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 Tabled by: Ms Nichols
 At: 10:40am Brisbane
 Time/date: 11/6/21
 Signature: S. Gallbreath

Summary

Total cane production in the Burdekin has been decreasing over the last 20 years, and did decrease from 2016 to 2020. The total area of land under cane production in the Burdekin has also declined over the last 20 years. Despite this, the amount of cane produced per hectare has actually increased over the last 20 years.

Production fluctuations occur across the 20-year period, both prior to and after the introduction of the Reef regulations and so it cannot be said that the 2016-2019 decline was due to the Reef regulations. These fluctuations are due to a combination of factors, including area of cane grown, sugar price, soil health, management practices and weather conditions.

Introduction

The enforcement of Reef regulations since 2016 has been suggested as a reason for a drop in cane yields in the Burdekin region. To investigate these claims, 20 years of Burdekin yield data (2001 to 2020) was gathered from Canegrowers and Sugar Research Australia (SRA). Using data from a longer period enables any recent changes to be considered in the context of longer-term variability. The first iteration of Reef regulations commenced in 2010, so this analysed time period spans the non-regulated period and the regulated period.

Cane production, tonnes

Between 2001 and 2020, annual total cane production in the Burdekin fluctuated, ranging from 6.4 million tonnes (in 2010) to 9.4 million tonnes (in 2011). This variability follows similar fluctuations in the area harvested, with area ranging from 49,800 hectares in 2010, to 80,000 hectares in 2011. The green dotted line on Chart 1 shows a small overall decline in total tonnes of cane production over the 20-year period. The blue dotted line shows an overall decline in area of cane harvested. The dotted lines are linear trends, which show if a variable is increasing or decreasing at a steady rate over time.

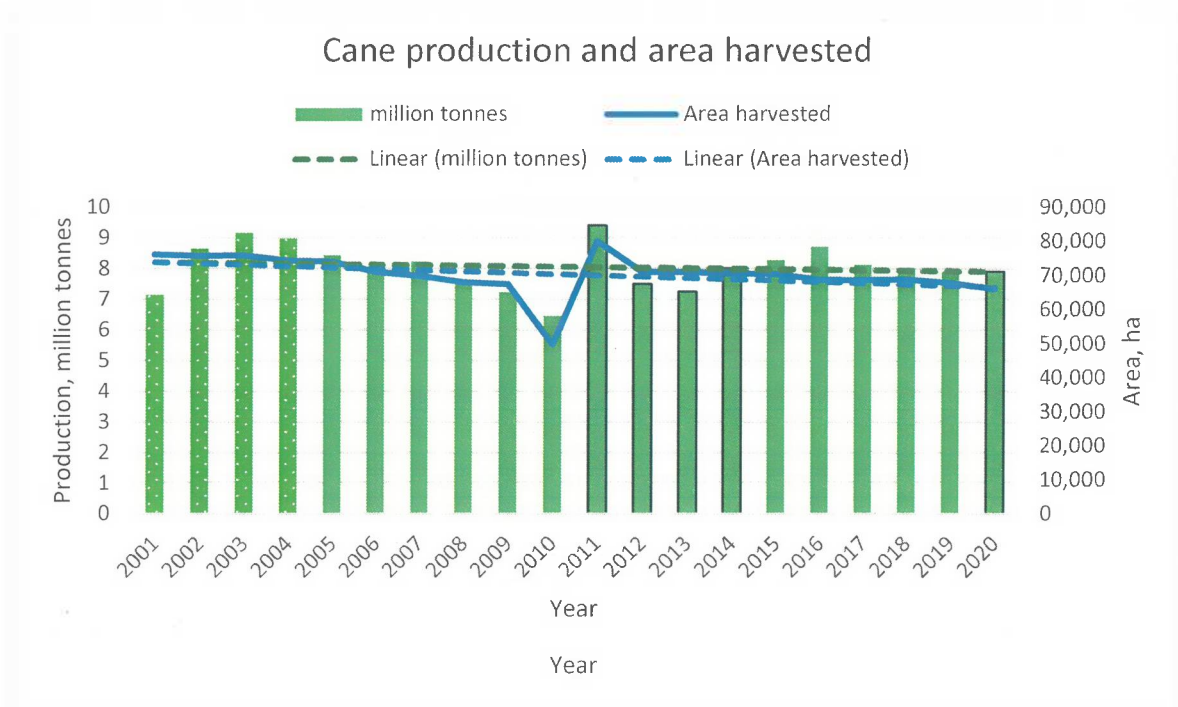


Chart 1. Annual cane production in tonnes, area harvested and trend lines 2001-2020. Outlined bars are data from SRA’s QCane Select regional reporting. All other data from Canegrowers Annual Reports. Dotted bars are the sum of Invicta, Pioneer, Kalamia and Inkerman mills.

Prepared by the Department of Environment and Science

Total production and area harvested have fluctuated due to various factors including cane left unharvested as a result of wet weather in 2010 associated with a La Niña event, and the subsequent large increase in tonnes and area (2011) due to the harvest of the additional standover cane. 2016 saw higher yields due to favourable growing conditions in the Burdekin including ideally timed rainfall and an early finish to crushing in 2015, allowing more time for ratoon crops to accumulate biomass (pers comms).

Cane production, tonnes per hectare (t/ha)

Over the 20-year period, tonnes of cane per hectare also fluctuated, ranging between 94 t/ha (in 2001) and 129 t/ha (in 2010).

The orange circle in Chart 2 shows that, while total production fell from 2016 to 2020 (chart 1), the tonnes per hectare during this period were higher and more consistent than in most of the previous 20 years. The green dotted line shows an overall increase in tonnes per hectare over the last 20 years, suggesting it is unlikely that enforcement of the Reef regulations has negatively affected yield per hectare.

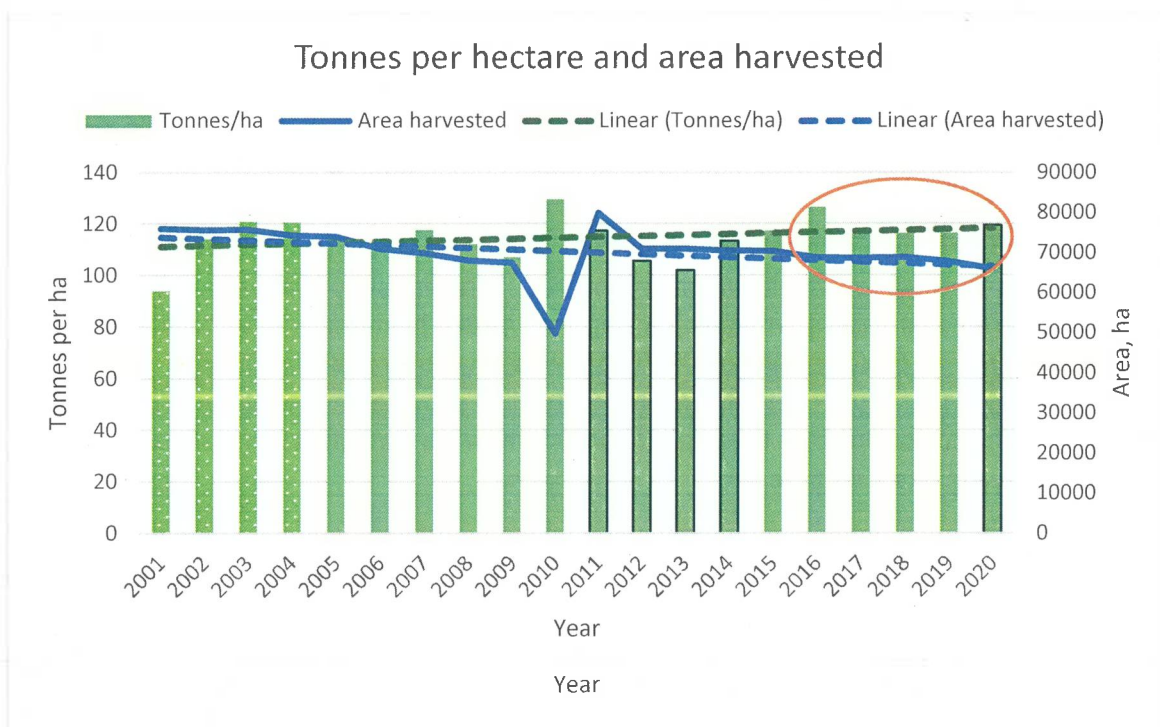


Chart 2. Annual production in tonnes per hectare (t/ha, area harvested and trend lines 2001-2010. Outlined bars are data from SRA’s QCane Select regional reporting. All other data from Canegrowers Annual Reports. Dotted bars are the sum of Invicta, Pioneer, Kalamia and Inkerman mills.

High tonnes per hectare in 2010 were due to the best cane being cut first during the harvest season because of an early onset to the wet season. The high tonnes per hectare in 2016 were due to the ideal growing conditions including ideally timed rainfall and an early finish to crushing in 2015 (pers comms).

Chart 3 shows all available data from SRA’s QCane Select Regional Reporting for tonnes of cane per hectare in the Burdekin, again demonstrating the variability in the region.

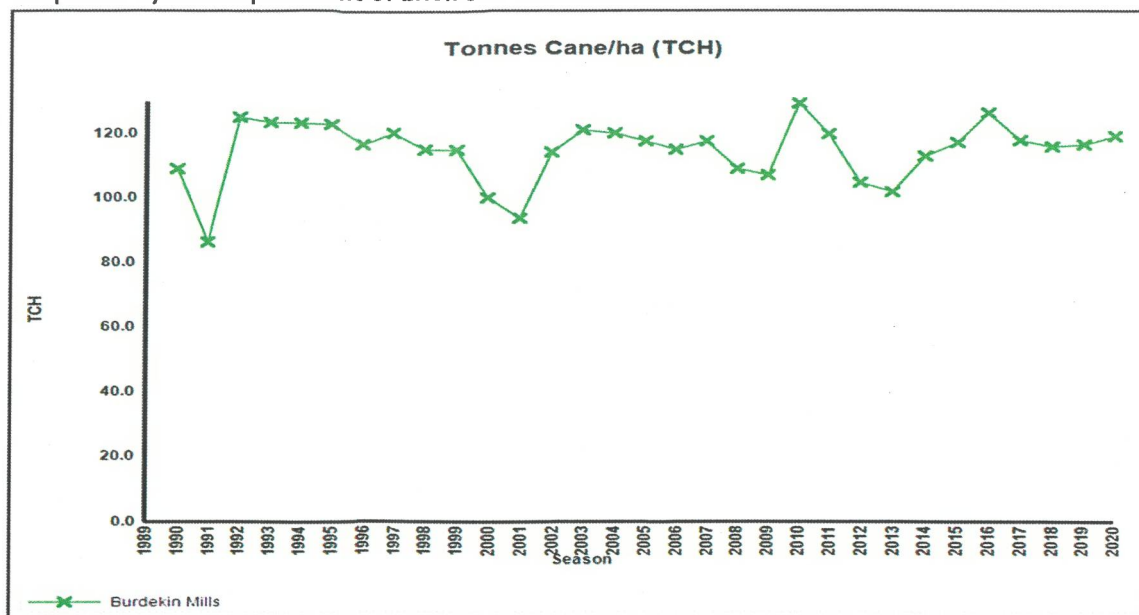


Chart 3. All available data for Burdekin mills for tonnes cane per ha. Source: SRA QCane Select Regional Reporting.

What else might have caused overall production to decline?

Many factors influence yield decline, including soil health and management practices such as a lack of break crops and excessive tillage. It is also known that weather variables such as rainfall, solar radiation and temperatures can affect cane yields (e.g. Everingham et al 2016, Muchow et al 1997). The results shown in Chart 4, indicate that the 2016-2019 yield decline coincided with higher rainfall, lower solar radiation, and lower maximum and minimum temperatures. Given that research has shown these weather conditions are associated with lower yields (e.g. Everingham et al 2016, Muchow et al 1997), it is likely that weather conditions during this period had an effect.

An analysis of the influence of weather on yield compared yield data with weather variables data over the 20-year period (not shown) and found significant relationships with rainfall, minimum temperature and solar radiation. This means there is 95% confidence that the relationships found are real and not due to chance.

Sugar yield has been declining for some time and was the basis of the Sugar Yield Decline Joint Venture study done in the late 1990's. The report released in 2000 found that "yield decline has been clearly associated with soil degradation caused by the long-term monoculture of sugarcane and how that monoculture has been practiced". The report also found that "yield decline appears to have been part of the Australian sugar industry for most of its history as declining yields under sugarcane monoculture were recorded as early as 1900".

References

Everingham, Y., Sexton, J., Skocaj, D., Inman-Bamber, G., 2016. Accurate prediction of sugarcane yield using a random forest algorithm, *Agronomy for Sustainable Development*, (2016) 36: 27.

Muchow, R.C., Evensen, C.I., Osgood, R.V., Robertson, M.J., 1997. Yield accumulation in Irrigated Sugarcane: II. Utilization of Intercepted Radiation, *Agronomy Journal*, 89: 646-652.

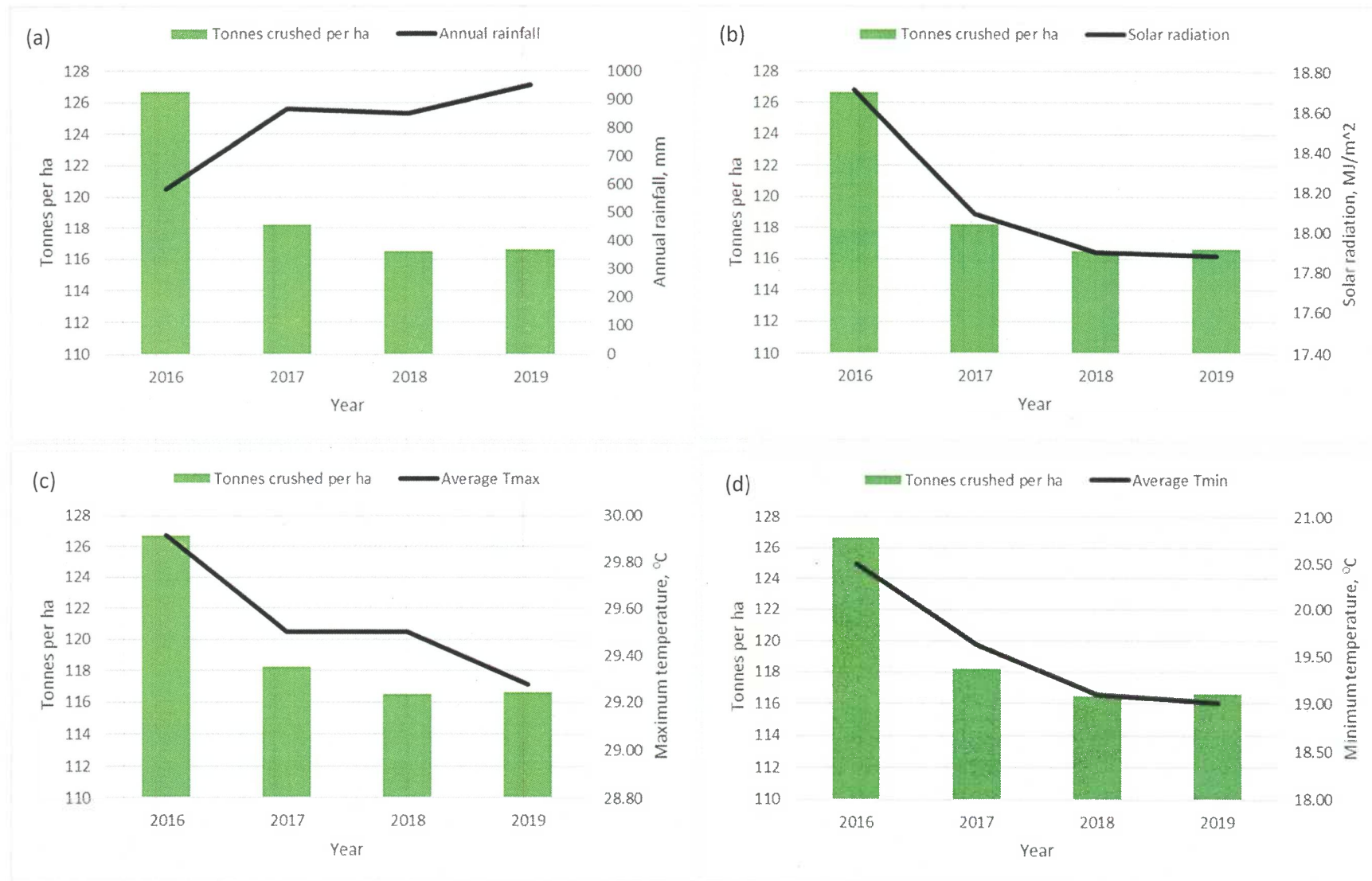


Chart 4. Plots of tonnes cane per ha (green bars) overlaid with meteorological variables (black lines) for the period 2016-2019 (a) rainfall, (b) solar radiation, (c) maximum temperature (Tmax), (d) minimum temperature (Tmin).