Project Catalyst Trial Report

Ripped vs Not Ripped Cultivation

Grower Information	
Grower Name:	Steven Muscat
Entity Name:	Tacsum Industries
Trial Farm No/Name:	MKY-04740A
Mill Area:	Mackay Sugar
Total Farm Area ha:	125
No. Years Farming:	8
Trial Subdistrict:	Homebush/Oakenden
Area under Cane ha:	120

Trial Status

Completed

Author: John Turner (Farmacist). For further information contact John on Mb. 0437 581 921.

Background Information

Aim: To assess the impact of deep ripping in ratoons after harvesting in wet conditions.

Background:
Traditionally paddocks were 'worked' to alleviate compaction issues. As machinery becomes heavier and better equipped to handle wet conditions, compaction issues have the potential to become more severe. Currently, the advice given to farmers is to minimise the amount of tillage operations that are carried out in the paddock to minimise disturbance to soil biology as well as decrease the likelihood of impacting soil structure.

It is thought that where severe compaction has occurred (i.e., harvesting in wet conditions), ripping will alleviate the issue and improve water infiltration, in turn improving crop growth.

In this situation, the grower attempted to minimise compaction at harvest by only half filling the track transporter, however, once irrigation was required, run-off was evident. This led to a decision to centre rip half of the paddock once all herbicide and nutrient applications were made.

Potential Water Quality Benefit:
Increased water infiltration leading to reduced risk of nutrient run-off and improved nutrient uptake by crops.

Expected Outcome of Trial:
It is expected that the ripped treatment will improve infiltration.

Service provider contact: Farmacist Pty Ltd

Where did this idea come from: Steve Muscat

Plan - Project Activities		
	Date:	**Activities:**
Stage 1	**December 2017**	Harvested in very wet conditions
Stage 2	**January 2018**	Centre rip and install GDot® (soil moisture sensor) for monitoring
Stage 3	**January – October 2018**	Conduct frequent assessments of soil moisture
Stage 4	**October 2018**	Harvest
Stage 5	**December 2018**	Install moisture probes and conduct site assessments
Stage 6	**October 2019**	Harvest

Project Trial site details	
Trial Crop:	Sugar Cane
Variety: Rat/Plt:	3R Q208
Trial Block No/Name:	01-03
Trial Block Size Ha:	4.5ha
Trial Block Position (GPS):	-21.297844, 149.038437
Soil Type:	Marian

Block History, Trial Design

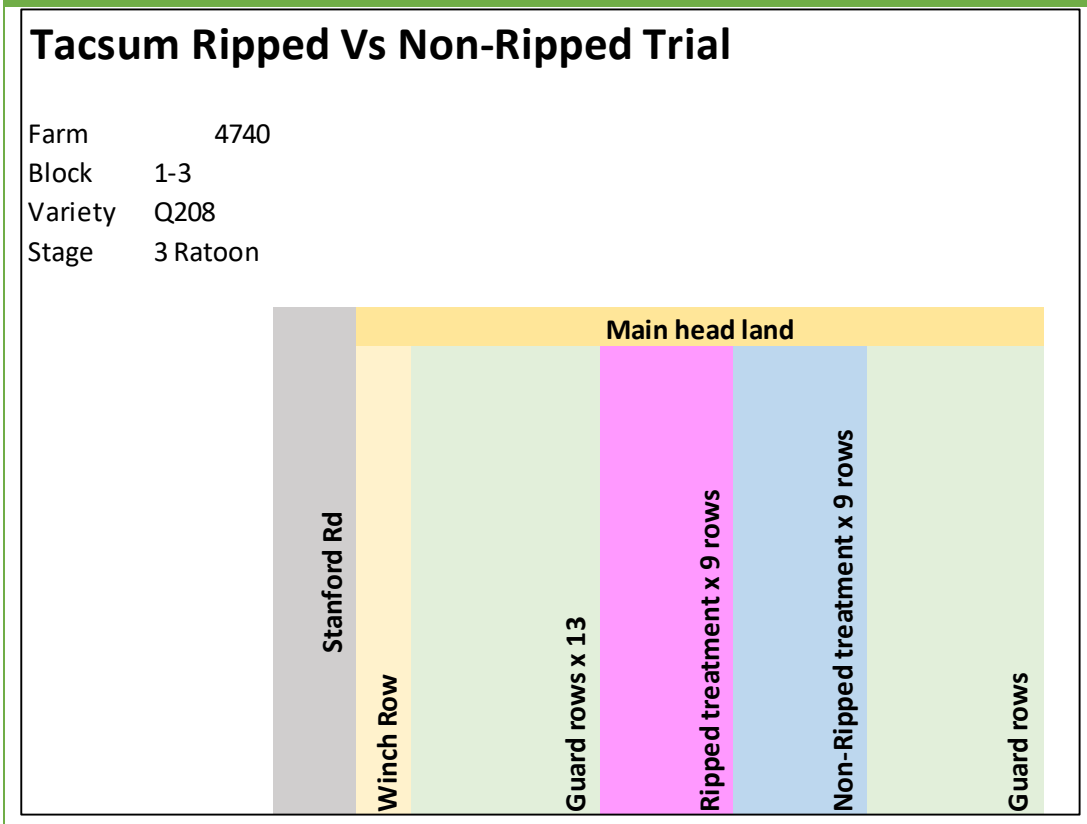


Figure 1 - Trial layout

Treatments

1. Ripped to 30 cm
2. Non-ripped

As shown in Figure 1, this trial had a simple layout to demonstrate the impact of different practices. The treatments consisted of a ripped (to 30cm) and non-ripped section of the block.

Results

In the first season after ripping, GDots® soil moisture monitors were installed to assess moisture content of the soil. Consistently, the non-ripped treatments showed that there was more moisture present, as shown in Figure 2. When combining this information with the harvest results where the ripped site was significantly higher yielding (Figure 3), it was decided to investigate the site further and implement some more informative assessments. GDot® sensors are not precision technology and only monitor to 40cm depth. A reading can only be obtained for a point in time by visiting the sensor on location.

Non-ripped	Ripped
	

Figure 2 - GDots indicating soil moisture levels. More dots indicate higher moisture content

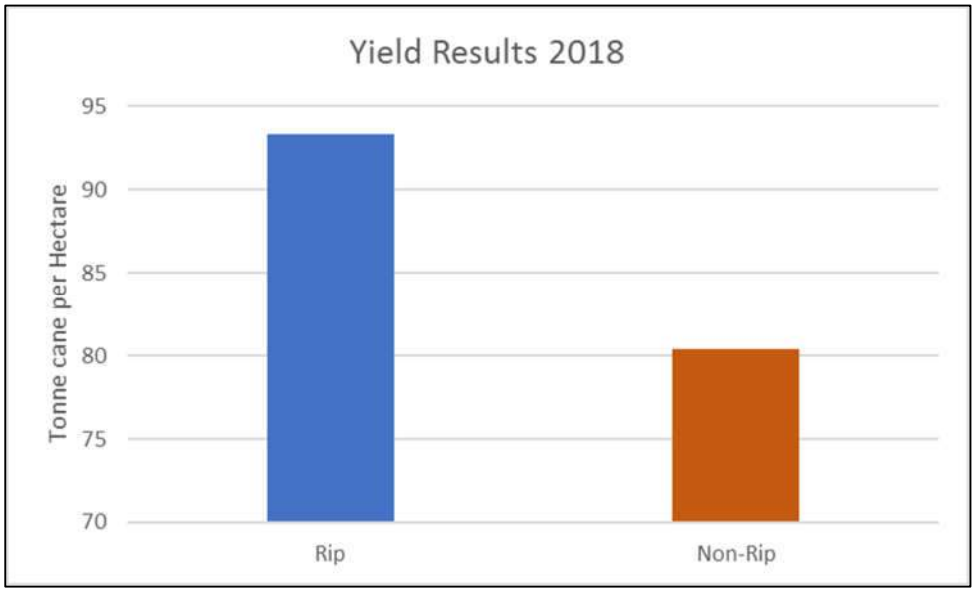


Figure 3 - Yield results from 2018 harvest

Figure 4 - Wireless moisture sensor

More advanced moisture sensors (Figure 4) were installed to measure moisture content every 10cm down to 80cm and have capability to store precision measured logged data. A reading was taken every half hour to assess the changes in moisture over time. To download the data an App is installed on a smart phone and, when in proximity to the sensor head, the unit downloads the data and uploads to a web-based platform for reporting and interpretation.

Trends of soil moisture content varied between sensor sites, however, one of the non-ripped sites was consistently higher than the other sites as shown in Figure 5.

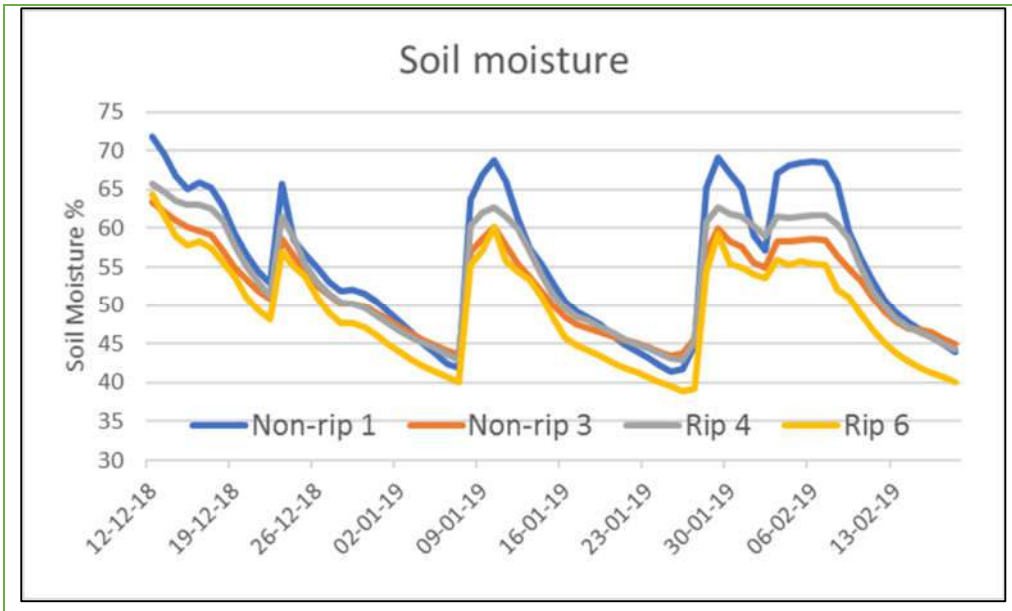


Figure 5 - Soil moisture content over time

To access the early impact on cane growth, measurements were taken throughout the season (Figure 6). In the 2018-2019 season, in most circumstances, the non-ripped site developed at a slightly faster rate than the ripped site.

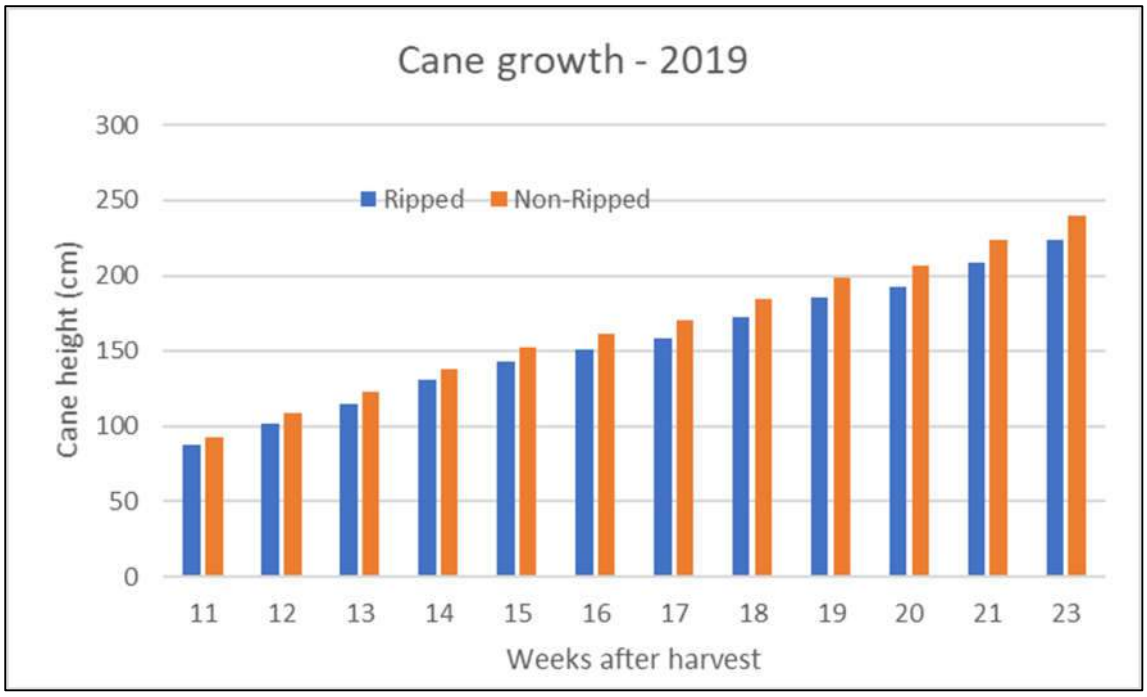


Figure 6 - Cane growth measurements 2019

Soil bulk density was measured (Figure 7) in the ripped and non-ripped sites to assess longer-term impact on soil compaction. As Figure 8 demonstrates the bulk density of the soil changed with depth. The non-ripped soil generally had a higher bulk density than the ripped soil.

Figure 7 – Collecting soil bulk density from interspace

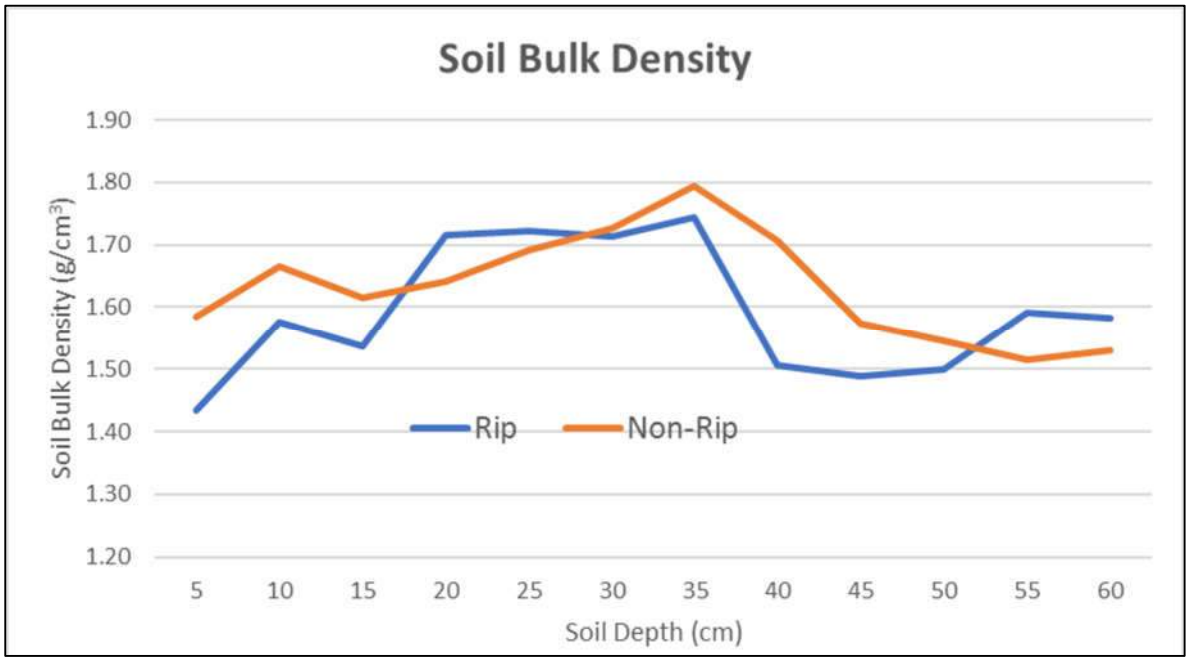
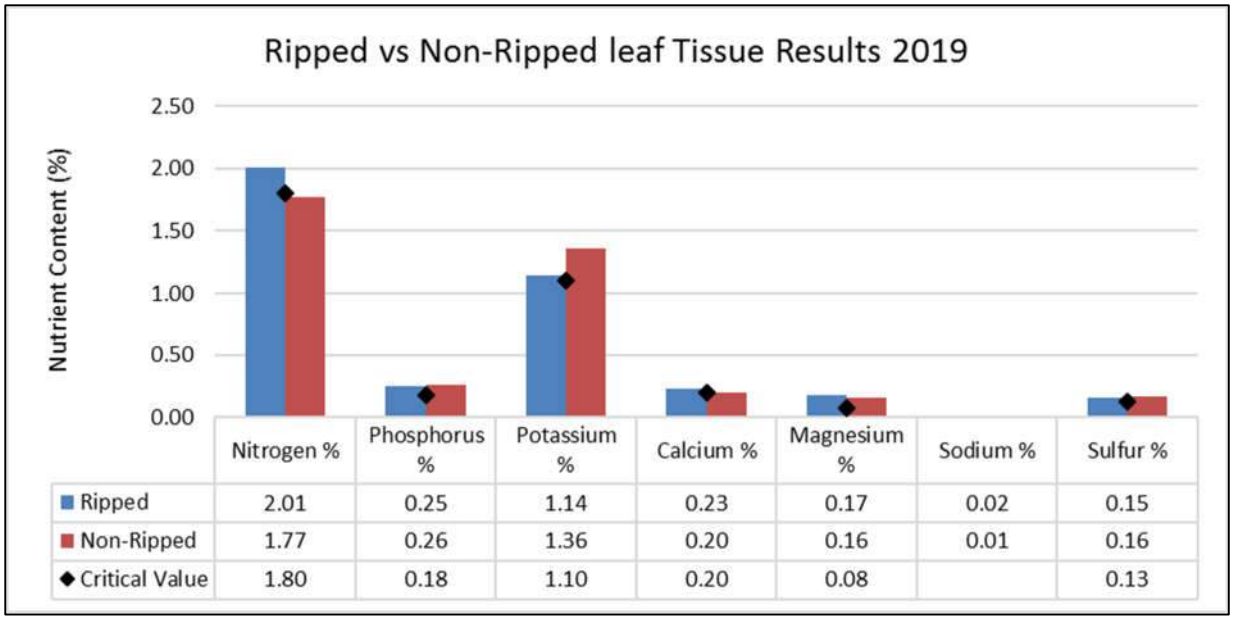


Figure 8 - Soil bulk density from 5 to 60cm.

Leaf Sample Results 2019

Leaf samples were taken in March 2019 to assess the difference between nutrient content of the cane in the ripped vs non-ripped treatments (Figure 9). Excluding nitrogen (N), all nutrients were above the critical value for both treatments. N content in the ripped treatment was higher than the non-ripped treatment, however opposite results for potassium (K) were obtained.



	Nitrogen %	Phosphorus %	Potassium %	Calcium %	Magnesium %	Sodium %	Sulfur %
Ripped	2.01	0.25	1.14	0.23	0.17	0.02	0.15
Non-Ripped	1.77	0.26	1.36	0.20	0.16	0.01	0.16
Critical Value	1.80	0.18	1.10	0.20	0.08		0.13

Figure 9- Leaf tissue results 2019

Harvest results 2019

The second-year harvest (Figure 10) show no yield difference between the two treatments.

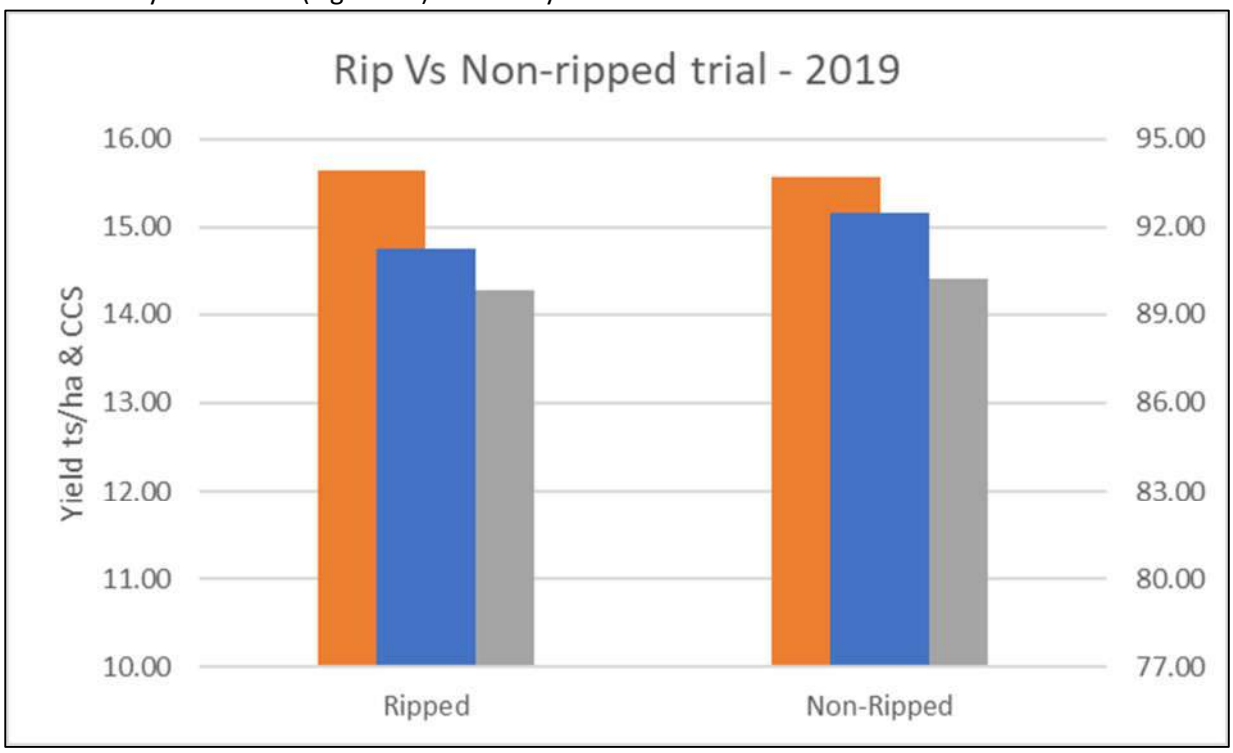


Figure 10- Yield harvest 2019

Harvest results 2020

The third-year harvest results demonstrate that the non-ripped treatment performed more favourably by 1.7 tS/ha (Figure 11).

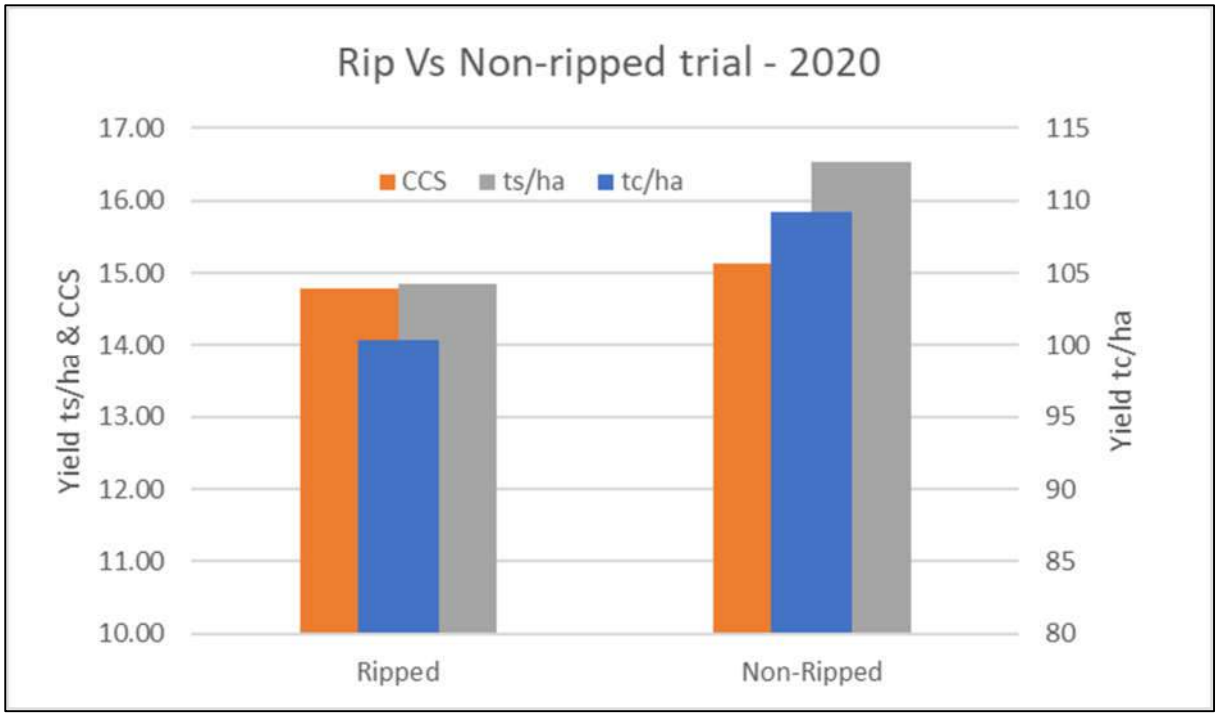


Figure 11- Yield harvest 2020

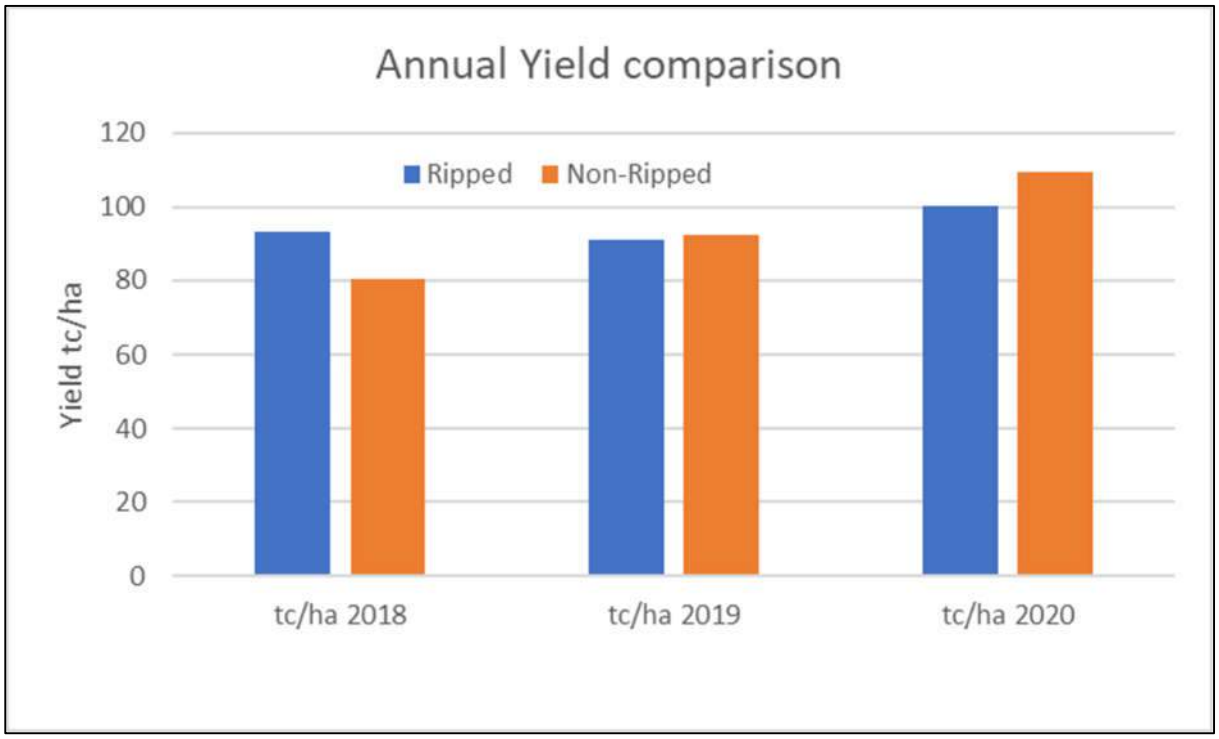


Figure 12- Yield comparison for 2018 to 2020

Conclusions and comments

The first harvest after ripping showed increased yield (Figure 3) on the ripped treatment, however, by the second year (Figure 10) the yields were the same for both treatments and the third year (Figure 11) showed the non-ripped site out-perform the ripped treatment. The annual yield trend for treatments is not conclusive (Figure 12), with the best yield exchanging between treatments.

Soil water extraction (Figure 5) showed insignificant difference between treatments, however, the soil bulk density (Figure 8) cores had the ripped soil with lower BD, indicating increased soil water holding capacity.

Cane growth rates for 2019 (Figure 6) had the non-ripped slightly taller than ripped treatment. The final non-ripped height was 160 mm greater then ripped.

Nutrient extraction by the crop was very similar with only small variation for N and K (Figure 9). All nutrients were considered above critical value and no influence on yield result.

The benefits for ripping are only manifested in the first year and mostly influencing water infiltration as soil surface has been compacted from wet harvest and prevents water infiltration. The depth of ripping to achieve suitable water infiltration may potentially be reduced from what tested in this trial, therefore reducing input costs and mitigating soil movement. By reducing soil losses there is less risk of sediment and nutrient movement into local catchments.

Grower observation at irrigation and during rainfall events concluded that a reduction in surface runoff was achieved in the first year only.

Advantages of this Practice Change:
Improve water infiltration on compacted soils, reducing runoff under moderate rain fall conditions.

Disadvantages of this Practice Change:
Benefits are short term. Potential exposure to soil erosion if high rainfall within short period after ripping.

Will you be using this practice in the future:
Ripping is used sparingly, and all effort is made not to compact soils in the first place.

% of farm you would be confident to use this practice :
For soils that compact when harvested under wet condition this practice will be utilised to reduce runoff.