

**“Quantifying the impacts of rehabilitating degraded lands on soil health, pastures, runoff, erosion, nutrient and sediment movement”**

Trevor Hall

**RR Forums 2013**



CARING FOR  
OUR COUNTRY



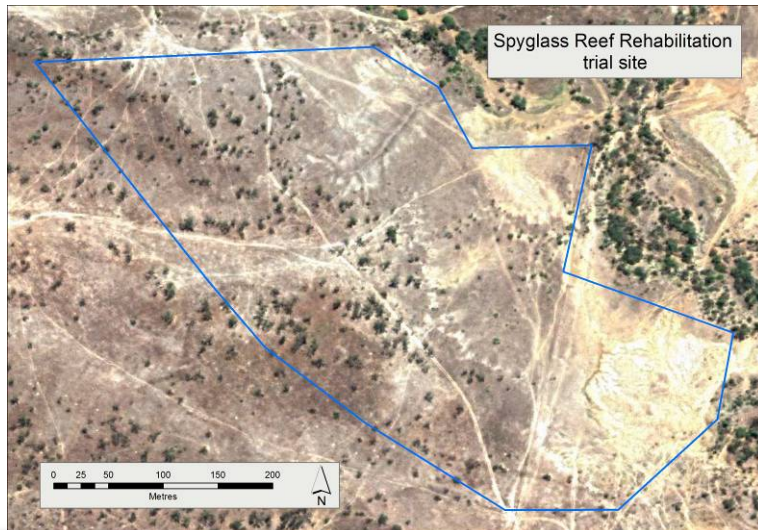
# METHODOLOGY

1 Field rehabilitation trials – 3 sites Burdekin & Fitzroy

2 Landholder surveys

3 Literature review

Burdekin site

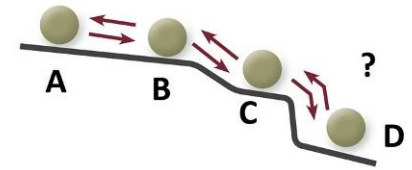


Fitzroy – Injune & Banana sites



# RELEVANCE OF WORK 1

1. How to rehabilitate bare D-condition grazing lands – *mechanical disturbance*
2. Barriers to rehabilitation
3. Social and economic drivers
4. Ground cover and surface conditions for rehabilitation
5. Time lag between mechanical rehab. and permanent cover



Chisel ploughed scald



Unresponsive ripped dermosol

## RELEVANCE OF WORK 2

6. Incentives
7. Quantify sediment and nutrient losses from rehab. methods
8. Landholder rehabilitation approaches and successes - survey
9. Costs and benefits of rehab.
10. Literature review on rehab. of grazing lands.

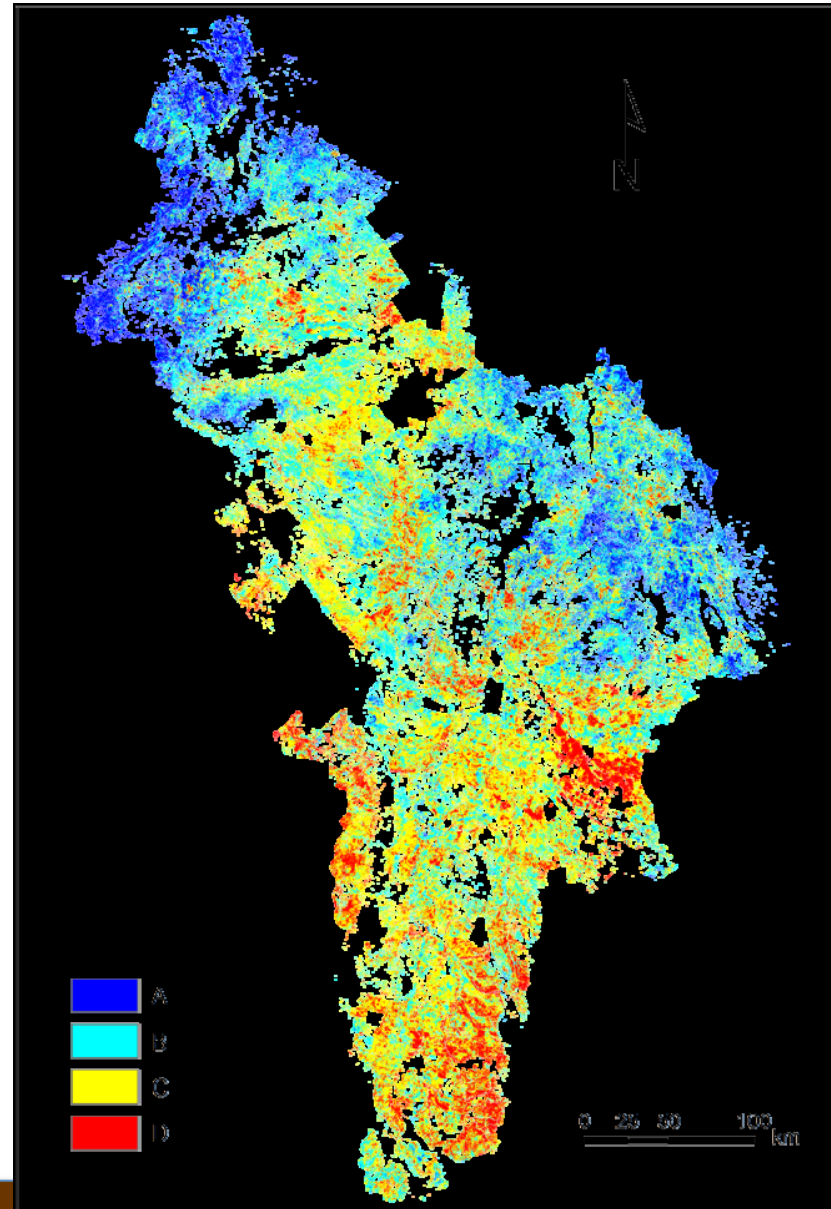
Ripping – end first summer (Apr. 2012)



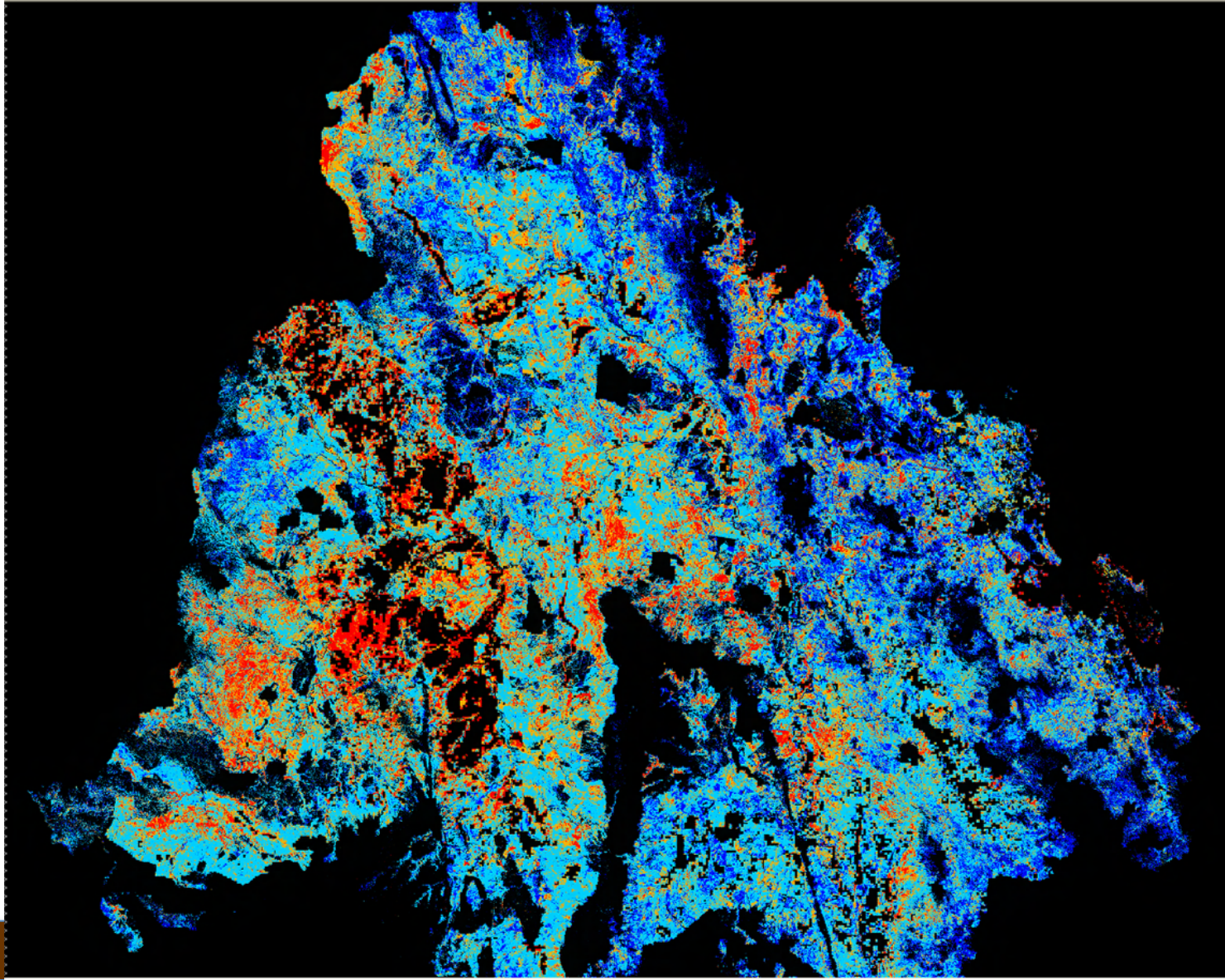
Chisel plough legumes in first winter (Aug. 2012)



# ABCD LAND CONDITION IN BURDEKIN



# ABCD LAND CONDITION IN FITZROY



# RESULTS

- Mechanical methods of rehab \* soil types
- Pasture establishment, composition, production, cover
- Rainfall simulation of sediment & nutrient losses
- Landholder survey of rehab methods & management
- Costs of mechanical methods
- Literature review



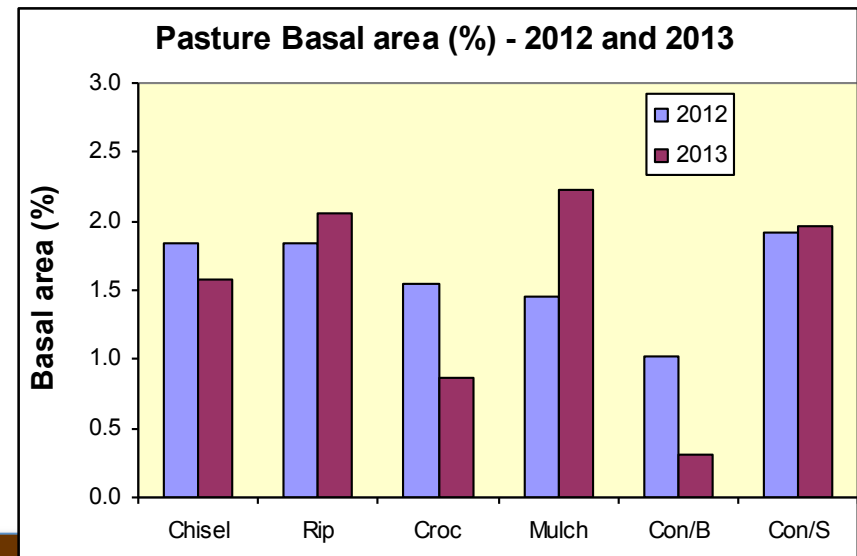
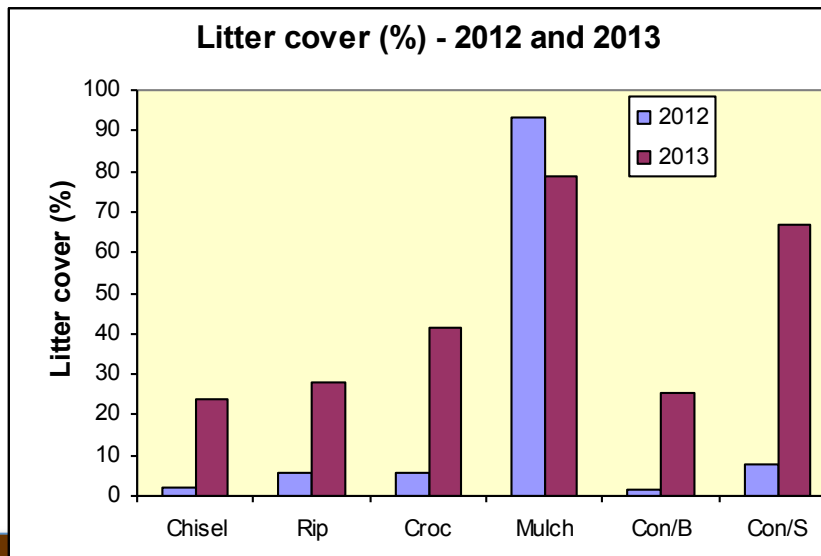
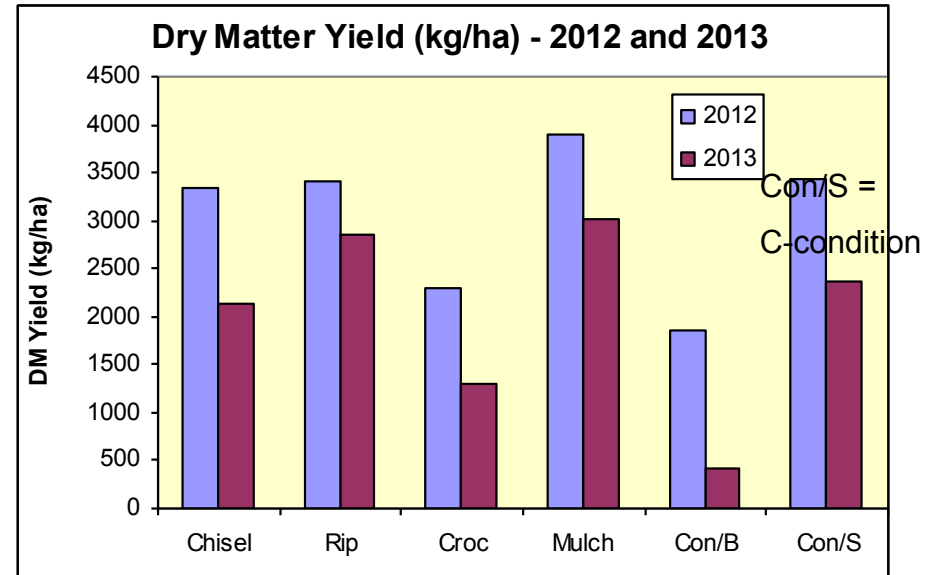
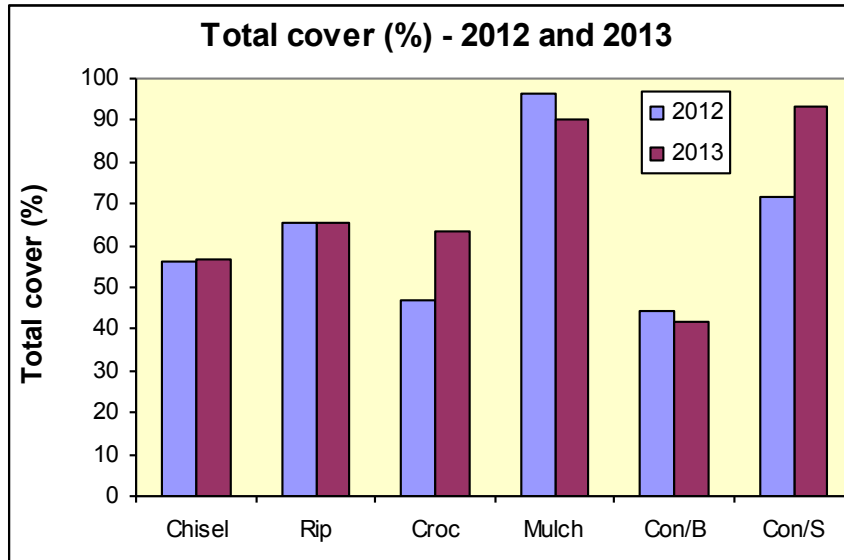
Fitzroy blade ploughed



Burdekin ripping - Spyglass

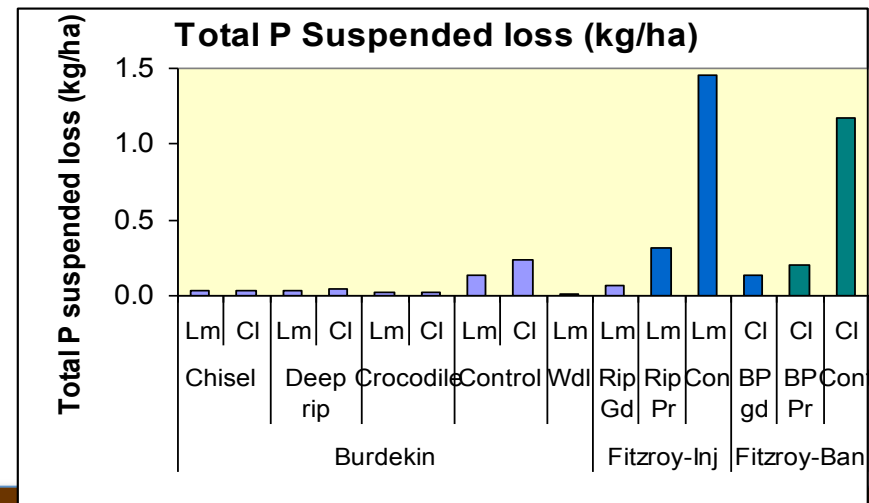
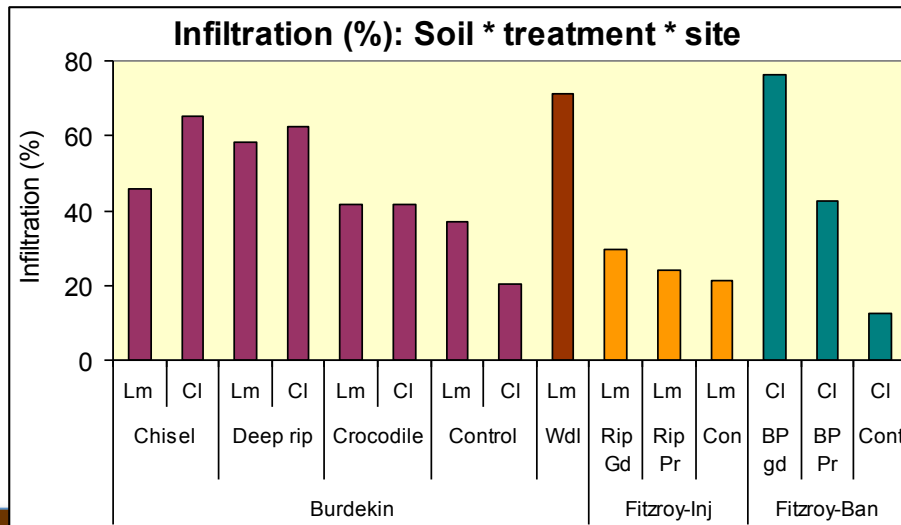
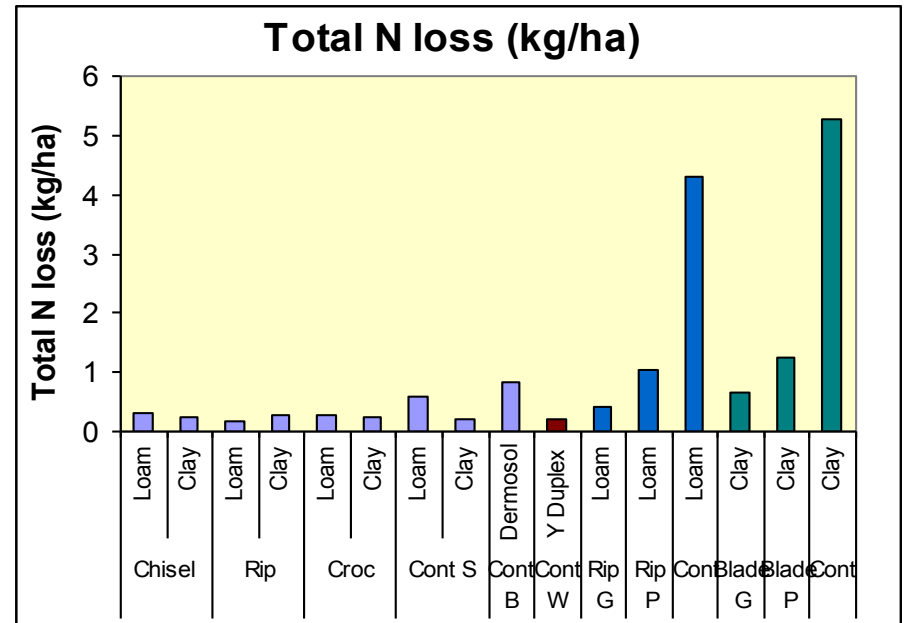
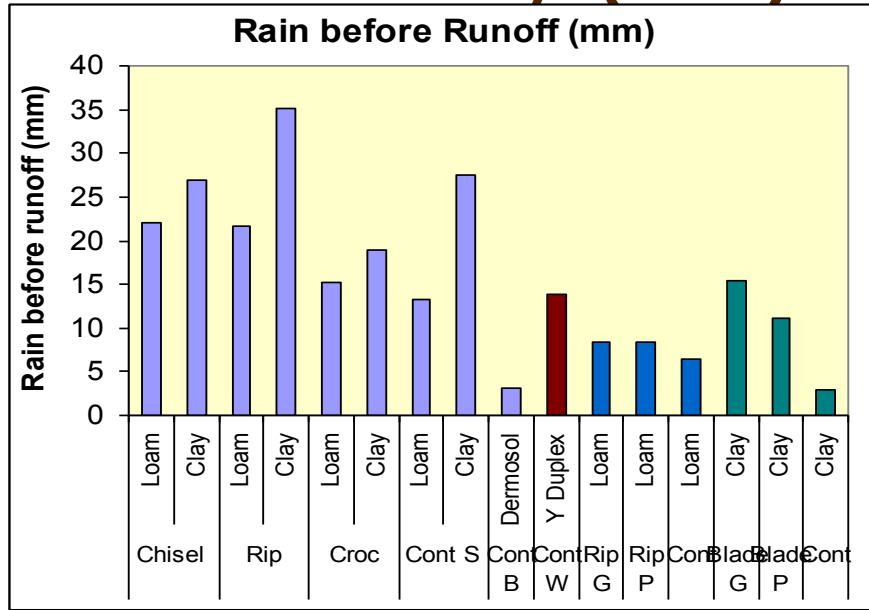


# PASTURE RESULTS - Burdekin 'Spyglass' 2012-13





# Runoff, infiltration & nutrient loss RESULTS – Burdekin & Fitzroy (2012)



# Economics – private Vs public benefits

- Land Reclamation Economics Tool (T. Moravek/DAFF economics team)
- Assumptions: D-condition patch will not expand if untreated, Public benefits, such as reduced sediment or nutrient losses and biodiversity improvement, are not included.
- Rehabilitation was a only positive if larger areas, beyond the scalds, were renovated and seeded at the same time.
- E.g. Burdekin – economic for landowner only if significant amount of a larger paddock is restored (e.g. 2000 ha of 2500 ha) – soil type dependent.
- Some methods, sites, soils never economic.



# Economics – Fitzroy site on brigalow country

- 35ha degraded paddock in 2003
- In October 2003 - fenced, ripped and seeded
  - (burgundy bean, butterfly pea, siratro, Bisset creeping bluegrass, silk sorghum)
- Grazing excluded for 2 years
- Rehabilitated to 'C-' condition by September 2007
- To 'B-' condition 2009 (further improvement 2012 to 'B+')
- NPV = **\$14,046** discounted at 6% over 20 years
- Seasonal conditions very dry establishment period

IF good rainfall years at start:

Rehabilitation in above av. rainfall yrs est. 3 years;

- NPV (with sensitivity) = **\$16,782** discounted at 6% over 20 years

# RESULTS Rehab. summary

## Conclusions

1. Select better soil types (e.g. vertosols)
2. Rehab. mechanical methods (high disturbance level)
3. Use well adapted sown pastures (high seed rates)
4. Control grazing & resting periods (for years)
5. Rehab. in above av. rainfall years (SOI)
6. Start rehab. before lose all topsoil.

vertosol



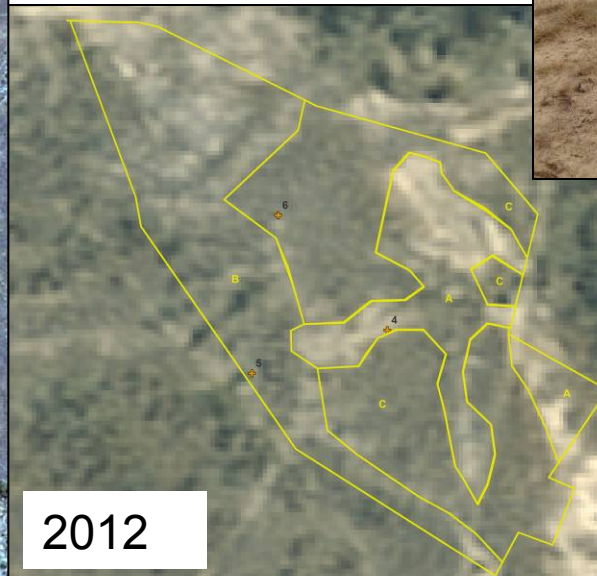
dermosol



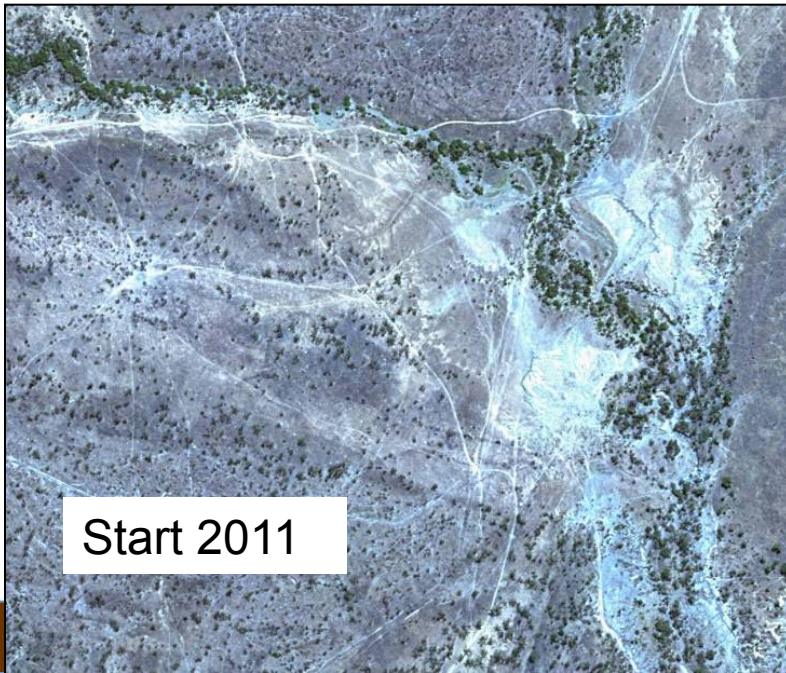
3 soil types



2012



Start 2011



2003



2007



2011



Not Rehabilitated 2012

2008

Fitzroy Blade ploughing - Site 2



2012 – (blade ploughed and seeded 2009)



# APPLICATION OF WORK

- Suitable methods (high disturbance) of mechanical rehabilitation  
– *for some soils only*
- Recommendations on adapted sown pasture species
- Grazing / resting management after rehabilitation – *years!*
- Quantified sediment and nutrient losses from mechanical rehab methods.
- Understand barriers and drivers of rehab.
- Costs and benefits of rehab. of D-condition bare areas  
*(Land Reclamation Economics Tool)*
- Landholder perceptions of rehabilitation of bare areas
- Incentives *(on one-size)* required to encourage and assist landholder rehab.
- Literature review of rehab. of bare D-condition grazing lands

## **FUTURE DIRECTIONS**

- **Research economic methods, management and seasonal conditions to rehabilitate different soil types.**
- **Continue to monitor Spyglass rehabilitation treatments over varying seasonal conditions; Periodic measurements of Fitzroy sites.**
- **Survey methods, management and conditions of successful landholder rehabilitation works on multiple landtypes in Burdekin and Fitzroy.**
- **Conduct field measurements on landholder rehabilitation**
- **Review catchment organisation funded rehabilitation works on properties: site inspections, methods, management, measurements, conditions, landtypes & soil types**
- **Identify and map soil types requiring rehabilitation – Identify problem soils.**



## **MW queries**

- Can this work be reasonably related to MW grazing systems?
- What are the WQ impacts?
- Economic outcomes of mechanical intervention - would the outcomes be similar in MW?

# THANK YOU

- Spyglass and co-operating Fitzroy properties for access to sites
- Richard Silcock for literature review
- Brett Abbott (CSIRO) and Terry Beutel (DAFFQ) for satellite imagery
- DAFFQ economics team; field staff and management
- DNRM rainfall simulation team
- Jane Waterhouse for assistance with project administration
- Reef Rescue / Caring for our Country and DAFFQ for financial support.



Scald 2011



Rip 2012



Chisel 2012

