

Deterioration in Cane Quality and Milling Performance in the South African Sugar Industry from 2007 to 2016

Tim Murray Pr Eng






Background

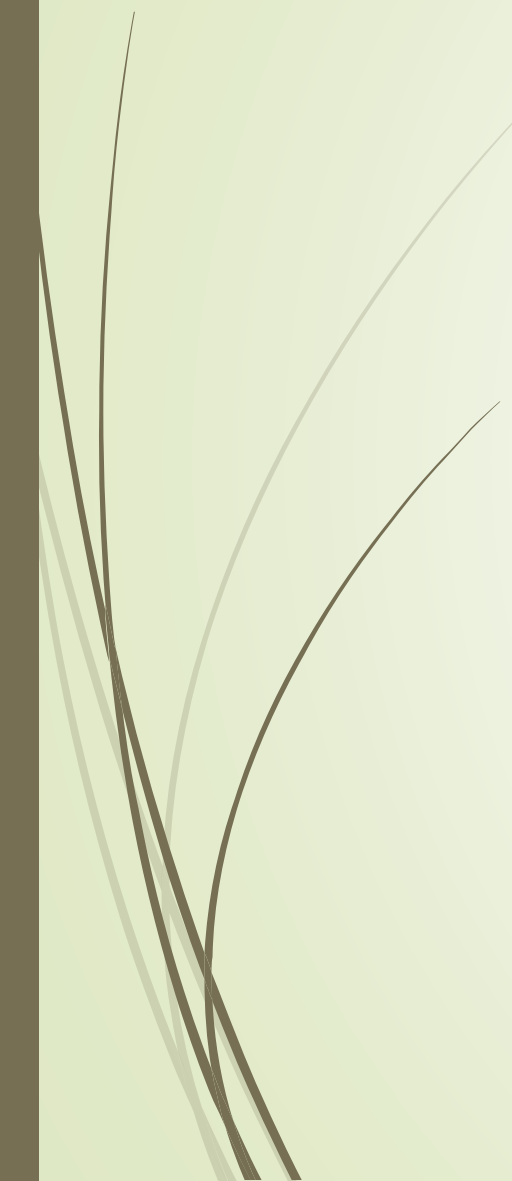
In 2000 the South African sugar industry changed the cane-payment system

- ▶ Pre-2000: growers were paid their share of industry proceeds pro rata based on the sucrose content of their sugar cane alone
- ▶ Post-2000: growers are paid their share of industry proceeds pro rata based on the total recoverable value (RV) that a miller can extract from their sugarcane

This change incentivizes millers to become more efficient and growers to improve the quality of their sugar cane




Original thinking

- ▶ Growers were paid proportional to $S\%c$
 - ▶ Move towards exposure to millability of cane
 - ▶ Growers wanted to share in the “lemon juice” not simply sell “lemons”
- 



Current Cane Payment system

- Growers receive 64% of value of sugar AND molasses sales valued at Notional and export Prices
 - This value is distributed between Growers in proportion to the value recovered (RV) from their cane
- 



The RV formula

(units of $t_{\text{sugar}} / 100t_{\text{cane}}$)

- ▶ The sugar value: $aS - bN - cF$ $t_{\text{sugar}} / t_{\text{cane}}$ (with $a=1$) multiplied by a sugar price (where a is the recovery of S in the sugar before b and c)
- ▶ The molasses value : mN $t_{\text{molasses}} / t_{\text{cane}}$ multiplied by a molasses price



The RV formula

- $RV = S - dN - cF$
- d brings the loss of sugar per unit of N in cane together with the gain in value of the molasses made per unit of N in cane
- So the RV has units of t sugar per ton cane where the value of the molasses is expressed as a sugar equivalent value
- Growers are notified of RV price every month as well as the current d factor , Growers noticed the steady increase in the d factor with time which prompted this work to be done!

The RV formula

Sucrose % cane

Non-sucrose % cane

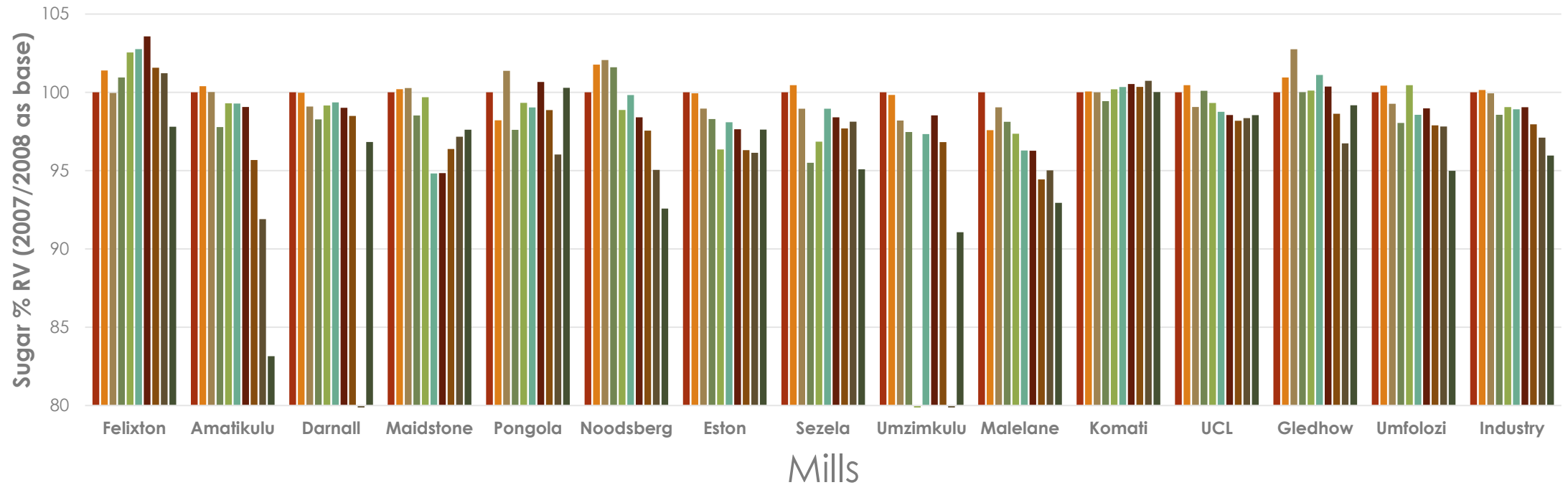
Fibre % cane

$$RV = S - dN - CF$$

Factor that reduces the amount of sugar that will be made due to losses in molasses – per unit of N

Factor that reduces the amount of sugar that will be made due to losses in bagasse - per unit of F

Figure 1



■ 2007/2008 ■ 2008/2009 ■ 2009/2010 ■ 2010/2011 ■ 2011/2012 ■ 2012/2013 ■ 2013/2014 ■ 2014/2015 ■ 2015/2016 ■ 2016/2017



Method used

- ▶ Data obtained from SASA
- ▶ Regression analysis was done against time for the past 10 year period for all factors a,b,c,S,N,F (actually 1-a)
- ▶ The sum of losses was determined for each mill area for each year
- ▶ Sum of losses. Is $(1-a)*S + bN+cF$
- ▶ The rate of change with time for each factor was determined

Table 1 (10 years data)

| Area | S | N | F | LM | b | c | Sum of losses |
|----------|--------|-------|-------|---------|-------|--------|---------------|
| AK | -0.06 | 0.05 | 0.26 | 0.0015 | 0.004 | 0.0005 | 0.07 |
| DL | 0.01 | 0.02 | 0.19 | 0.002 | 0.002 | 0.0008 | 0.06 |
| ES | -0.09 | 0.01 | 0.03 | 0.0002 | 0.004 | 0.0004 | 0.03 |
| FX | 0.0005 | 0.01 | 0.21 | 0.006 | 0.012 | 0.0012 | 0.05 |
| GH | 0.03 | 0.004 | 0.10 | 0.0008 | 0.004 | 0.0007 | 0.04 |
| KM | 0.05 | 0.01 | -0.01 | 0.001 | 0.006 | 0.0009 | 0.04 |
| ML | 0.08 | 0.004 | 0.02 | 0.0004 | 0.005 | 0.0007 | 0.03 |
| MS | 0.001 | 0.01 | 0.21 | -0.0004 | 0.012 | 0.0012 | 0.05 |
| NB | -0.02 | 0.02 | 0.04 | -0.0005 | 0.01 | 0.0004 | 0.05 |
| PG | 0.10 | 0.01 | 0.05 | -0.0008 | 0.008 | 0.0015 | 0.04 |
| SZ | -0.03 | -0.02 | 0.08 | 0.0002 | 0.005 | 0.0008 | 0.03 |
| UC | 0.03 | 0.01 | -0.08 | -0.0004 | 0.008 | 0.002 | 0.04 |
| UF | 0.03 | 0.02 | 0.07 | -0.0006 | 0.008 | 0.001 | 0.04 |
| UK | 0.04 | 0.02 | 0.07 | 0.0001 | 0.011 | 0.0006 | 0.07 |
| Industry | -0.004 | 0.002 | 0.06 | 0.0012 | 0.005 | 0.0006 | 0.05 |

Table 2 (for past 5 years)

| Area | S | N | F | LM | b | c | Sum of losses |
|----------|-------|-------|-------|--------|--------|---------|---------------|
| KM | 0.10 | 0.06 | -0.06 | 0.003 | -0.004 | 0.0008 | 0.09 |
| ML | 0.23 | 0.08 | 0.002 | 0.002 | 0.013 | -0.0007 | 0.10 |
| NB | -0.30 | 0.075 | 0.20 | -0.004 | 0.015 | 0.0004 | 0.09 |
| Industry | -0.14 | 0.07 | 0.14 | 0.002 | 0.010 | 0.0003 | 0.10 |

Figure 2 (summed losses for the Industry over time)

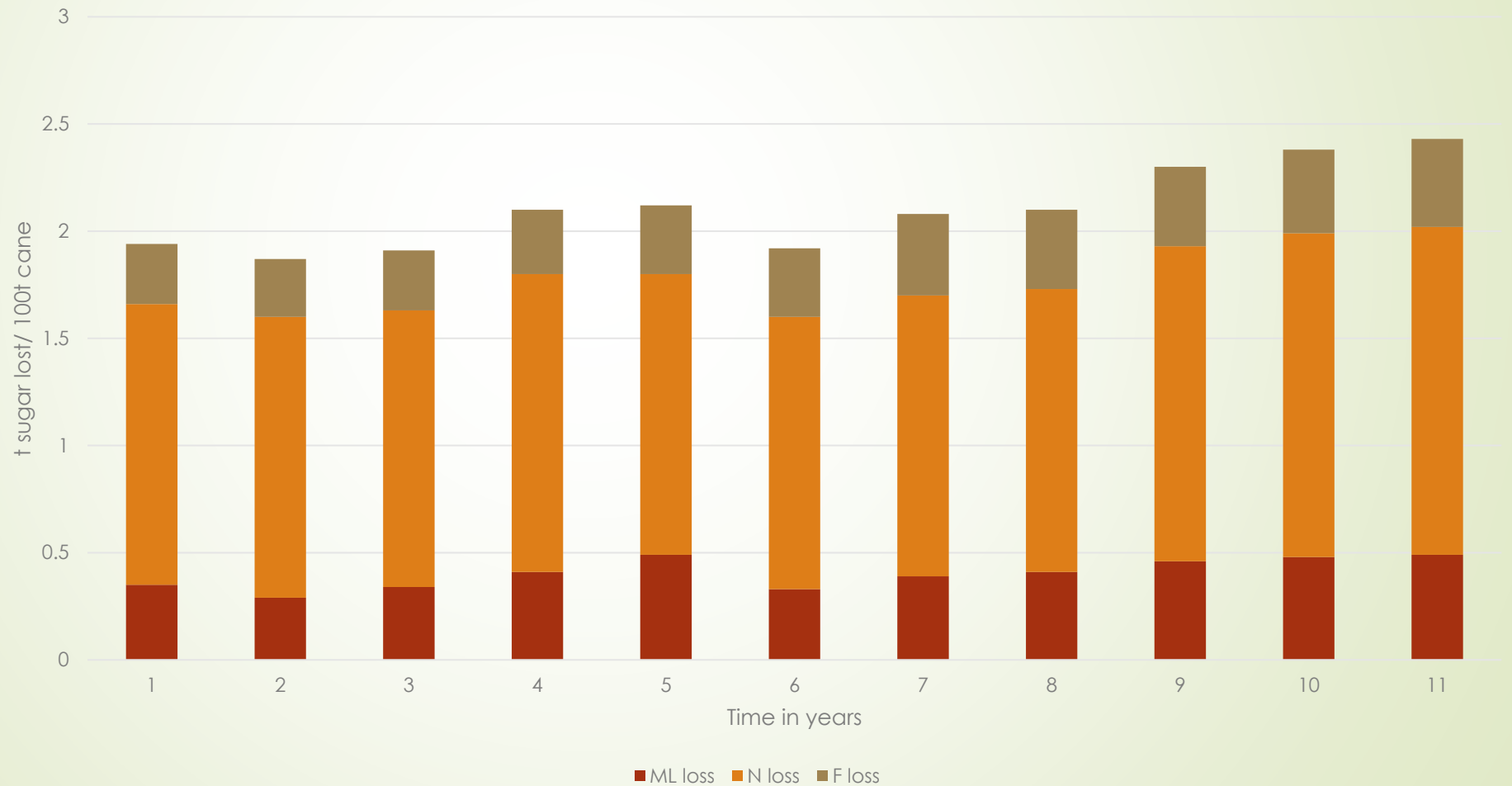
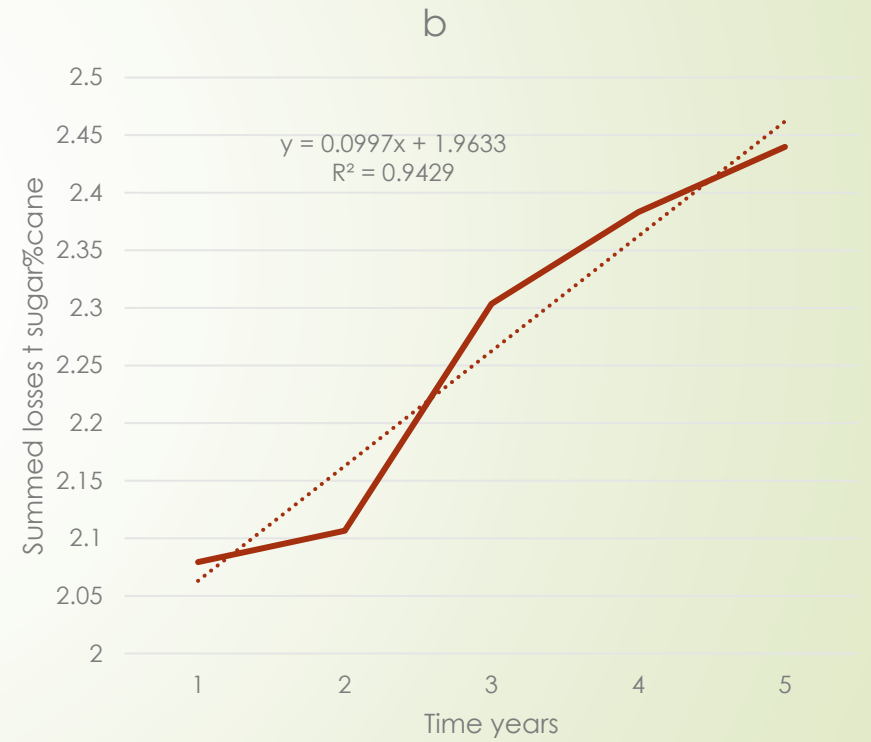
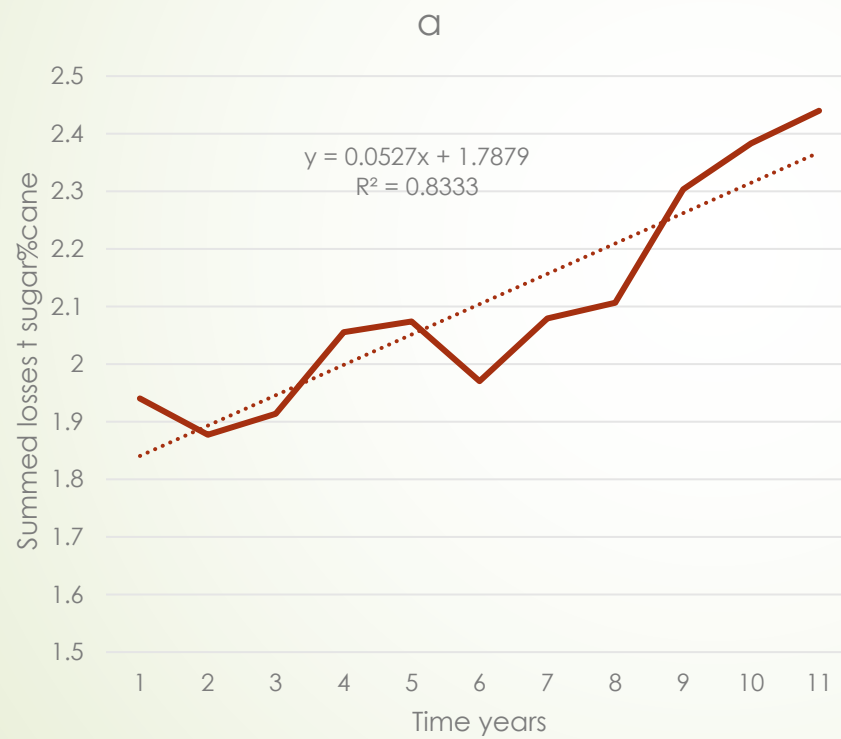


Figure 3 (summed lasses for Industry)
a for 10 years , b for 5 years





Conclusion

- ▶ All six parameters are getting worse with time
- ▶ The velocity of deterioration is accelerating
- ▶ The RV formula is not current enough
 - ▶ 3 year moving average for b,c,and m is over stating RV
 - ▶ The fact that a is set to 1 and R is outside of the RV formula over states the RV
- ▶ The South African industry needs to investigate, on a mill area basis, why RV does not create the correct incentives to improve performance , and why both cane quality and milling performance are deteriorating .



Acknowledgements

- ▶ SA Cane Growers Association for supporting my attendance here
 - ▶ Mr. Seelan Naidoo at SASA, CTS for collating the data set for me
 - ▶ My Son Dr. Lyle Murray for his invaluable support !
- 