The effect of whole crop processing on sugar recovery and sugar quality

Geoff Kent, David Moller,
Phil Scroope and Ross Broadfoot

Background

- Cogeneration plants were installed at both Condong and Broadwater
- Year round operation for best capital utilisation
- Trash planned as an additional fuel





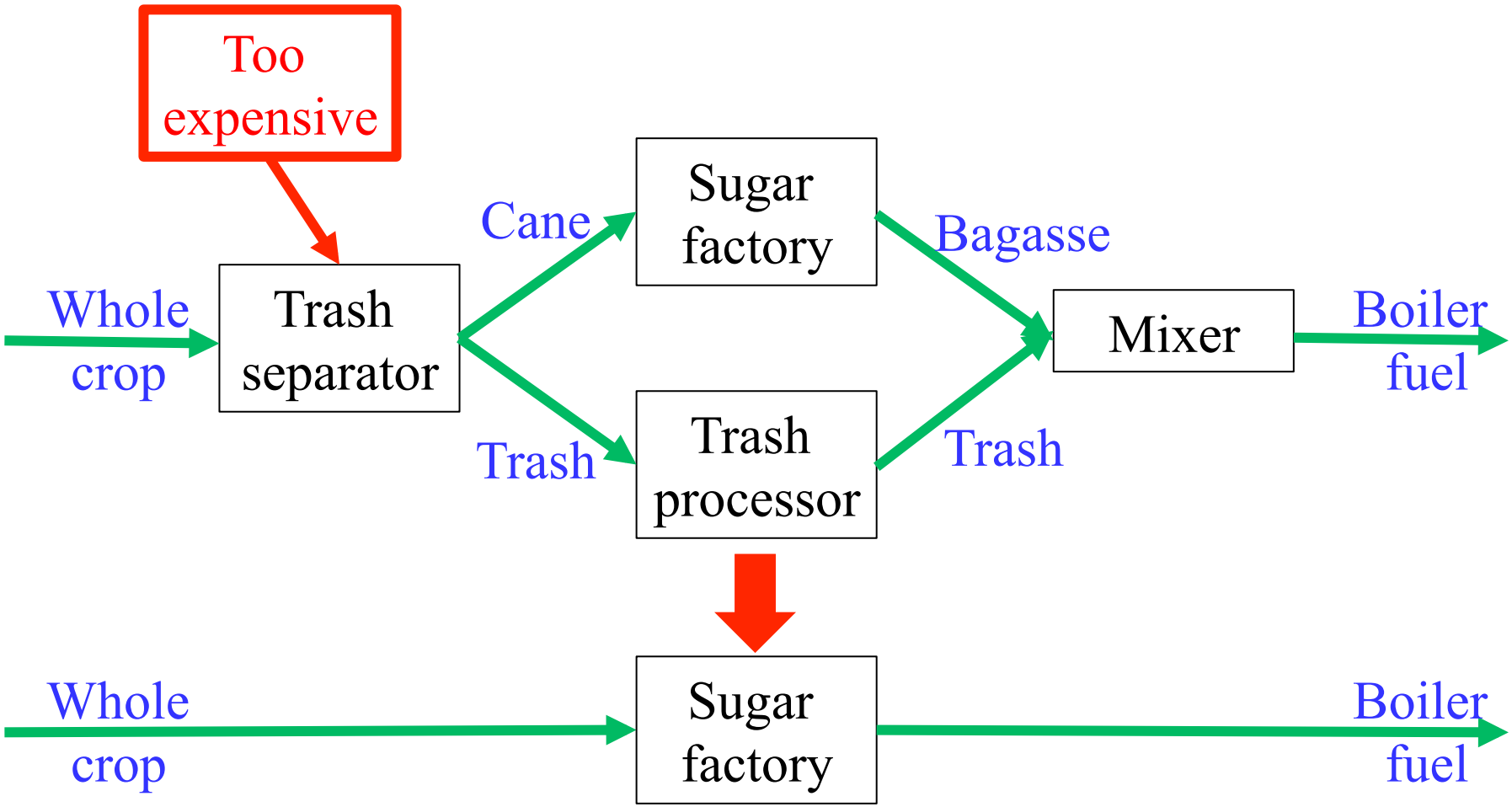
Whole crop harvesting and transport

- Trash harvested and transported with the cane





Whole crop processing options



Whole crop milling

- NSW Sugar committed to a significant effort to investigate whole crop milling in 2009 and 2010
- QUT successful in attracting an SRDC grant to provide assistance



Australian Government

Sugar Research and Development Corporation

QUT

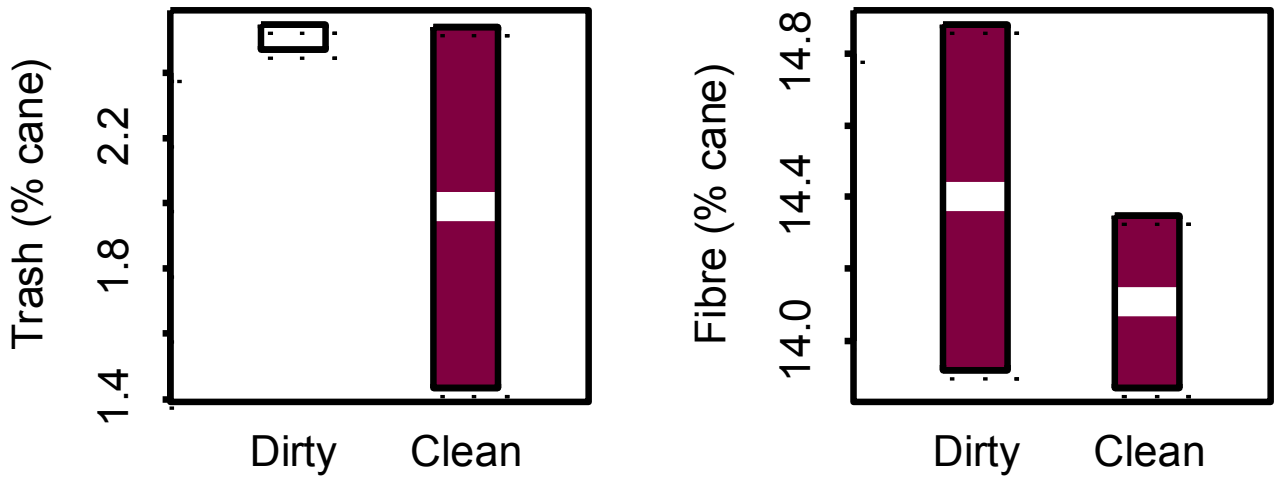
Sunshine Sugar

Measuring the effect of trash on the factory

- Requires control of harvest
  - Difficult to achieve for extended time
  - Most previous efforts had test times of 1 to 12 hours
    - Can only measure effects through to mixed juice
    - In several cases, mixed juice samples were processed further in pilot scale equipment to simulate factory effects

Measuring sugar production effects in the factory

- Mossman 1999
  - Two tests each of *dirty* and *clean* cane across district
  - Each test 6 days duration
  - Minimal difference in trash content
  - Highlighted difficulty in controlling whole harvest



Measuring sugar production effects in the factory

- Manuelita, Colombia reported 2009
  - One test each of manually harvested and mechanically harvested cane
  - 11 unit difference in extraneous matter
    - 1 unit difference in fibre content
  - Tests of about 2 days duration
  - Able to measure effects in liquor
    - but not sugar

Measuring sugar production effects in the factory

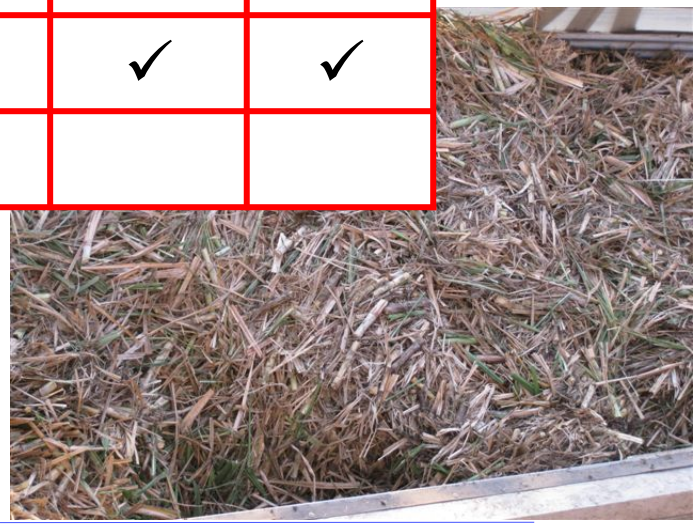
- Broadwater and Condong 2009
  - Seven tests at each factory
  - 3 days duration
    - To measure sugar production effects
- Condong 2010
  - Four tests
  - 14 days duration



Cane supply types

Description	BWR 2009	CDG 2009	CDG 2010
Burnt, trash extracted	✓	✓	✓
Burnt, trash not extracted	✓		
Green, trash extracted		✓	
Green, half trash extracted		✓	✓
Green, trash not extracted	✓		



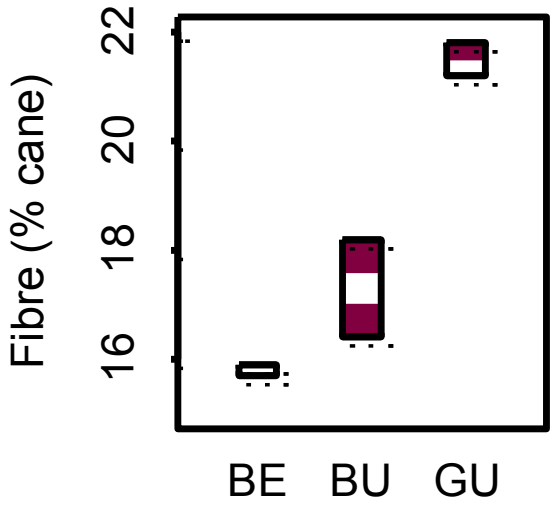


QUT

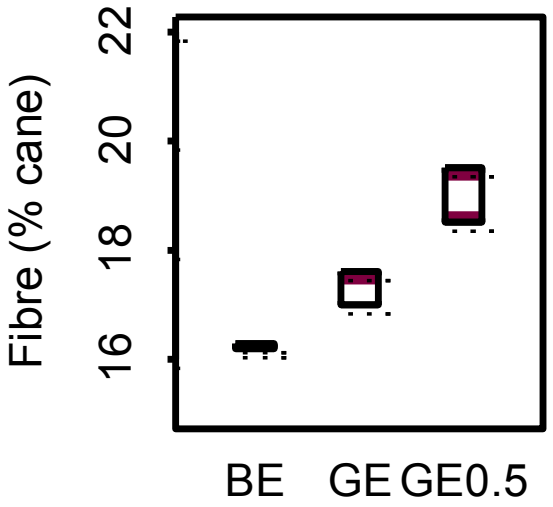
Sunshine Sugar

Trash levels achieved

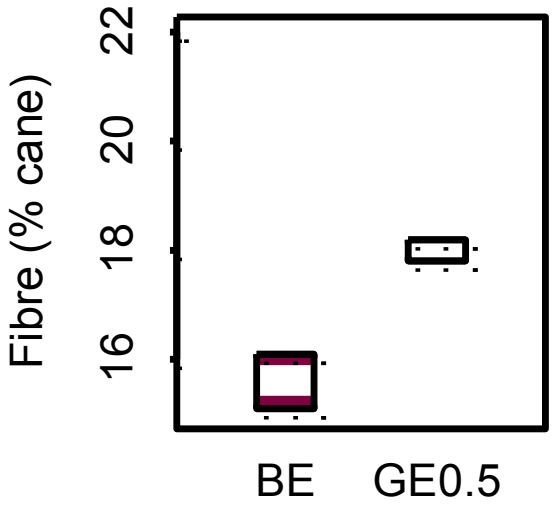
- Good separation between cane types



Broadwater 2009



Condong 2009



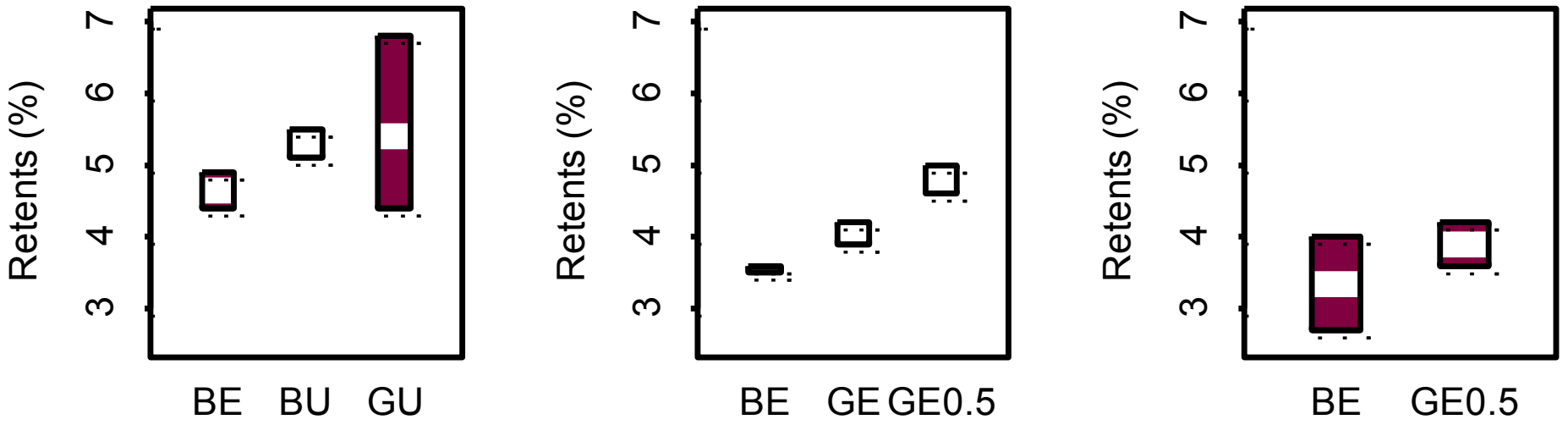
Condong 2010

Examination of sugar recovery

- Calculated recovery from losses
  - Bagasse
  - Mud
  - Molasses

Pol loss in bagasse

- Pol loss increases with trash

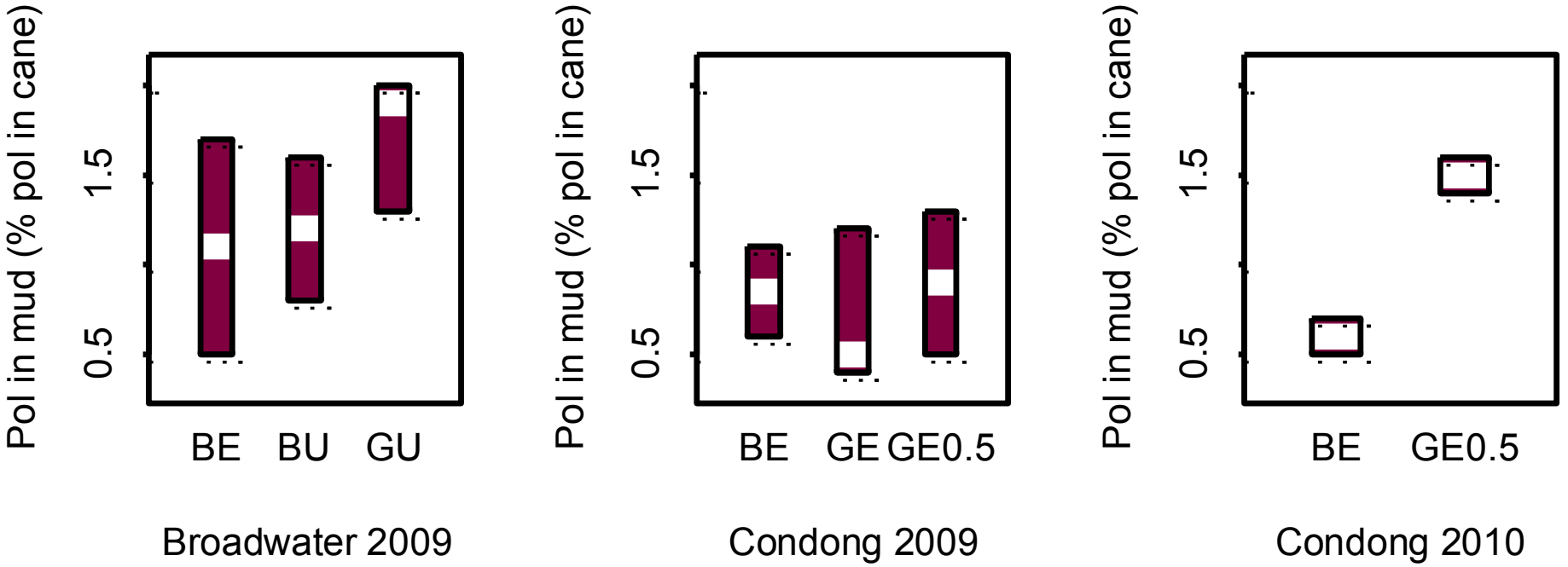


Pol loss in bagasse

- Pol to fibre ratio in cane reduces
  - More pol escapes with fibre at same bagasse pol content
- Added water % fibre reduced
  - Could compensate with extra added water
- Cane preparation reduced (maybe)
  - Could compensate with extra shredder power

Pol loss in mud

- Pol loss increases with trash (maybe)

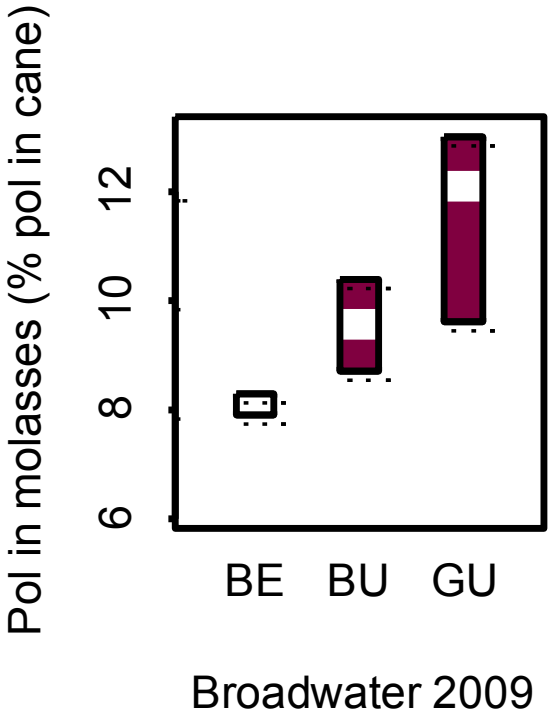


Pol loss in mud

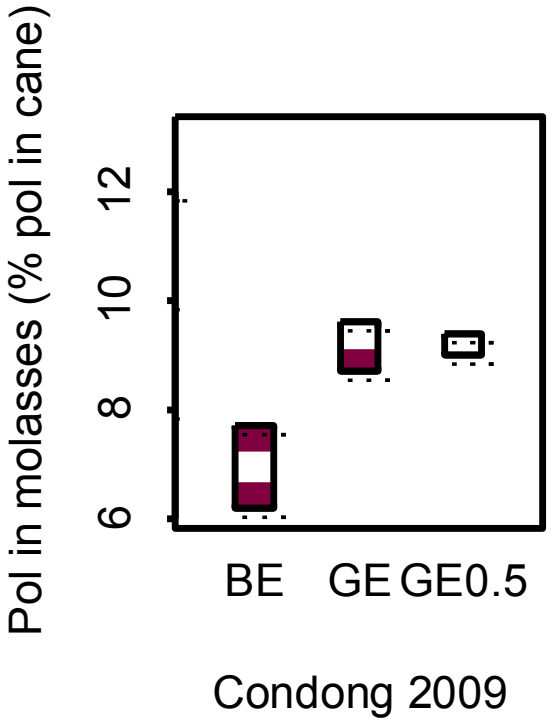
- Mud solids increase
  - Extra mud collected with trash
- Wash water % mud solids reduced
  - Could compensate with extra wash water

Pol loss in molasses

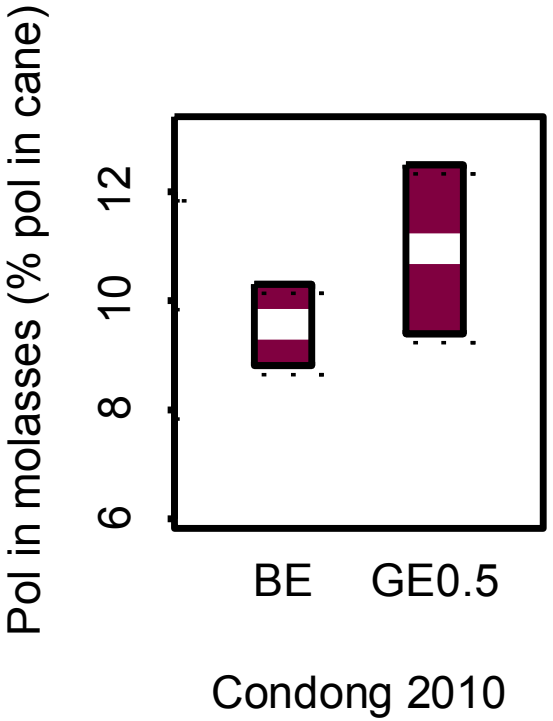
- Pol loss increases with trash



Broadwater 2009



Condong 2009

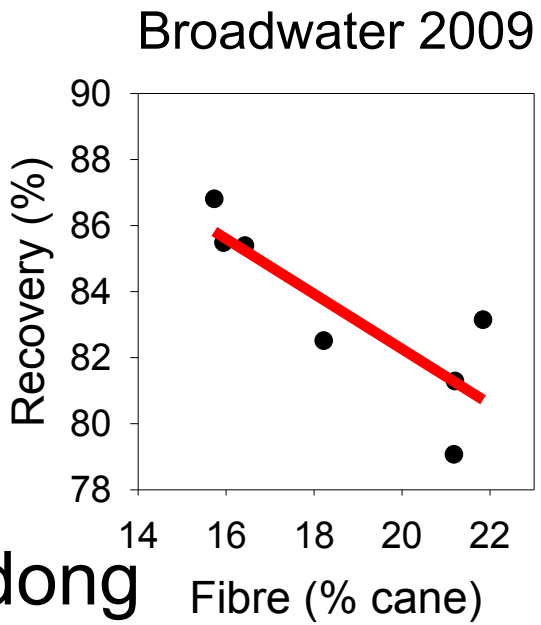


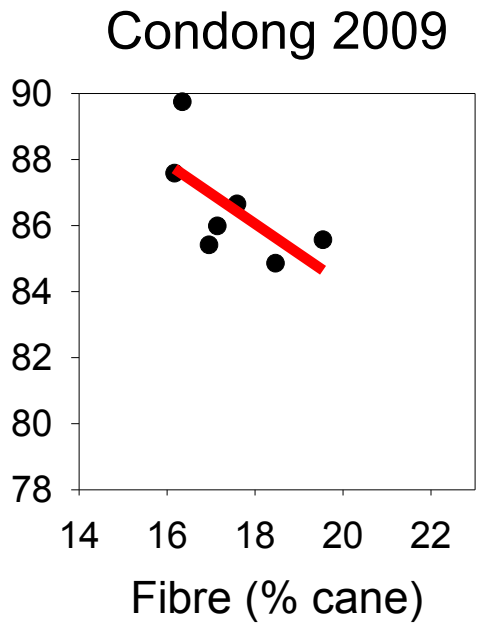
Condong 2010

Pol loss in molasses

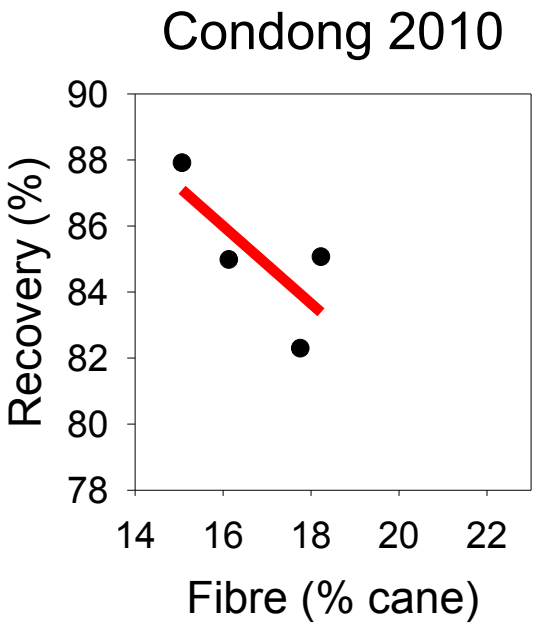
- Molasses production increases
  - Increase in soluble impurities in cane supply
- Molasses purity increases (maybe)
  - Exhaustions poorer in high grade massecuites
  - Massecuite viscosity increased (at Broadwater)

Recovery



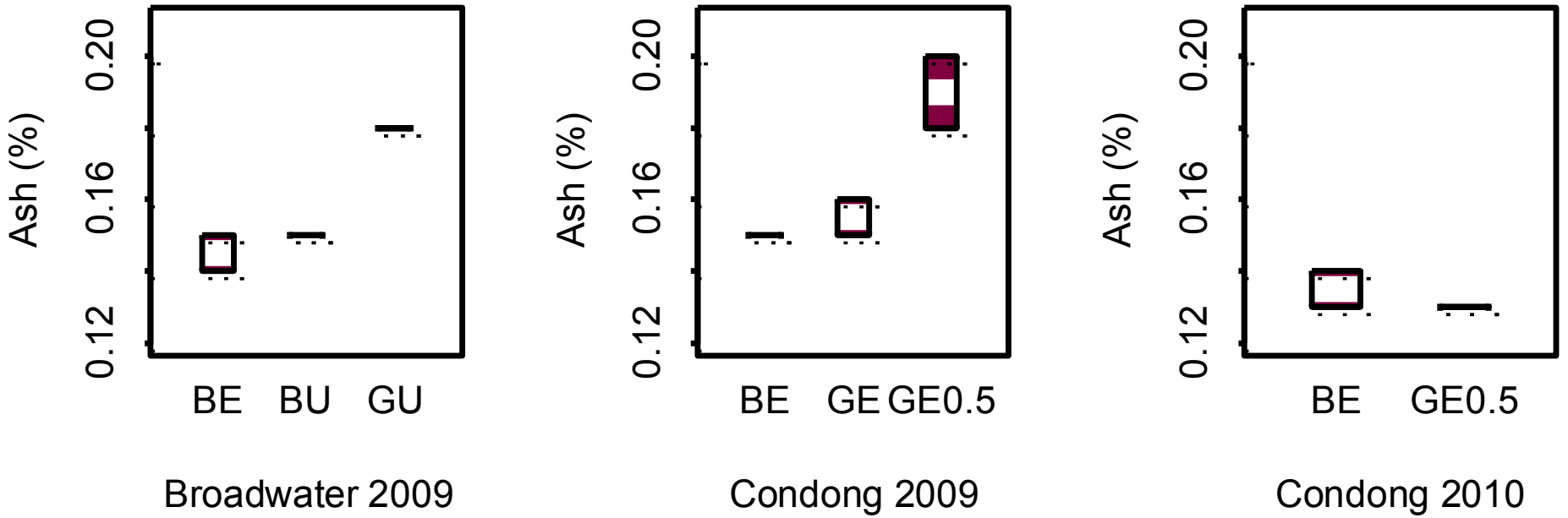


- Similar trend for Broadwater and Condong
- For each unit of cane fibre, recovery reduced
  - 0.8 units (Broadwater 2009)
  - 0.9 units (Condong 2009)
  - 1.2 units (Condong 2010)
- 0.9 units seems a reasonable average



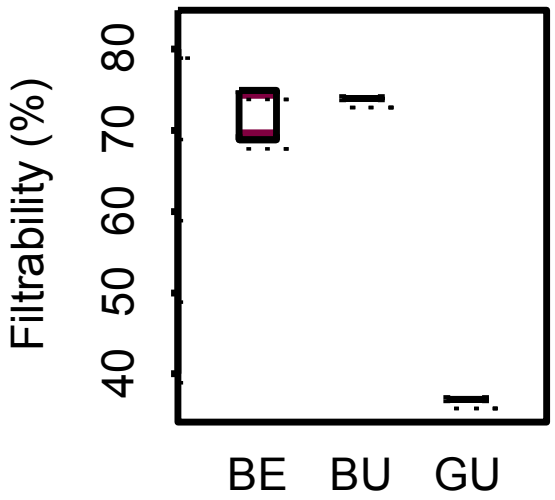
Sugar quality – ash

- Ash in sugar increases

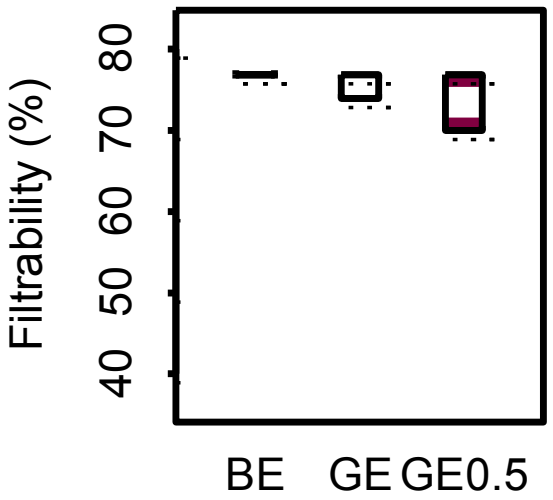


Sugar quality – filtrability

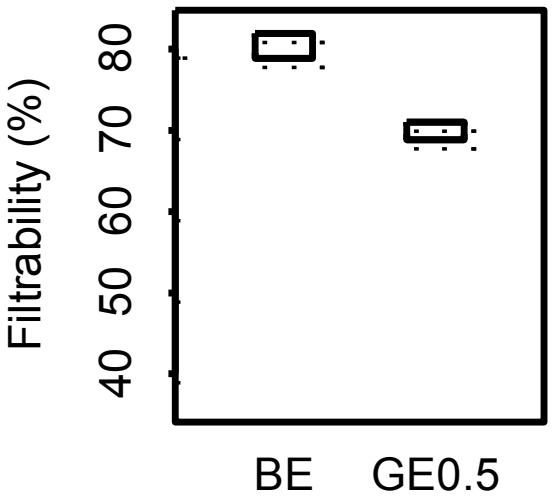
- Filtrability in sugar decreases



Broadwater 2009



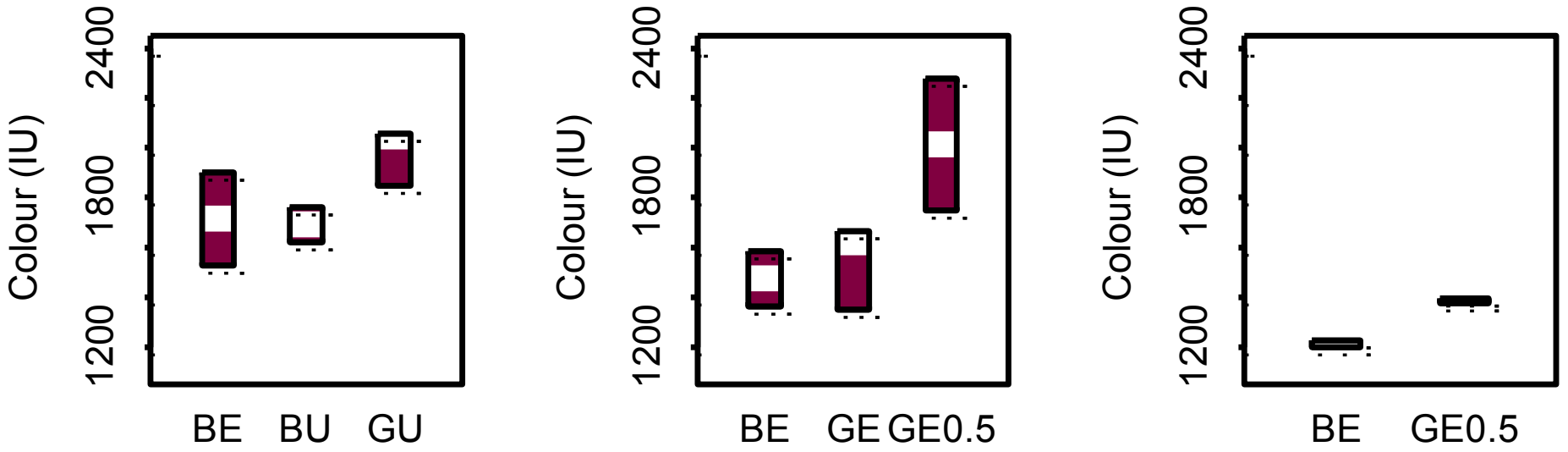
Condong 2009



Condong 2010

Sugar quality – colour

- Colour in sugar increases



Conclusions

- First time it has been possible to directly measure the effect of trash on sugar production and quality in the factory
- Recovery reduces about 0.9 units for each 1 unit increase in cane fibre content
- Sugar quality reduces
  - Ash, colour (and maybe filtrability)

Conclusions

- This information is valuable in determining the most profitable solution for the NSW Co-op
  - How to bring trash into the factory and make it available for cogeneration

Acknowledgements

- Funding
  - SRDC
- Assistance
  - Broadwater and Condong harvest contractors and growers
  - Staff at Broadwater and Condong factories



Australian Government

Sugar Research and Development Corporation

QUT

Sunshine Sugar