartons
- Week of the Year

TC Larry

2006/07

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# Staggered return to cropping

## Cropping Calendar

<table>
<thead>
<tr>
<th>Crop Schedule</th>
<th>Options</th>
<th>Intended Harvest Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late Summer - Autumn crop cycle</td>
<td>Mid May 2011 Nurse-sucker</td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td>Early June 2011 Plant Tissue/Potted Suckers</td>
<td></td>
</tr>
<tr>
<td>Late Autumn-Winter crop cycle</td>
<td>Late Aug-early Sept 2011 Nurse-sucker</td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td>Sept - Early October 2011 Plant bits/tissue</td>
<td></td>
</tr>
</tbody>
</table>
The “nurse-sucker” technique to schedule production

- Nurse 1.5m to the throat.
- A flush of suckers develop from the nurse.
- Nurse cut down and growing point gouged out.
- One sucker selected for the next crop.
Demonstration plots – farmer field days
Monitoring commercial farms
Comparing cyclone cycle to staggered crop

Comparing harvest from staggered crop strategy & cyclone cycle

- Target distribution
- Staggered crop
- Cyclone cycle

Week of Year

Percentage of population

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Comparing the effect from TC Larry & Yasi
Conclusion

- Sustainability challenges remain – many faceted and changing
- Farming systems approaches have been successful
  - Problem or issue is clearly defined
  - Participatory approach with farmers
  - The production system is analysed and benchmarked – components and interactions
  - Focused research and extension activities – focus on solution not discipline/profession
  - Process is iterative with on-going refinement and improvement
The “do with” approach offers greater success
Acknowledgements

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- Banana growers
- Project team members
Thank you