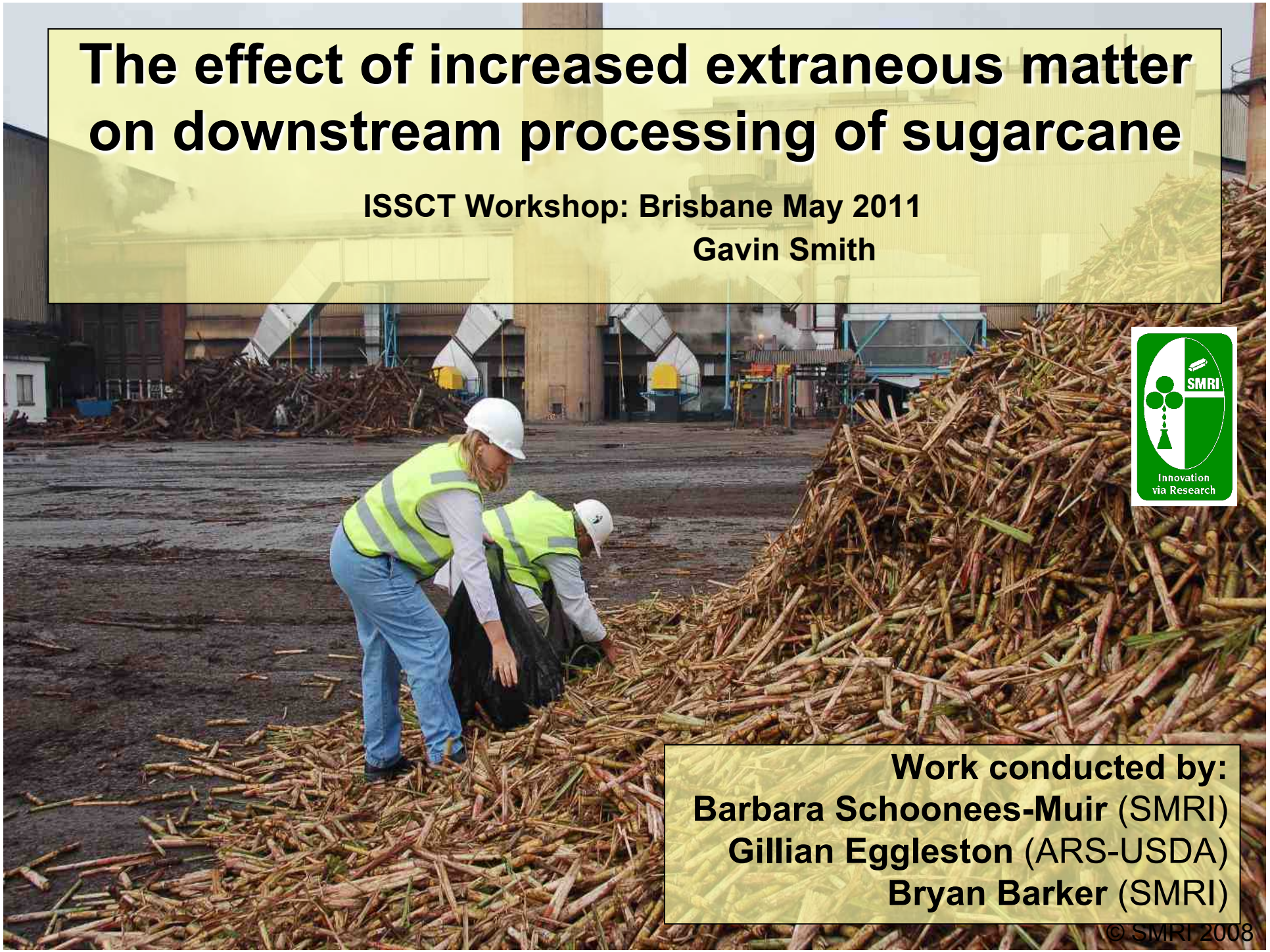
The effect of increased extraneous matter on downstream processing of sugarcane

ISSCT Workshop: Brisbane May 2011

Gavin Smith



Work conducted by:
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Presentation outline

- The SA sugarcane industry
- Trial harvesting and factory variables
- Experimental procedures
  - Extraction at factory
  - SMRI pilot plant (MJ to sugar)
- Results
  - Trash levels
  - MJ analytical results
  - Pilot plant results
- Conclusions

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South African sugar

- 100% sugarcane
- 2.3 mil tons sugar from 20 mil tons cane
- 50% exported
- 42 300 registered sugarcane growers
- 14 sugar factories
- 350 000 indirect employment

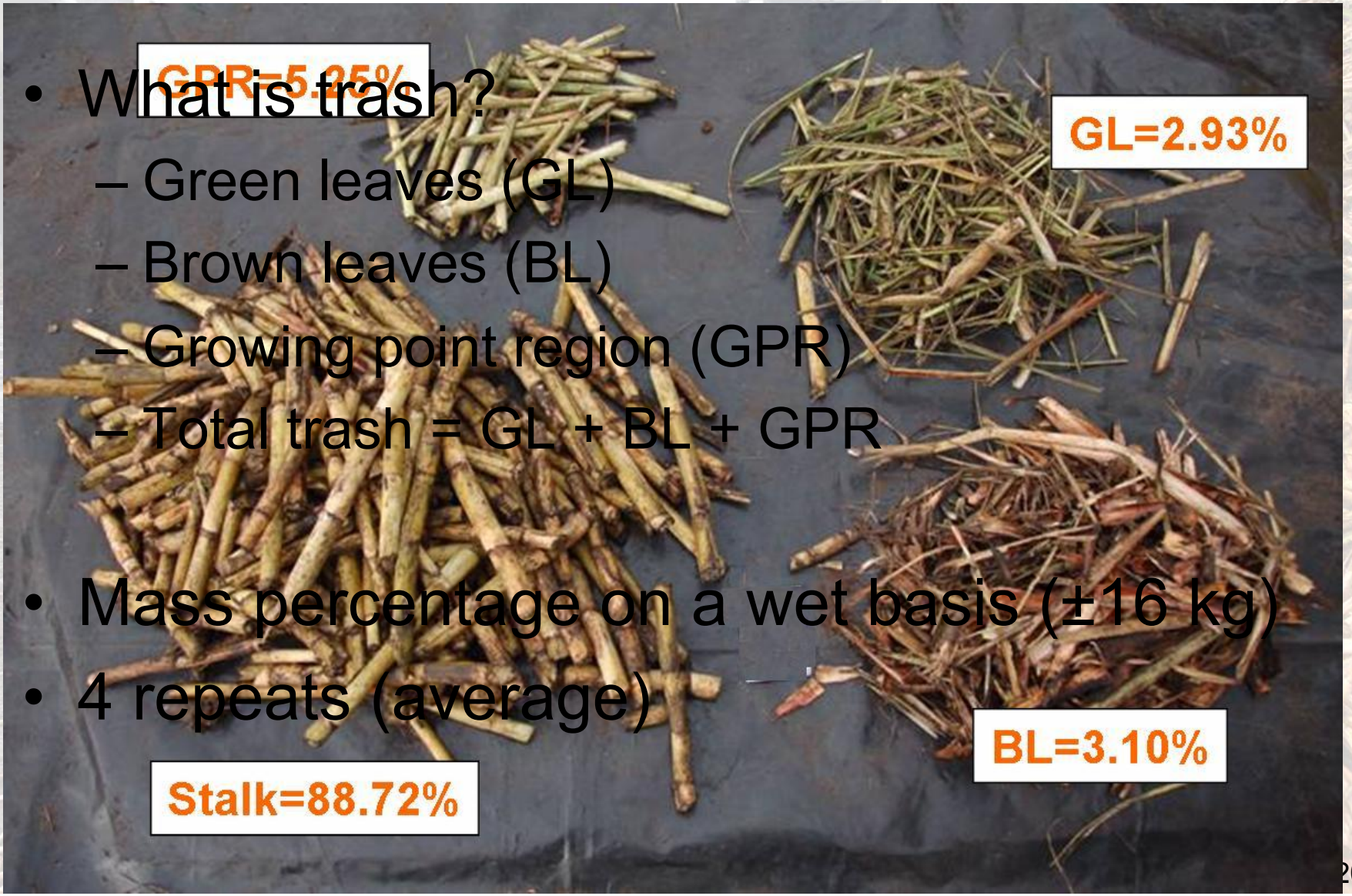
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The Trials

Noodsberg / UCL	Felixton
Milling tandem / diffuser	Diffuser
KZN Midlands	North Coast
N12	N27
20-24 months	12 months
Dry and cold (winter)	Dry and cool (winter)
Mechanical billets (burnt & unburnt) Manual wholestalk control (burnt)	Mechanical billets (unburnt) Manual wholestalk with tops (burnt)

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Trash levels determination



- What is trash?
  - Green leaves (GL)
  - Brown leaves (BL)
  - Growing point region (GPR)
  - Total trash = GL + BL + GPR
- Mass percentage on a wet basis (±16 kg)
- 4 repeats (average)

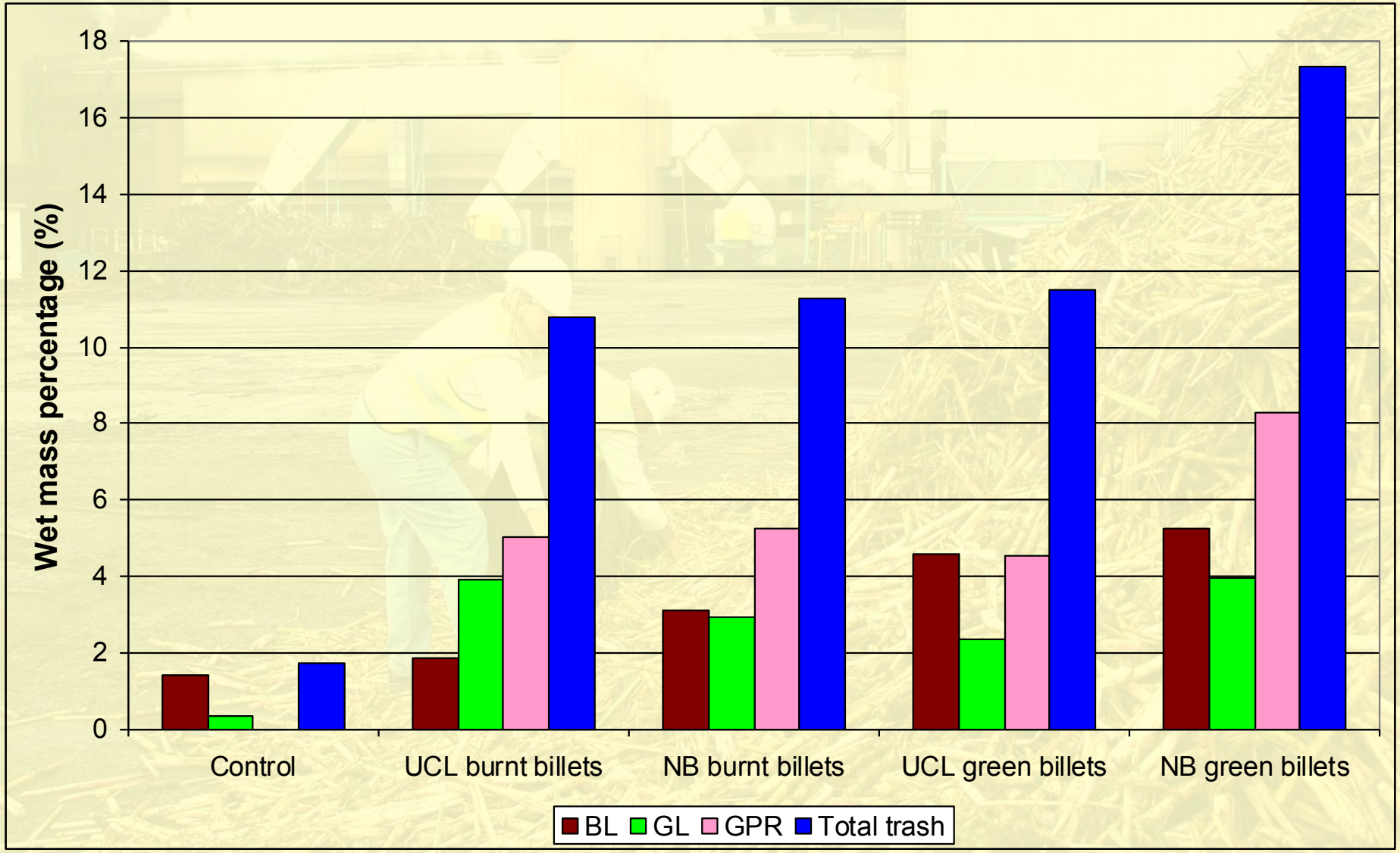
Trash Results

% Av trash on a wet mass basis (N=4)

Type	Field		Noodsberg			UCL		FX	
	UCL/ NB	FX	Burnt Whole-Stalk	Billets Burnt	Green Billets	Burnt Billets	Green Billets	Burnt Whole-Stalk	Green Billets
Stalk	70.0	75.5	98.3	88.7	82.6	89.2	88.5	89.8	88.7
GPR	8.8	7	0.0	5.3	8.3	5.0	4.5	6.1	4.8
GL	11.8	12	0.3	2.9	3.9	3.9	2.4	3.2	2.8
BL	9.4	6	1.4	3.1	5.2	1.9	4.6	0.9	3.7
Total GPR +GL+BL	**30.0**	**24.5**	**1.7**	**11.3**	**17.4**	**10.8**	**11.5**	**10.2**	**11.3**

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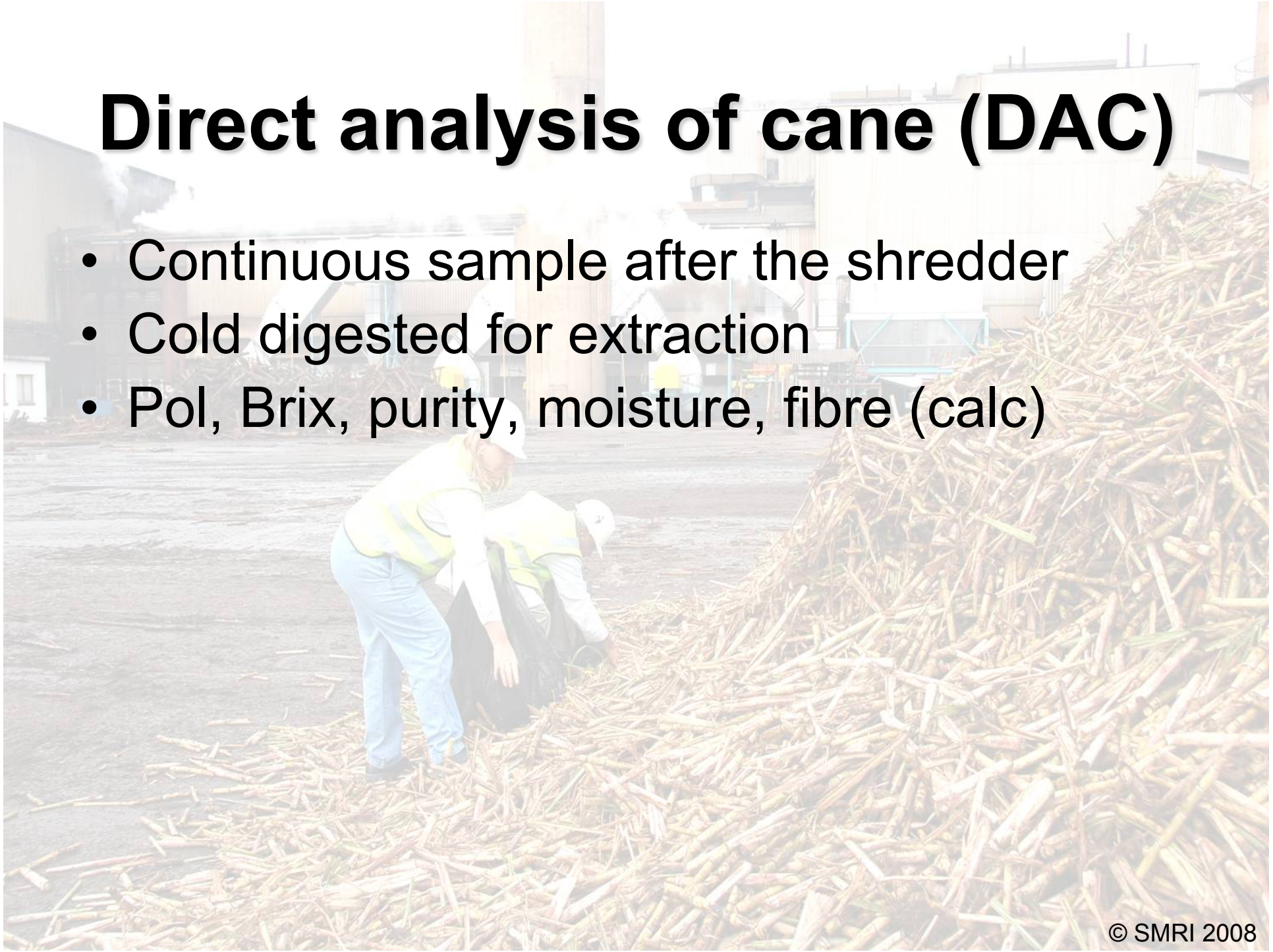
Trash results



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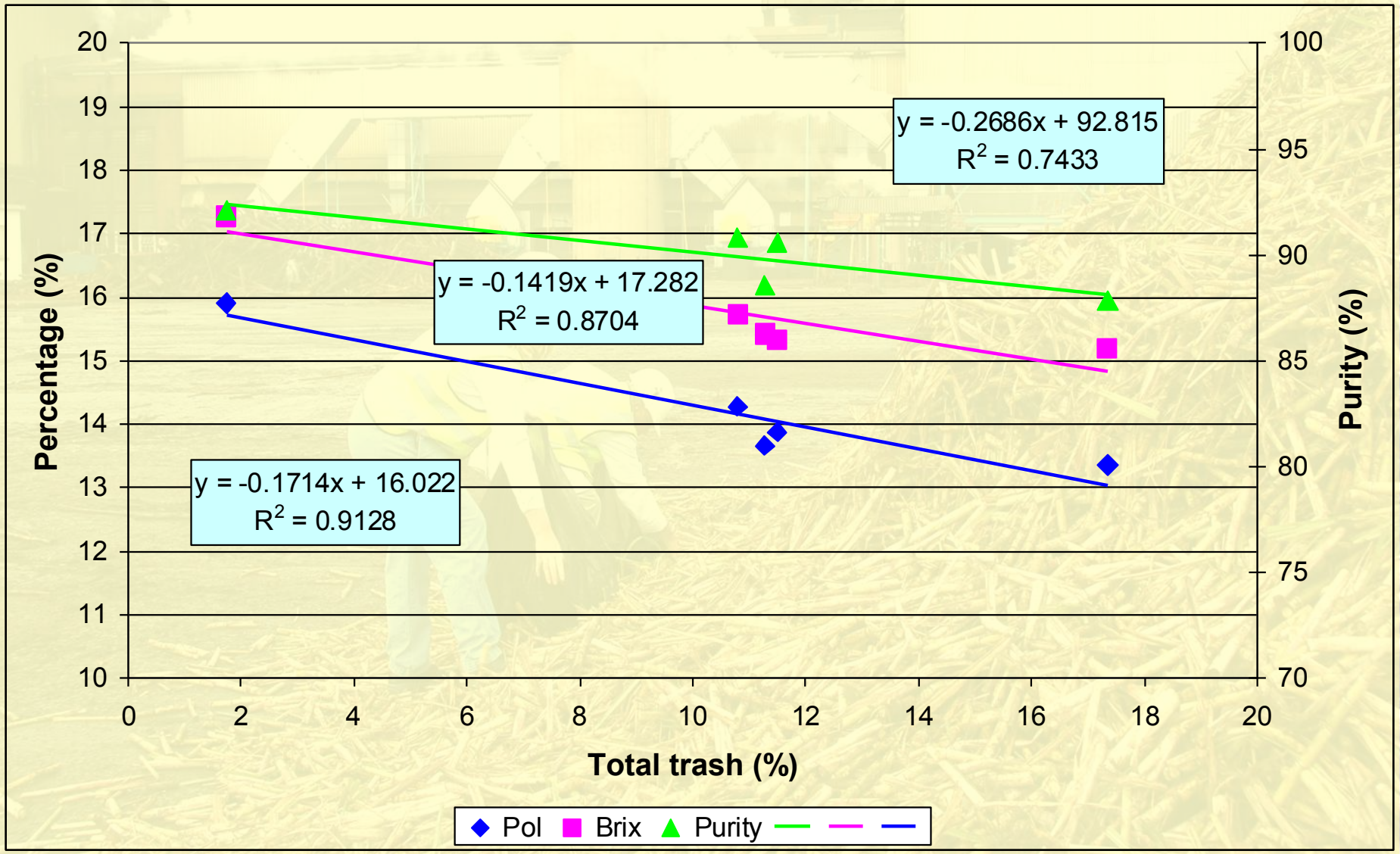
Direct analysis of cane (DAC)

- Continuous sample after the shredder
- Cold digested for extraction
- Pol, Brix, purity, moisture, fibre (calc)



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Direct analysis of cane (DAC)



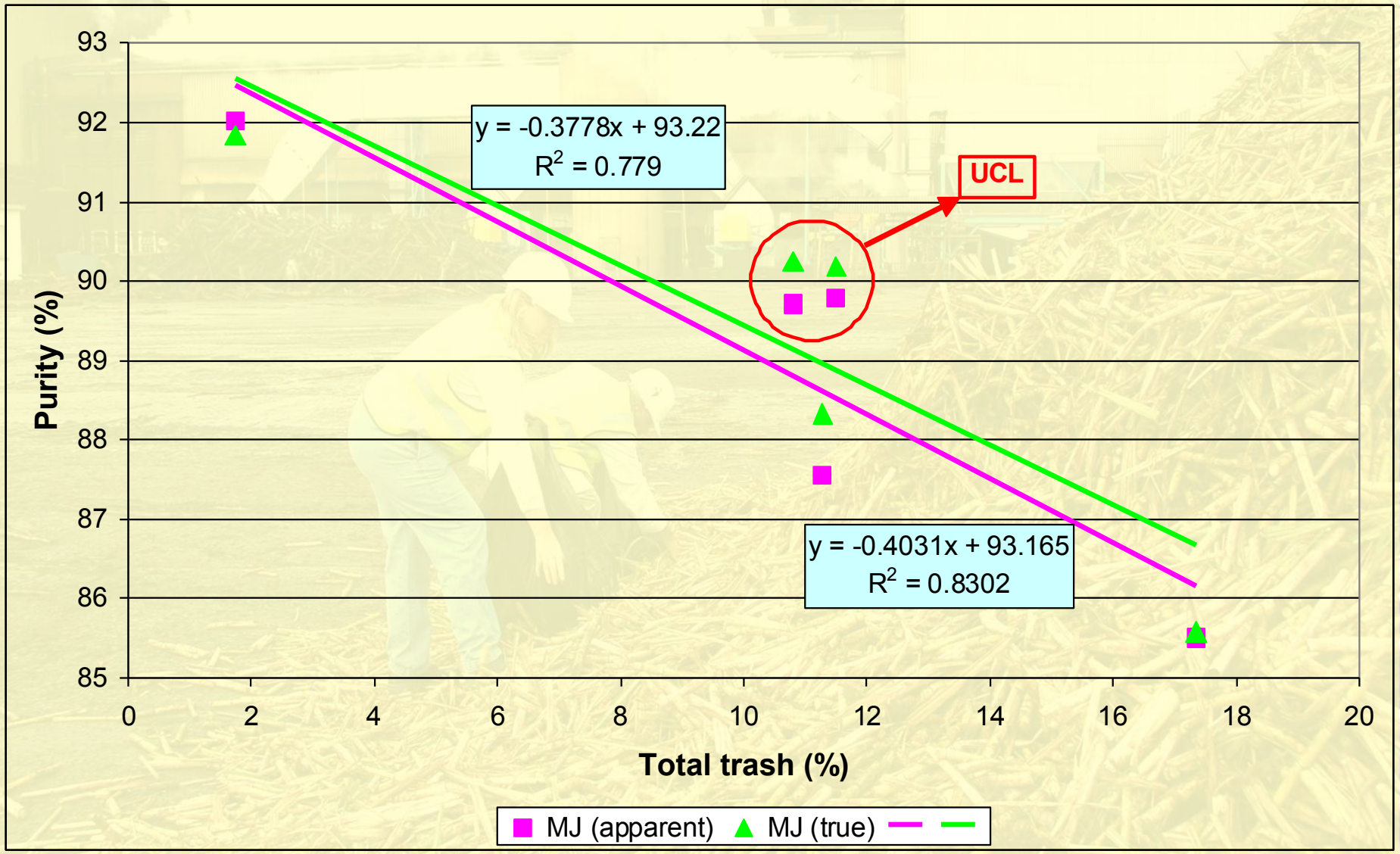
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Mixed juice

- Enough cane crushed to at least purge an fill the front end of the factory
- NB – 275 tons/h (milling tandem)
  - 300 tons per day (>1 hour)
- UCL – 135 tch (diffuser)
  - 300 tons per day (>2 hours)
- FX – 275 tch (diffuser)
  - 600 tons per day (>2 hours)
- Take 300 litres of mixed juice for analyses and further processing

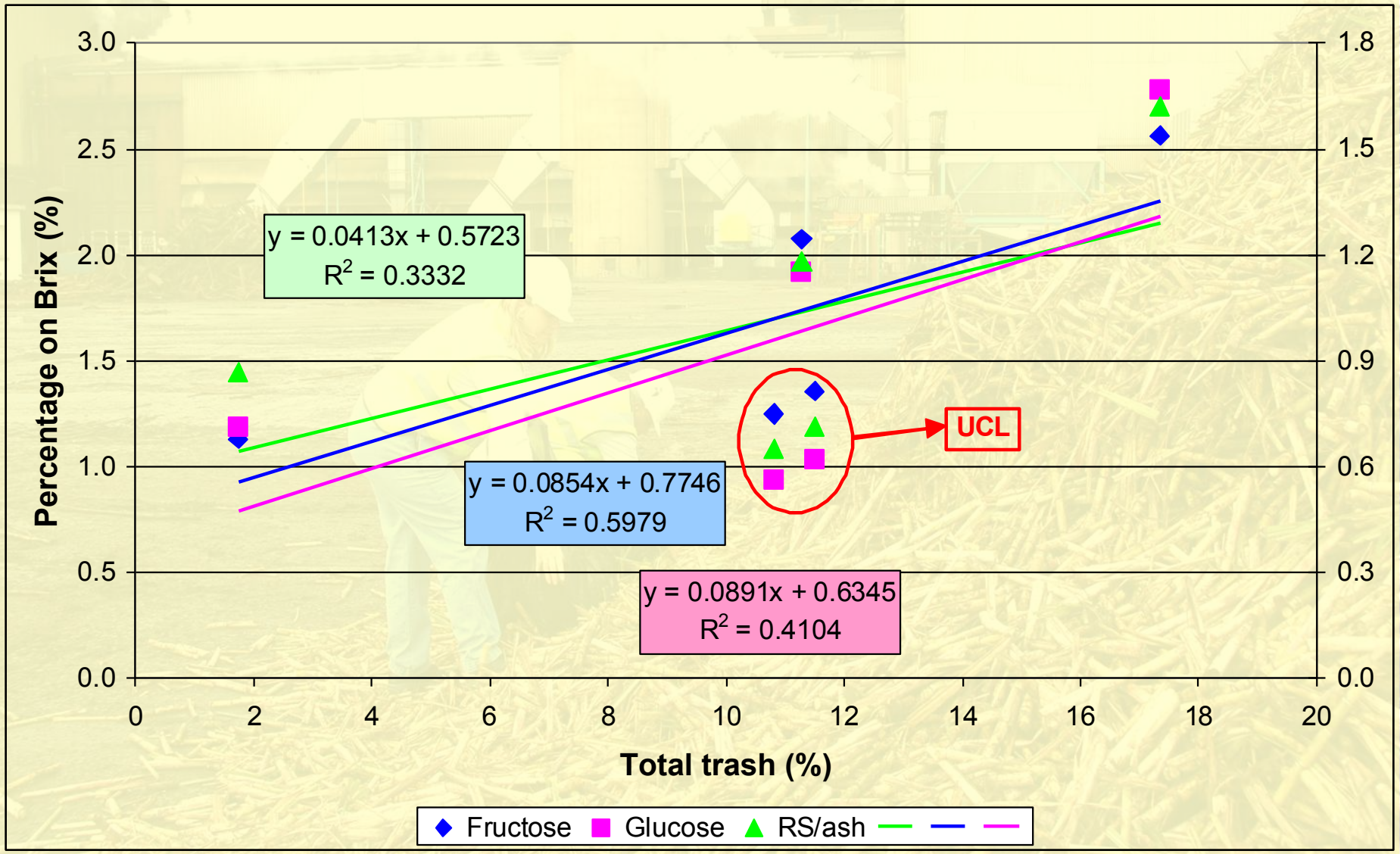
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Mixed juice purities



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Mixed juice - FG & ash

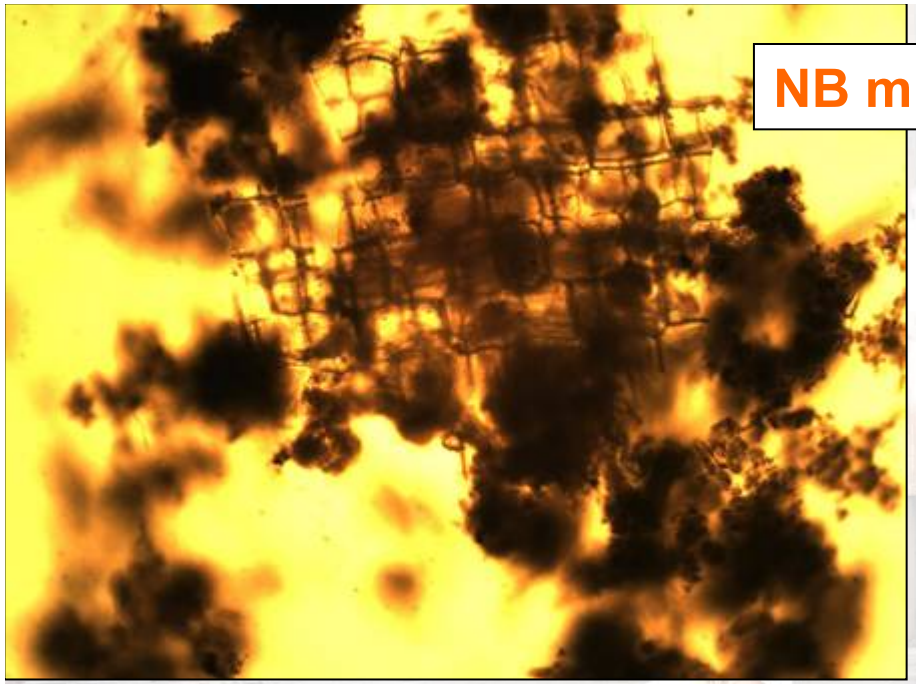


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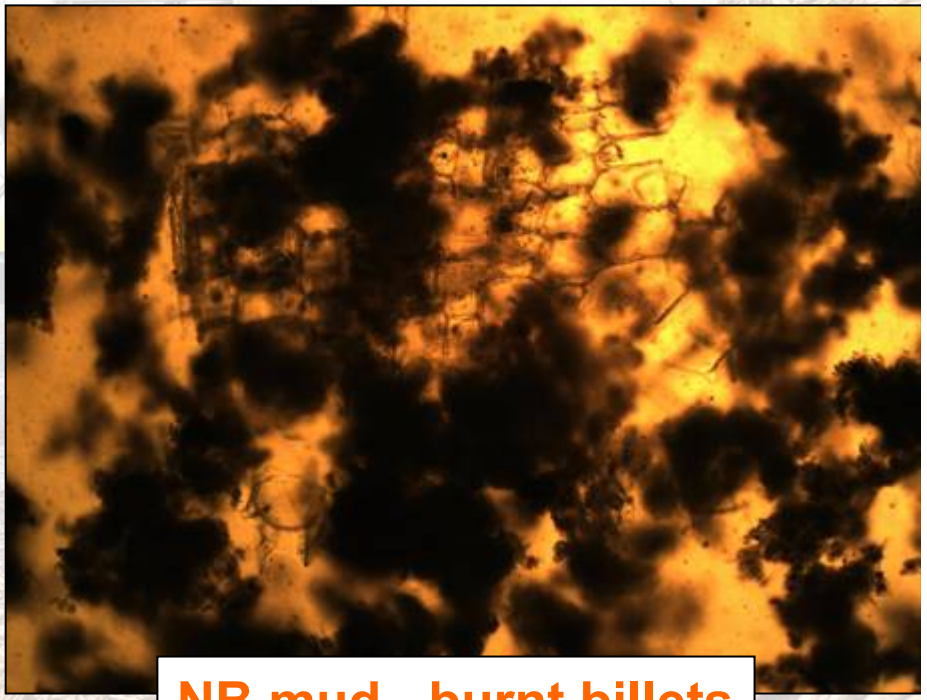
Mixed juice processing

- 300 litres of mixed juice
- Clarification
- Evaporation
- Vacuum pan boiling
- Centrifugation (molasses + sugar)
- Affination of sugar crystals

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NB mud - green billets



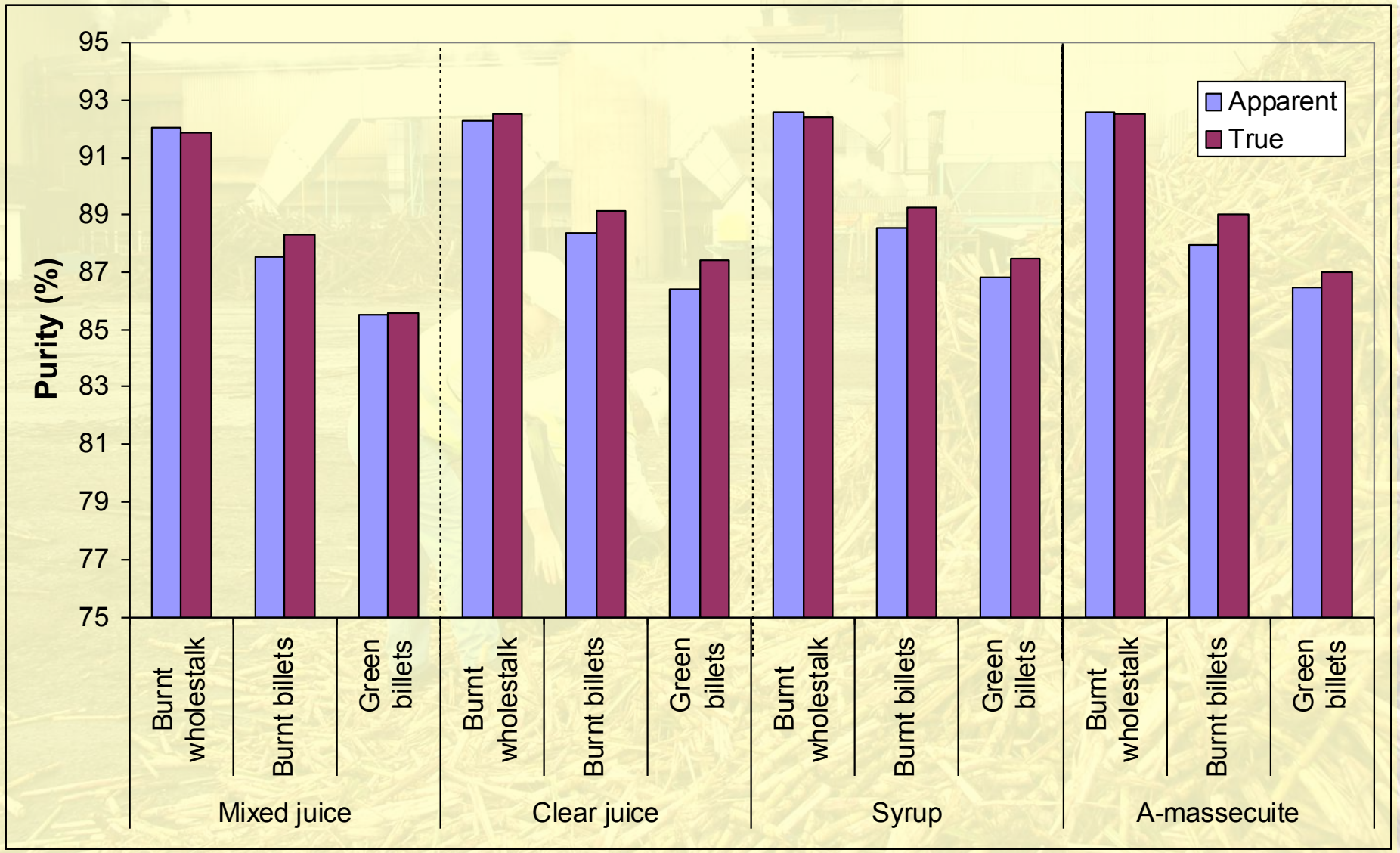
NB mud - burnt billets



NB mud – burnt wholestalk

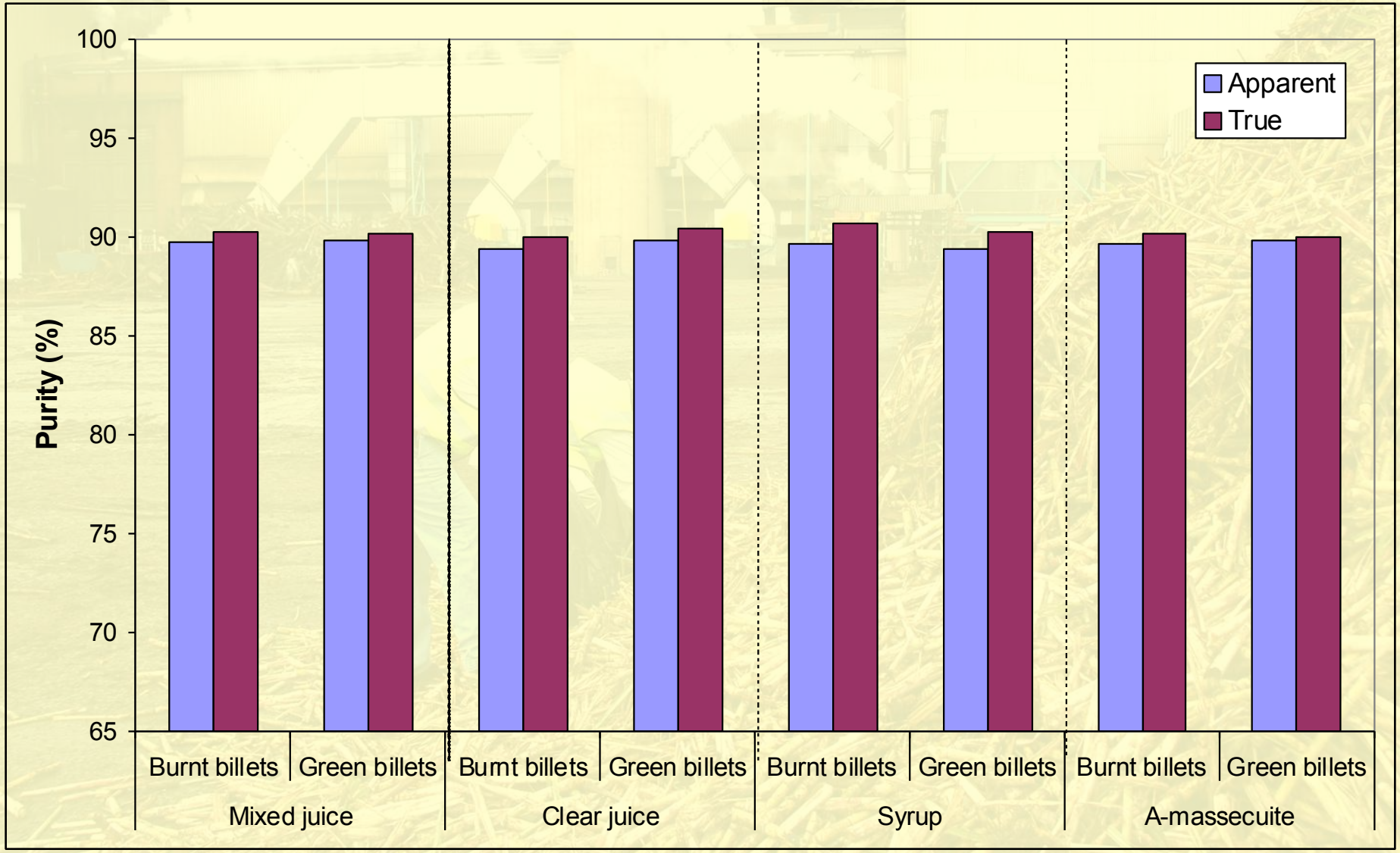
Micrographs 10x magnification

Pilot plant – NB purities



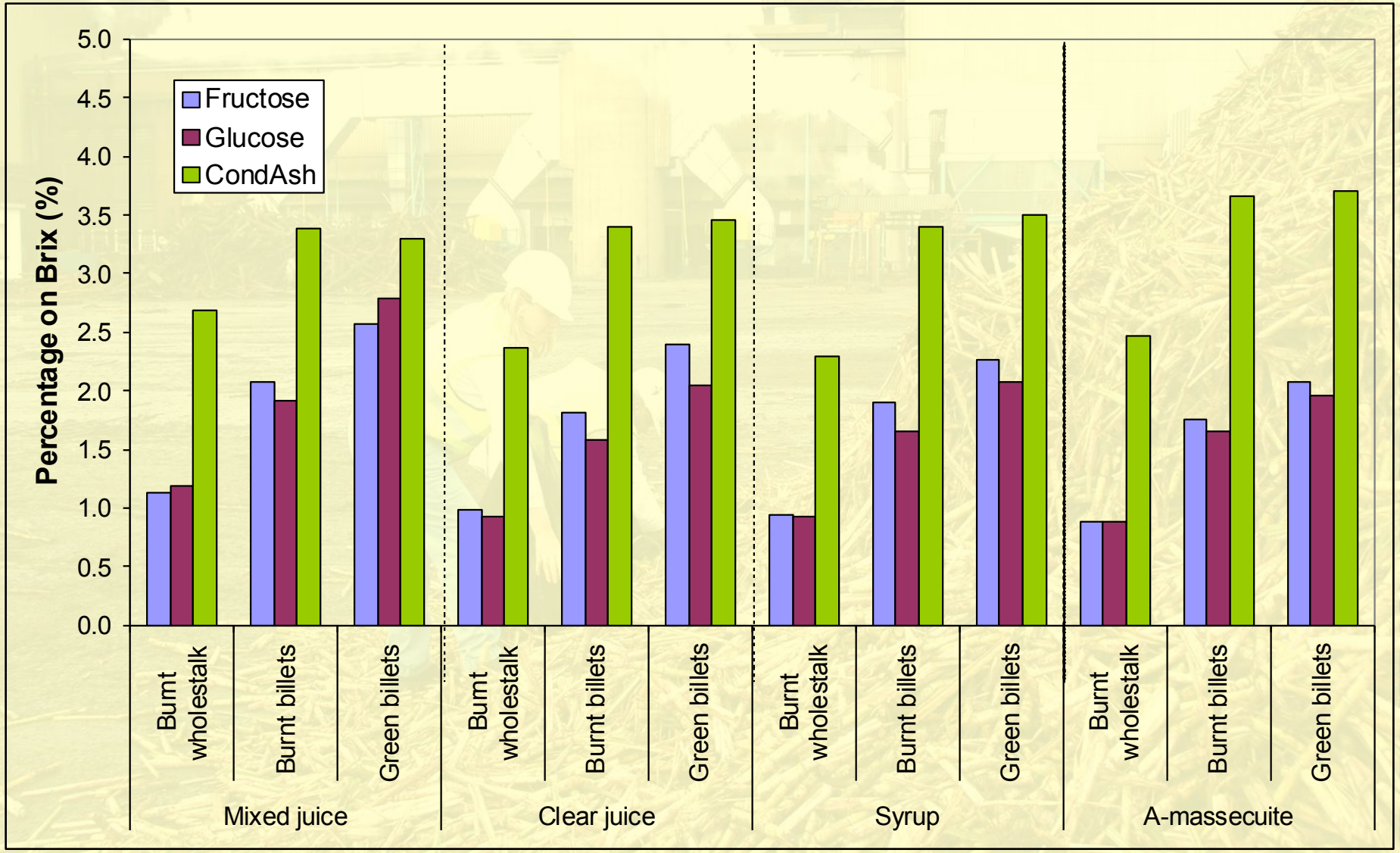
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Pilot plant – UCL purities



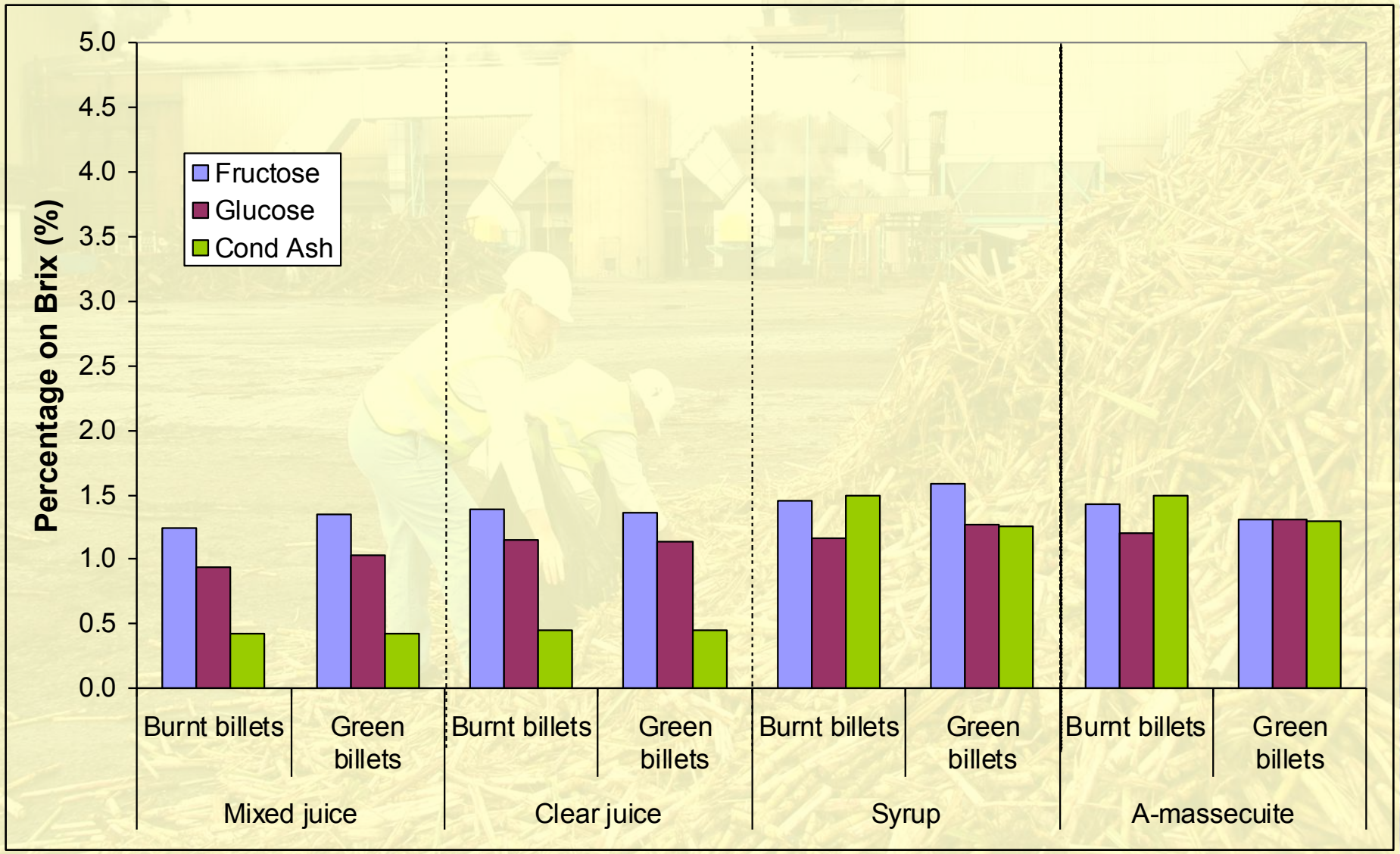
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Pilot plant – NB FG & ash



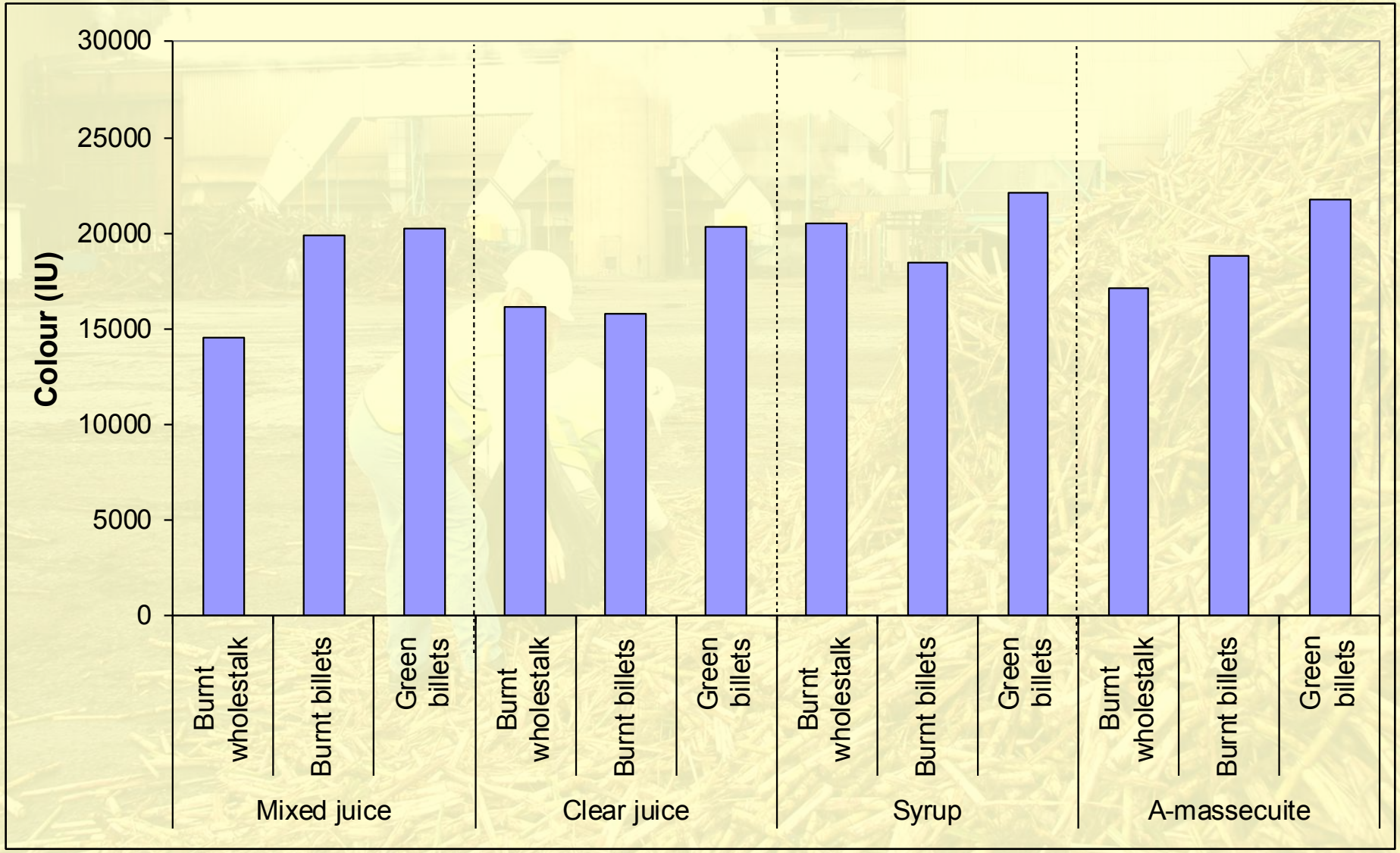
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Pilot plant – UCL FG & ash



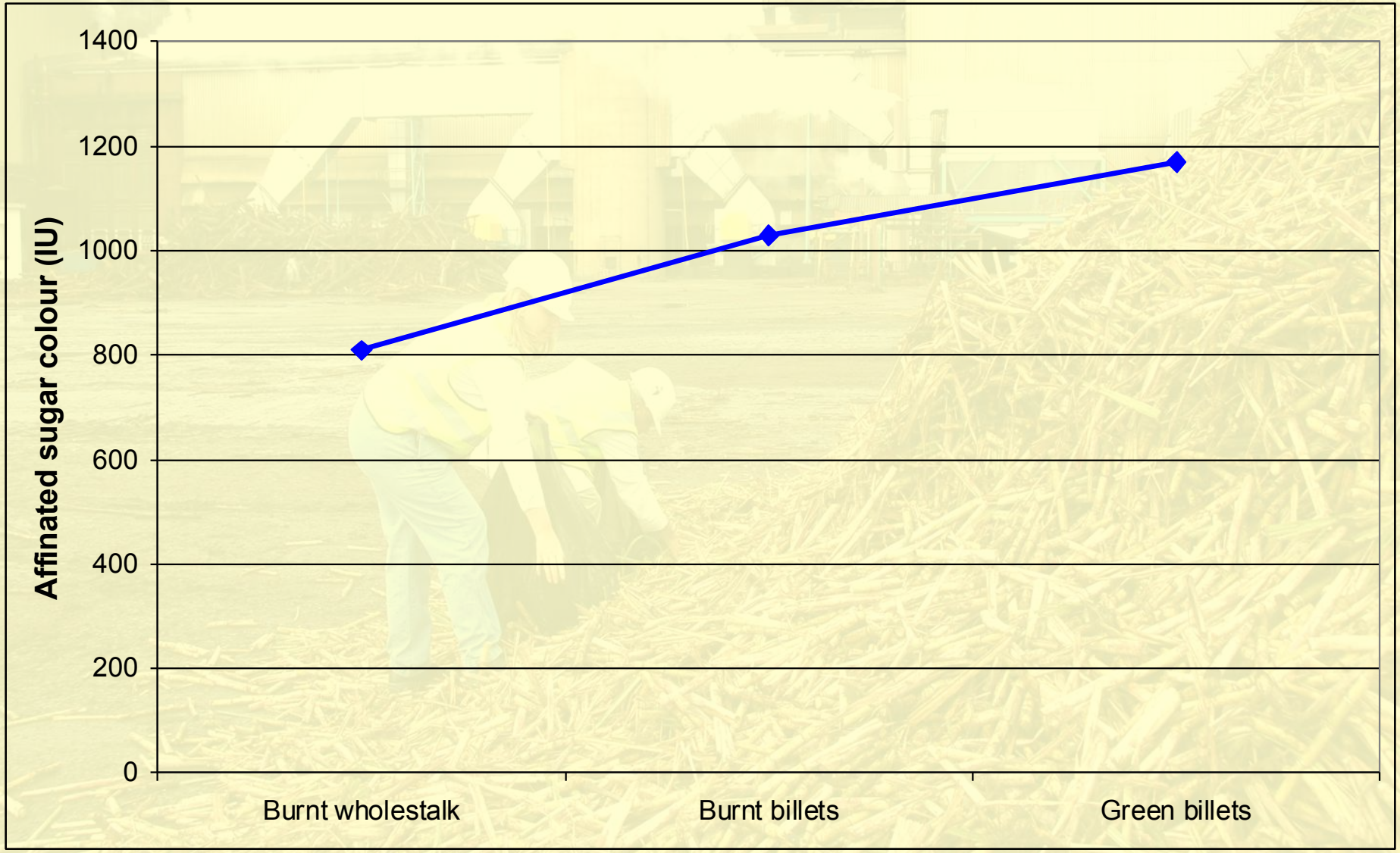
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Pilot plant – NB colour



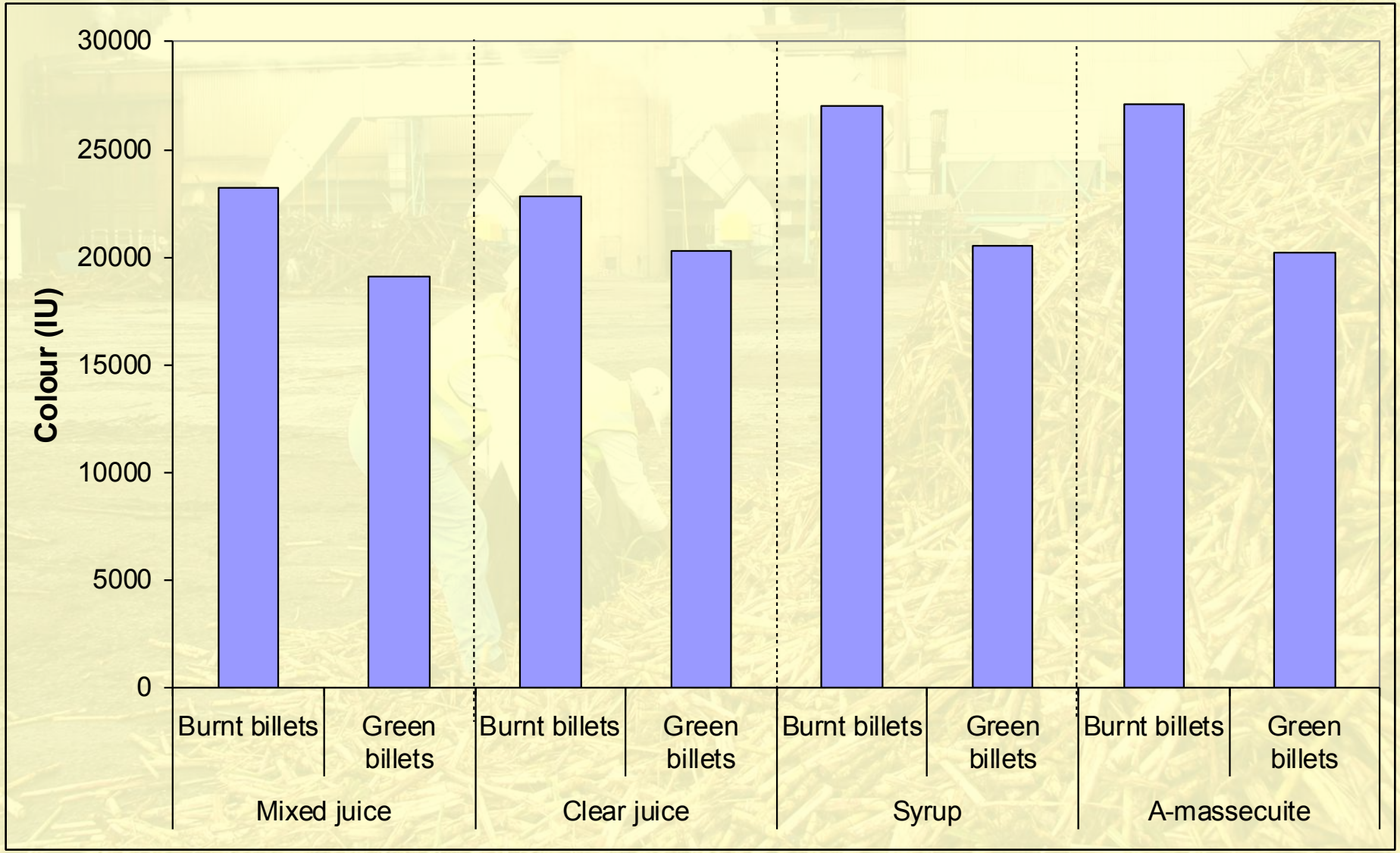
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NB affinated sugar colour



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Pilot plant – UCL colour



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UCL affinated sugar colour



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Conclusions

- Green & burnt mechanical billet harvesting increase extraneous matter significantly *versus* burnt wholestalks manually harvested
- Increase in extraneous matter caused
  - Reduction in the purity of the cane (DAC)
    - Less sucrose to extract per mass
    - More non-sucrose to extract per mass
  - Reduction MJ pol, increase Mj non-pol
  - Reduction in purities right throughout the factory
    - increase non-pol and increase RS/ash ratios
  - Increase in colour of affinated sugar

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Acknowledgements

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