Sugar Research Australia

Information Sheet

IS14025

Harvesting Best Practice origins

The Australian sugar industry has constantly sought to improve the efficiency of harvesting since the introduction of mechanisation.

A major challenge for the industry is the balance between minimising sugar losses and maintaining cane quality. The adoption of green cane harvesting brought advantages of weed control without constant cultivation and improved moisture retention. However it also created the challenge of finding a balance between effective cane cleaning to minimise extraneous matter (EM) levels without excessive cane loss.

Cleaning losses range from 5 per cent to 25 per cent depending on fan speed and pour rate but can be difficult to measure. Harvester trials over many years have identified a number of basic harvester performance principles:

- Field conditions and pour rate dictate EM levels – NOT fan speed
- Fan speed determines cane loss levels with limited impact on EM

Field conditions

One of the key learnings from green cane harvesting trials is that the main driver of cane quality is the field conditions faced by the harvester. The percentage of trash in the cane supply is determined by crop presentation factors such as lodging, wet/dry conditions, trashiness of the variety and row spacing/profile. Free-trashing varieties such as Q208$^{(l)}$ are much easier to clean than more tight-leafed varieties. Lodged or sprawled cane is more difficult to gather into the harvester, which reduces the efficiency of the cleaning system. Damp conditions cause the trash to clump together, making it harder to extract.

Figure 1 shows the percentage of EM in cane supply when harvesting the same variety under different field conditions. There is a significant increase in EM percentage when harvesting a lodged crop in wet conditions (>14 per cent EM) compared to harvesting erect dry cane (2 per cent EM). Increasing extractor fan speed has limited impact on trash levels as the harvester cleaning systems operate in a constant state of overload due to high machine pour rates.

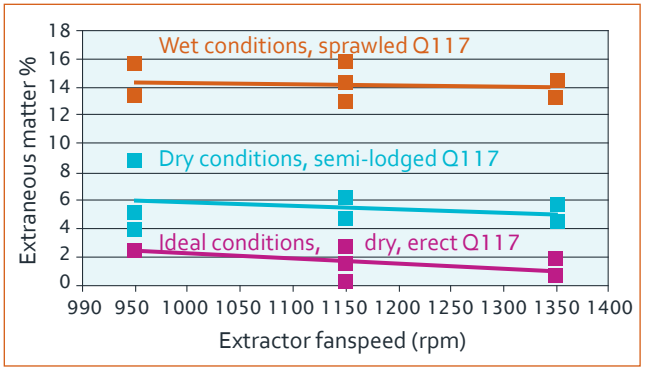

Figure 1: Impact of field conditions on EM levels.

Pour rate versus EM

One of the biggest problems for Australia's sugar industry is the high levels of EM entering factories. High EM levels:

- Reduce bin weights, which increases transport costs
- Can reduce mill crushing rates due to high fibre levels
- Reduce CCS and extraction efficiency
- Have negative effects on sugar quality.

High EM levels are predominantly caused by a high harvester pour rate. In order to meet grower pressure to minimise harvesting costs, harvesting businesses have increased in size with many machines cutting >100 000 tonnes each season.

To achieve this, typical elevator pour rates have increased from around 80 t/h in 1997 to in excess of 150 t/h in 2014.

Figure 2 shows how increasing pour rates affect EM levels in the cane supply. With EM levels at most green cane mills currently between 10 and 15 per cent, there is a need to rethink how the system can be better managed.

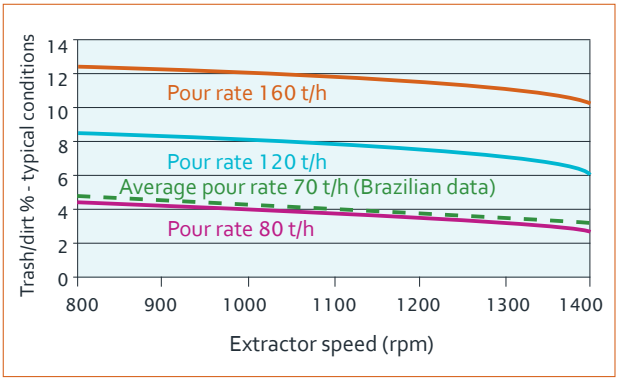

Figure 2: Impact of pour rates on EM levels.

Fan speed and cane loss

There are many sources of cane loss during harvesting, including pick-up loss, basecutter loss and chopper loss. But cleaning system losses have the biggest financial impact on the industry, costing millions in lost revenue each year.

Harvester operators are facing pressure to reduce EM levels and improve declining bin weights. In an attempt to better clean the cane supply while maintaining high pour rates, operators tend to increase primary extractor fan speeds.

Figure 3 shows cane loss from a standard John Deere extractor chamber. Cane loss rises rapidly as extractor fan speeds increase above 800 rpm. This is in contrast with older models; their losses start to increase rapidly above 1000 rpm (Figure 4).

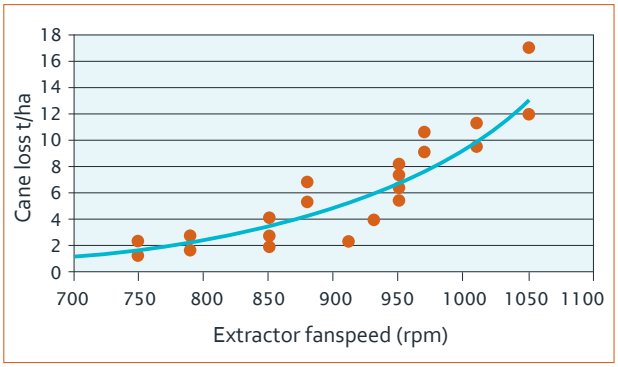

Figure 3: John Deere cane loss versus fanspeed.

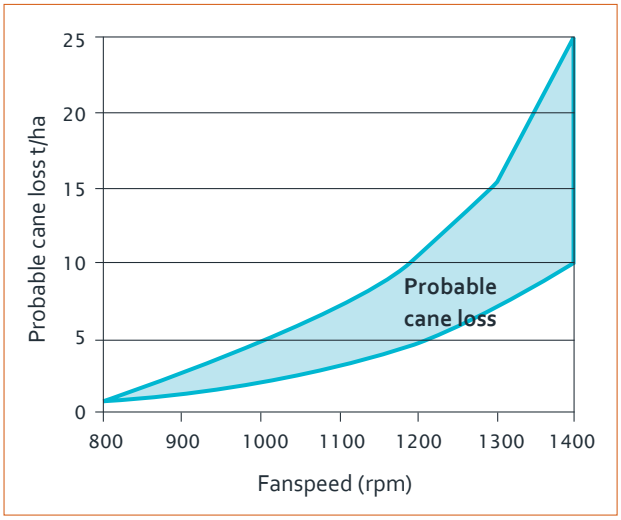

Figure 4: Fan speed dictates cane loss, not EM levels.

The 'anti-vortex' extractor design is standard to the current model Case IH harvester but retrofittable kits are available to suit earlier machines. As with the John Deere system, losses increase exponentially above 800 rpm (Figure 5).

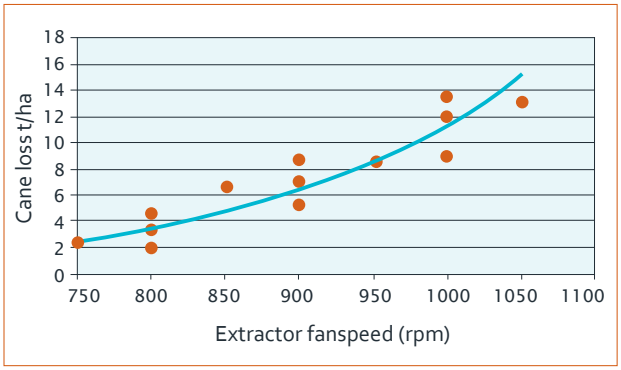

Figure 5: Anti-vortex cane loss versus fanspeed.

With losses of up to $1500/ha being measured in SRA field trials over recent years, it's important that operators are aware of the impact fan speed has on cane loss.

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