

REFEREED PAPER

REVIEW OF SOUTH AFRICAN SUGARCANE PRODUCTION IN THE 2018/19 SEASON: TOO MUCH OF A GOOD THING?

SINGELS A^{1,4}, MCFARLANE SA¹, BASDEW I¹, KEEPING MG¹, NICHOLSON R², PILUSA T³, SITHOLE P¹, AND TITSHALL LW^{1,4}.

¹South African Sugarcane Research Institute, Private Bag X02, Mount Edgecombe, 4300, South Africa

²South African Cane Growers' Association, 170 Flanders Drive, Mount Edgecombe, 4300, South Africa

³South African Farmers Development Association, 170 Flanders Drive, Mount Edgecombe, 4300, South Africa

⁴School of Agricultural, Earth and Environmental Sciences, University of Kwazulu-Natal, Private Bag X01, Scottsville, 3209, South Africa

abraham.singels@sugar.org.za

Introduction

During the 2018/19 season the South African sugar industry produced 19.03 million tons (Mt) of cane from an estimated 250 028 hectares harvested, translating in an estimated industry average cane yield of 76.1 t/ha. Corresponding amounts of the 2016/17 and 2017/18 seasons were 15.07 and 17.39 Mt harvested from 249 918 and 253 912 ha, respectively, with average cane yields of 60.3 and 68.5 t/ha. Sugar production rose to 2.19 Mt in 2018/19, compared to values of 1.55 and 1.99 Mt for the 2016/17 and 2017/18 seasons, respectively. The cane to sugar ratio was 8.67 in 2018/19, compared to values of 9.65 for 2016/17 and 8.72 for 2017/18.

Production data seem to suggest that the long term trend of declining cane production and area under cane may have bottomed out, with area under cane stabilising around 360 000 ha, and production ranging from about 15 to 19 Mt depending on condition (Figure 1).

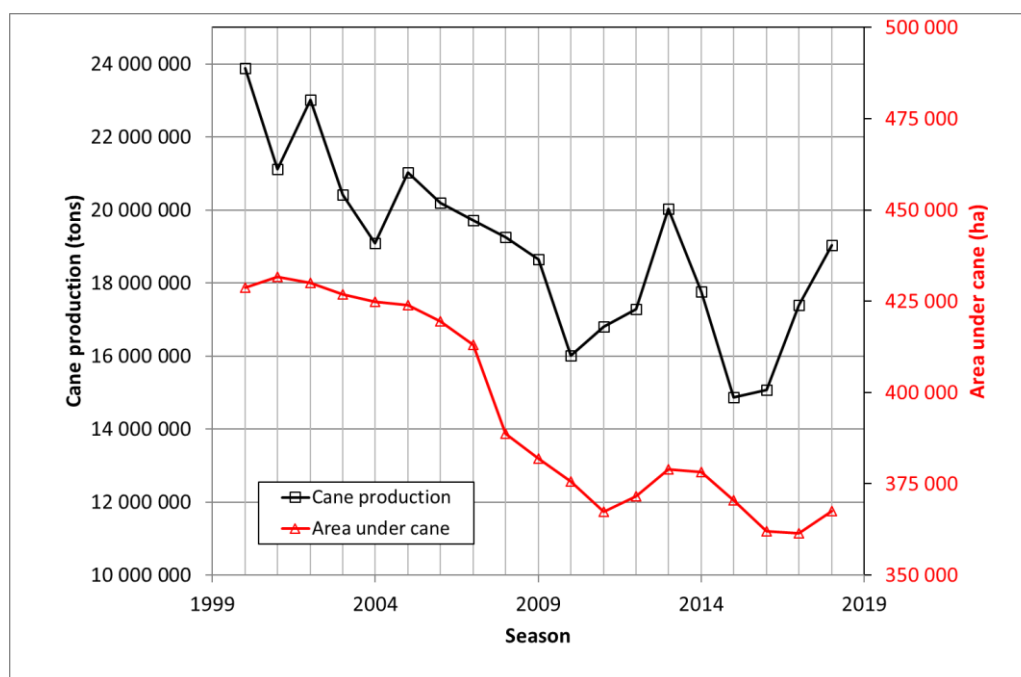


Figure 1. Cane production and area under cane in the South African sugar industry since 2000.

Mill level production increased further from the previous two seasons and exceeded the five season mean for most mill supply areas (MSAs), with the exception of the southern MSAs of Eston, Sezela and Umzimkulu (Figure 2).

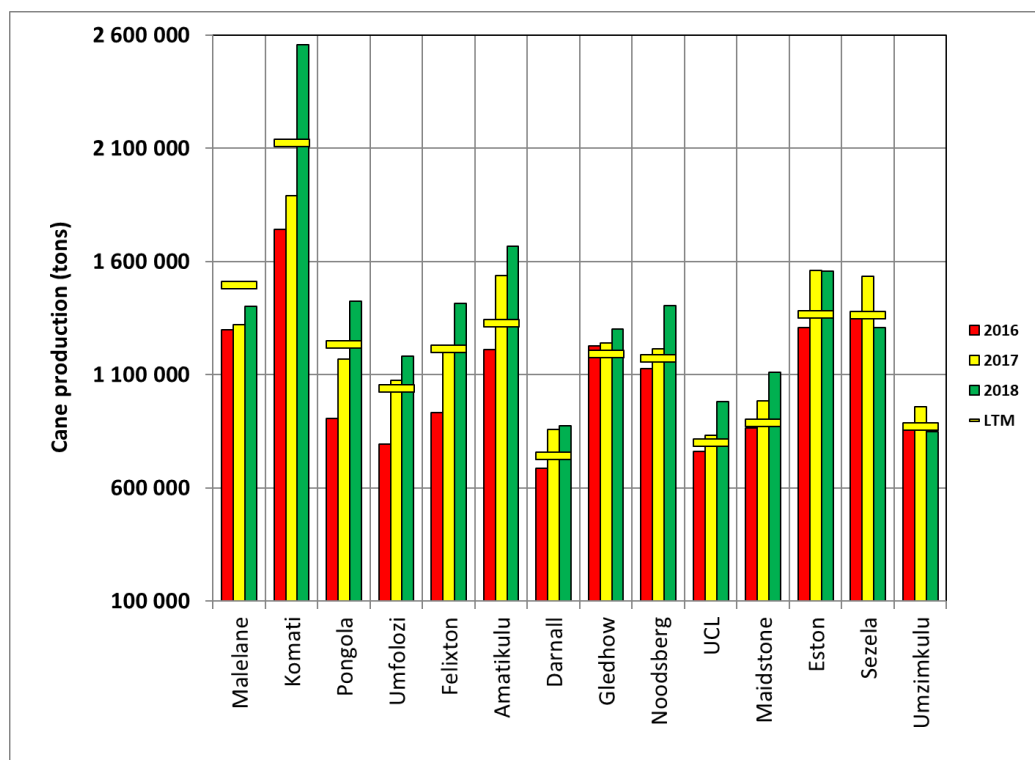


Figure 2. Cane production for different mill supply areas for the 2018/19 season compared to the 2016/17 and 2017/18 seasons and the five-season mean (Long term mean (LTM) shown as yellow horizontal bars).

This paper analyses cane production for the 2018/19 season, and relates the key performance indicators of cane yield and cane quality to the main production factors of climate, pests and diseases, agronomic and economic conditions. This is to provide insight into successes and failures of recent production strategies, and identify priorities for improved efficiency in producing high quality sugarcane in South Africa.

Methodology

A similar methodology was followed to that used in previous reviews (Singels *et al.*, 2014). Production data were mostly analysed at the MSA level, while in some cases pest and disease data were grouped or subdivided into pest and disease areas as defined by Local Pest, Disease and Variety Control Committees of the South African Sugar Association (SASA). Some results are also discussed in the context of broad agro-climatic regions (Figure 3).

The sugarcane produced in the 2018/19 milling season grew mostly from between April 2016 (long cycle cane) and December 2017 (annual cane), to between April 2018 and December 2018, when it was harvested. For simplicity, both the growing and milling seasons are referred to as the 2018 season.

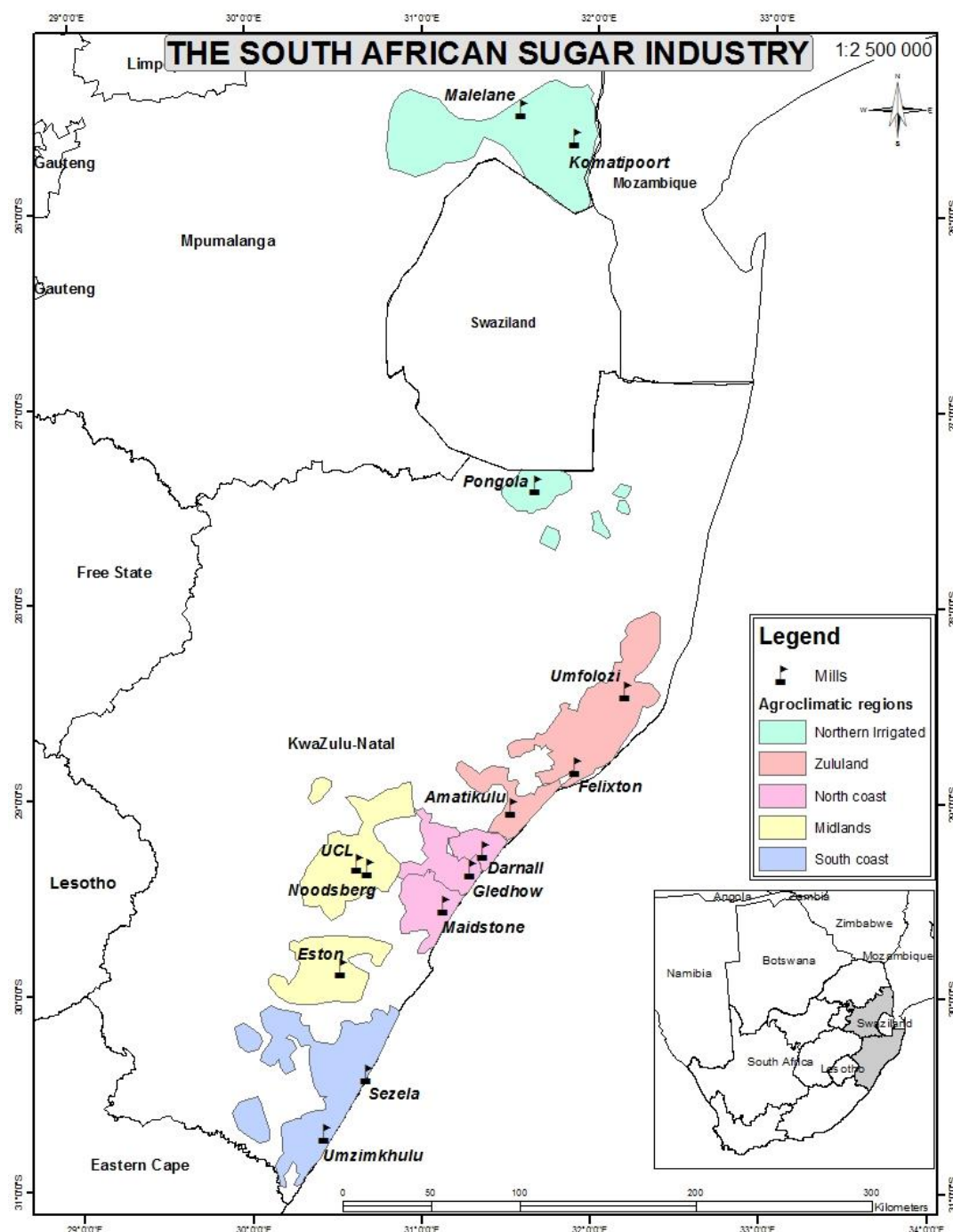


Figure 3. Map showing the 14 South African sugar mills and their location within broad agro-climatic production regions (source: South African Sugarcane Research Institute, Geographic Information Systems office).

Production data

Production (cane deliveries and cane quality) data were obtained from the SASA Cane Testing Service database, while the estimated area harvested was gleaned from survey data from the SASA Industry Affairs or from data provided by the Mill Group Boards.

Rainfall

Rainfall records from various weather stations, averaged per MSA, were obtained from the South African Sugarcane Research Institute (SASRI) weather database (sasri.sasa.org.za/weatherweb/). Twelve-month totals or average values leading up to each month of the 2018 milling season (e.g. 1 April 2017 to 31 March 2018, 1 May 2017 to 31 April 2018, and so forth) were compared to the corresponding long term mean (LTM) values. The deviations from the LTM (anomalies) were in turn compared to the corresponding anomalies for the 2016 and 2017 seasons.

Soil health

Trends in soil organic matter status, a key soil health indicator, were investigated by extracting the relevant data from the Fertiliser Advisory Service database for samples submitted for routine soil fertility analysis in 2018 and in 2013. Median and 1st and 3rd quartile values were determined for each MSA.

Pests

SASRI Biosecurity teams conduct industry-wide pest surveys annually. *Eldana saccharina* Walker (Lepidoptera: Pyralidae) (eldana) infestations are quantified as the number of larvae per 100 stalks (e/100). Larval numbers were averaged for different MSAs over the 12-month period from June 2016 to May 2017. For analysis, seasonal average infestation levels for different MSAs and for the industry as a whole were compared to that of the previous two seasons, as well as to the mean over the last five and 15 seasons.

In the Entumeni area, fields were regularly surveyed by SASRI Biosecurity teams for the flying adult longhorn beetle (*Cacosceles newmannii*) and for grubs.

Diseases

The same data collection and processing procedures were followed as described by Singels *et al.* (2014). SASRI Biosecurity teams inspected 6 450 commercial fields and 3 325 intended seedcane sources for smut, mosaic and off-types during the June 2017 to May 2018 period. Inspections covered over 40 900 ha representing approximately 11% of the area under cane. Note that while disease surveys are mostly random, almost all of the remaining fields of the smut-susceptible variety NCo376 in the Zululand region are inspected each year. A total of 6 263 commercial fields were tested for RSD.

Economic information

Large scale commercial farm economics were analysed using survey data from SA Cane Growers' Association (SACGA, 2018a). Only actual data for the 2016 season were available. Data for the 2017 season were estimated using indices from reports by the Department of Agriculture, Forestry and Fisheries (DAFF, 2018), while estimates for the 2018 season were based on the average inflationary increase (Statistics South Africa, 2018). The survey elicited cost and income data from a sample of large scale growers from the 14 MSAs in SA. Average cost and income statistics reported in this study were determined by weighting MSA values by the deliveries of large scale growers in each MSA.

Small-scale (less than 10 ha) farm economics were based on a survey conducted by the South African Farmers Development Association amongst small-scale growers during the 2018 season (SAFDA, 2018).

Results and Discussion

Firstly, production conditions during the 2018 growing season are reviewed, focusing on rainfall, irrigation, soil health and pests and diseases. The impacts of these factors on cane productivity are then discussed, followed by a brief review of economic conditions and its impacts on grower profitability.

Production conditions

Rainfall and irrigation

Growing season total rainfall was above normal for Zululand and North Coast MSAs and below normal for Mpumalanga, Midlands and South Coast MSAs (Figure 4). Industry average rainfall was close to normal.

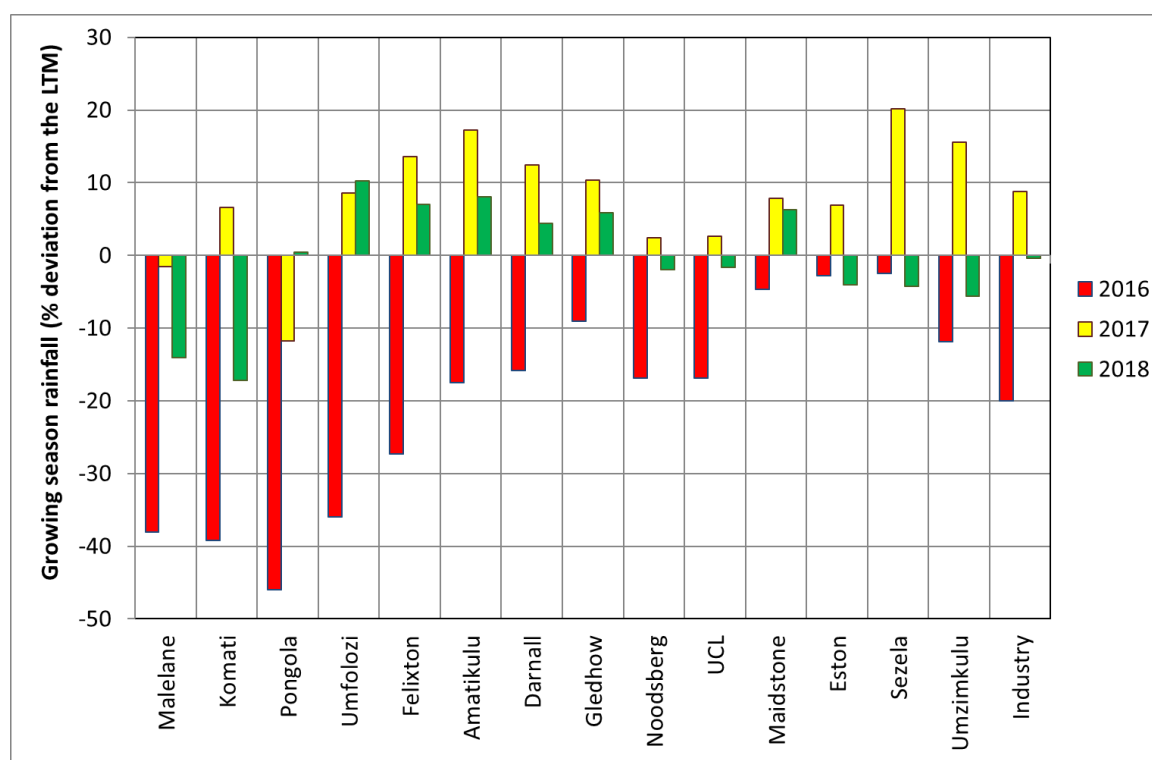


Figure 4. Total 12-month rainfall expressed as a percentage deviation from the long term mean (LTM), averaged over each month of the harvest season for different mill supply areas and the industry as a whole for the 2018 season compared to the 2016 and 2017 seasons.

Monthly rainfall averaged for Kwazulu-Natal stations in rainfed areas in 2016/17 was close to normal, but with dry spells in December 2016 and in March and April 2017 and very high rainfall in February and May of 2017 (Figure 5). The 2017 winter was relatively dry, followed by good rainfall in the last three months of 2017. A dry spell during the first two months of 2018 was followed by good rains during the autumn months of 2018. The winter of 2018 was dry and spring rainfall was close to normal except for November, which was well below normal.

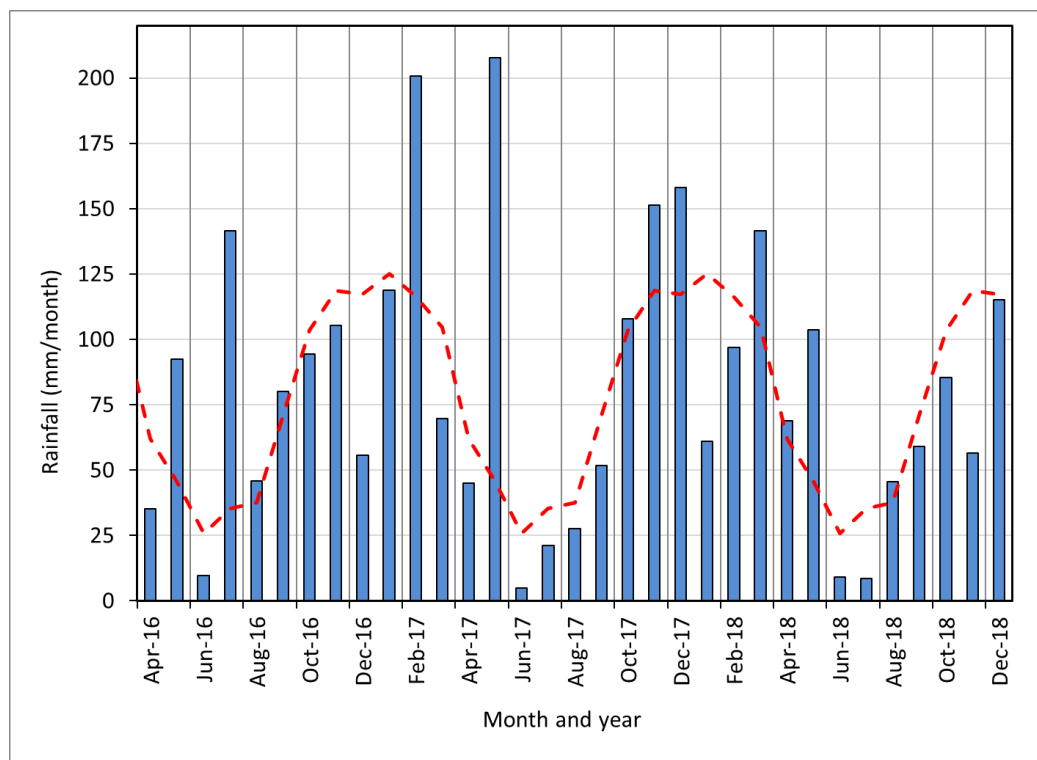


Figure 5. Monthly rainfall averaged for KwaZulu-Natal from April 2016 to December 2018 (bars) compared to the long term mean monthly values (line).

Irrigation water allocations in 2018 improved markedly from the previous two seasons for all sources but remained very low in the Umhlatuze catchment (Table 1).

Table 1. Growing season average water allocation expressed as a percentage of the full allocation for different water sources for the past three seasons.

Mill supply area	Irrigation water source	2016	2017	2018
Komati, Malelane	Komati	49	33	57
Malalene, Komati	Crocodile	47	54	67
Pongola	Bivane	34	57	65
Felixton	Umhlatuze	18	18	27
Umfolozi, Felixton, Pongola	Pongolapoort	89	80	88
Umfolozi	Umfolozi	34	65	80

Soil health

Soil organic matter (OM) is considered an indicator of soil health and function due to its critical role in several physical, chemical, and biological soil processes. Several management practices associated with intensive sugarcane cultivation can lead to declines in soil OM content, where residue burning, intensive cultivation and excessive erosion are primary causes of OM loss.

For all MSAs the median top soil (0-20 cm) OM values ranged between 2 and 4%, suggesting generally acceptable OM levels. It is, however, concerning to note that in all MSAs there were declines in the median, and first and third quartile OM levels from 2013 to 2018 (Figure 6). It

is however, interesting to note that maximum values were higher in 2018 than in 2013 for most MSAs. Anecdotal evidence suggests these maxima are frequently associated with increased OM inputs (notably green cane harvesting and mulching, green manuring between replanting, and organic products added to soil) and improved OM conservation (e.g. conservation tillage practices and erosion control measures) practices on some farms. It is also worth keeping in mind that the OM measurements in 0 – 20 cm soil depth range may lack sensitivity to more dramatic changes that are likely to occur very near the soil surface (0 – 5 cm depth) due to changes in management practices such as mulching. Ideally a more refined sampling methodology is required to truly elucidate the specific impacts of shifts in practice affecting OM accumulation.

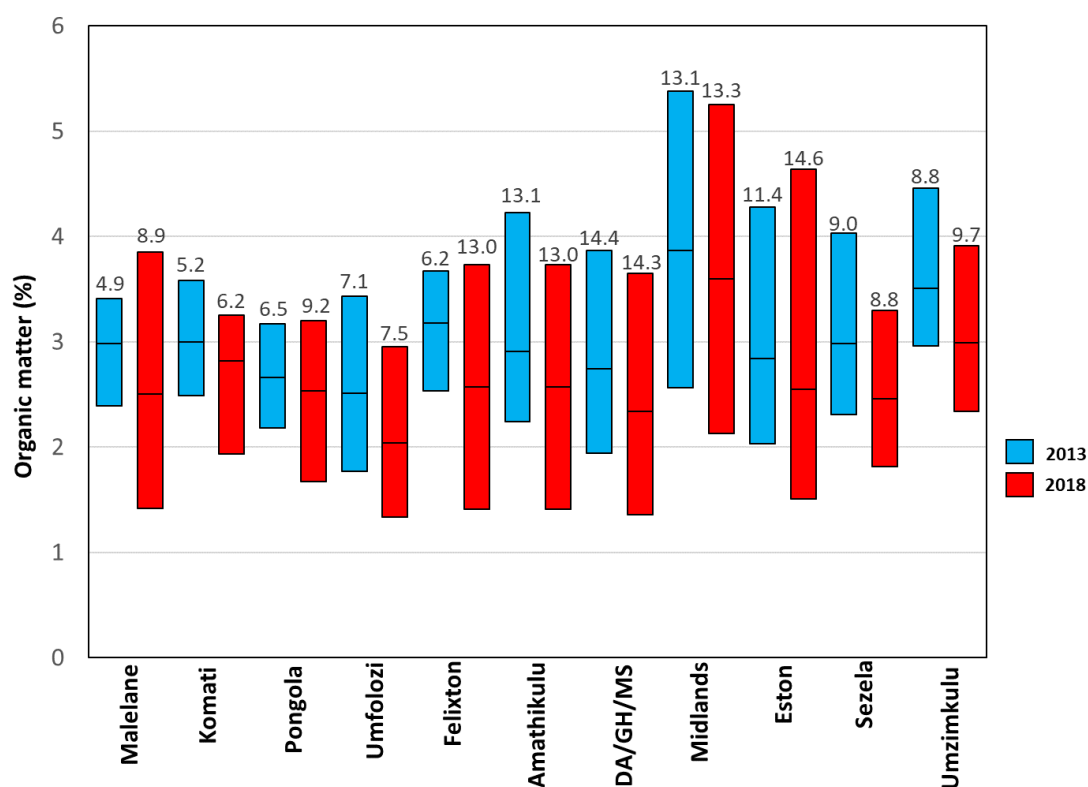


Figure 6. Box plots of organic matter as determined by SASRI FAS for topsoil (0-20cm) samples sent from the different mill supply areas in 2013 and 2018. The box indicates values at the 1st quartile, median and 3rd quartile, and the values above each bar are the maximum value recorded in an area.

Pests

Eldana

Eldana infestation levels declined markedly in most rainfed areas (Figure 7). Improved water status in 2017 and 2018 (see Figure 5), in comparison to the severe drought experienced in 2015 and 2016, likely played a major role. A marked exception was noted for Pongola where infestation levels increased sharply to above the 5 and 15 season means. This is ascribed to excessive aging of some crops due to limited milling capacity.

Despite the increased infestation levels in Pongola, industry average infestation levels declined further from 2017 and was below the five season mean. The overall trend of the long term decline in infestation levels across the industry is very encouraging and reflects keen vigilance by the SASRI Biosecurity teams and growers, and increased implementation of

integrated pest management strategies. Scouting and implementation of robust control measures needs to remain a priority going forward.

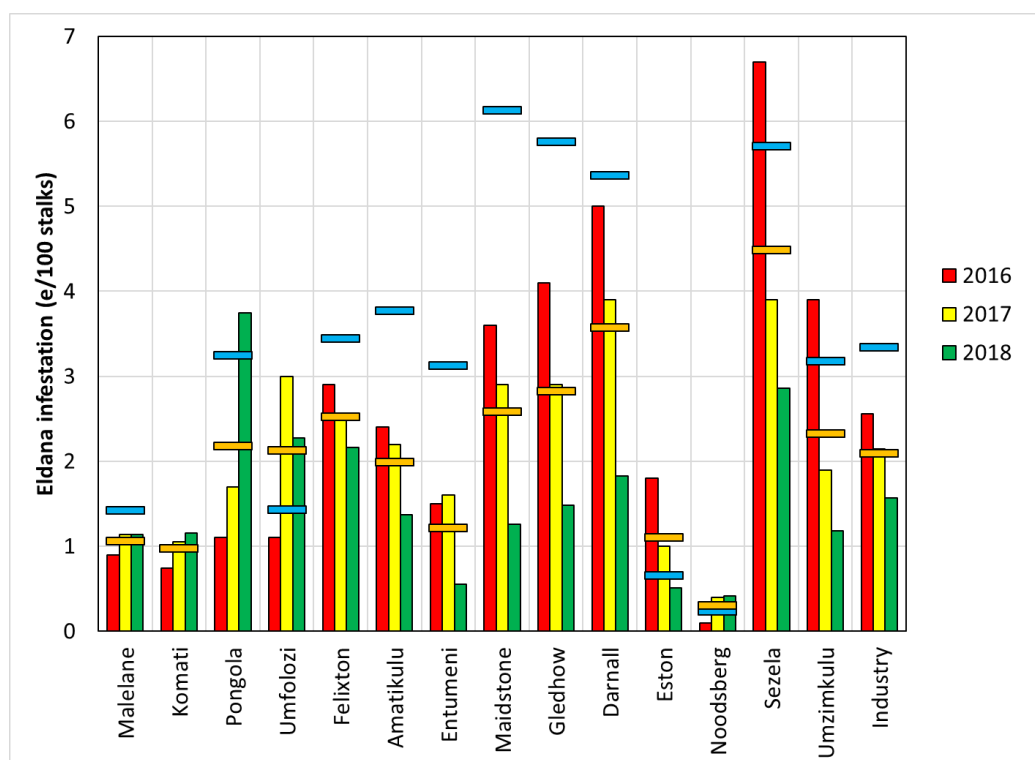


Figure 7. Eldana infestation for different areas and for the industry as a whole for the 2018 season, compared to the 2017 and 2016 seasons and to the mean value over the past five (yellow horizontal bars) and 15 seasons (blue horizontal bars).

Longhorn beetle

Adult longhorn beetle (*Cacosceles newmannii*) flights were observed in the Entumeni area from February 2017 until March 2018, but far fewer specimens were collected compared to the same period in 2016/17. These flight events, which occurred on warm days, seemed associated with good rainfall that preceded hot and dry conditions. It also proved more difficult in 2017/18 than in 2016/17 for the SASRI Biosecurity Team in Entumeni to find larvae in the fields that were previously heavily infested. The incidence of the grubs appeared higher in sandier soils (clay content below 25%) derived from the Natal Group Sandstone. Two pupal cocoons were found, one immediately below an old stool in a previously eradicated field at a depth of 20 cm. This confirmed that mature larvae pupated beneath stools, but could remain untouched during cane eradication and plough-out if all stools were not removed in the process. A further 198 ha of infested sugarcane had to be destroyed to contain the pest, bringing the total area removed from cane production to 1122 ha. This leaves approximately 1576 ha of cane still in production in Entumeni. A workshop of researchers and various other parties involved in the containment and research effort was held at SASRI in June 2018, followed by a group visit to the Entumeni area to review work done so far and plan future actions. These will include continued surveys by biosecurity teams, and research at SASRI and the Universities of Pretoria and Stellenbosch.

Yellow sugarcane aphid

The yellow sugarcane aphid (*Sipha flava*) now occurs throughout the South African sugar industry. It also occurs in Swaziland, Mozambique, Zimbabwe, and in Zambia, where it is especially problematic. In order to address grower concerns over the spread of the pest, particularly in the North Coast region, SASRI has recently assembled a task team to research the pest's ecology in order to determine the main drivers of infestation, and explore insecticidal and biological control options. Long-term practical applications for in-field use, which will promote pest management in a more sustainable manner, will be devised from this information.

Diseases

Smut

The overall prevalence and incidence of smut in the industry was similar to the 2017 season but higher than the five season mean, with 25% of the area surveyed being infected (Figure 8). Smut was most prevalent in Pongola, and unchanged from the 2017 season, with 59% of the area surveyed being infected. Incidence was largely below the permissible level of 2% stools infected set for the area. Incidence exceeded 10% stools infected (a level where yield loss is expected) in five fields surveyed in the 2018 season. Roguing orders were issued for 111 fields (420 ha) and crop eradication orders for eight fields (17.5 ha). Varieties most commonly infected were N19, N25 and N41. There was a substantial increase in smut prevalence in Umfolozi compared to the previous two seasons and the five season mean. Almost half of the area that was found to be infected during the 2017-18 surveys was above the permissible level for the area of 1% stools infected. All these fields were planted to the smut-susceptible variety NCo376. Smut incidence exceeded 10% stools infected in six fields (five on one farm) covering an area of 22 ha. Roguing orders were issued for 11 fields (66 ha). Smut prevalence was below the five season mean in Malelane and Komati and most of the area surveyed was below the permissible level of 4%. No fields exceeded 10% stools infected. Ten roguing orders (67 ha) and 10 crop eradication orders (64 ha) were issued in the Malelane and Komati areas. Two large fields with high levels of infection contributed to the marked increase in the area infected in Darnall, with levels exceeding 10% in one field of N16. The number of surveys conducted in commercial fields in Eston was limited due to an increased focus on eldana. No disease surveys were conducted in commercial fields in Amatikulu due to the team assisting with longhorn beetle surveys in Entumeni.

Sugarcane mosaic virus

The overall prevalence of sugarcane mosaic virus in the industry was low and similar to the previous two seasons and the five season mean, with 3% of the area surveyed being infected (Figure 9). While the disease was most prevalent in the Midlands North area, the area infected with mosaic was below the five season mean and lower than the previous season. Incidence was low with most fields being below the permissible level of 3% stools infected. There was a notable increase in mosaic incidence in the Darnall area, mainly due to extremely high levels in two fields of NCo376. Mosaic was most common in N19 in the Malelane area, NCo376 in the southern, coastal parts of the industry and N12 in the midlands region. One roguing order was issued for a field (3 ha) in the Umzimkulu area.

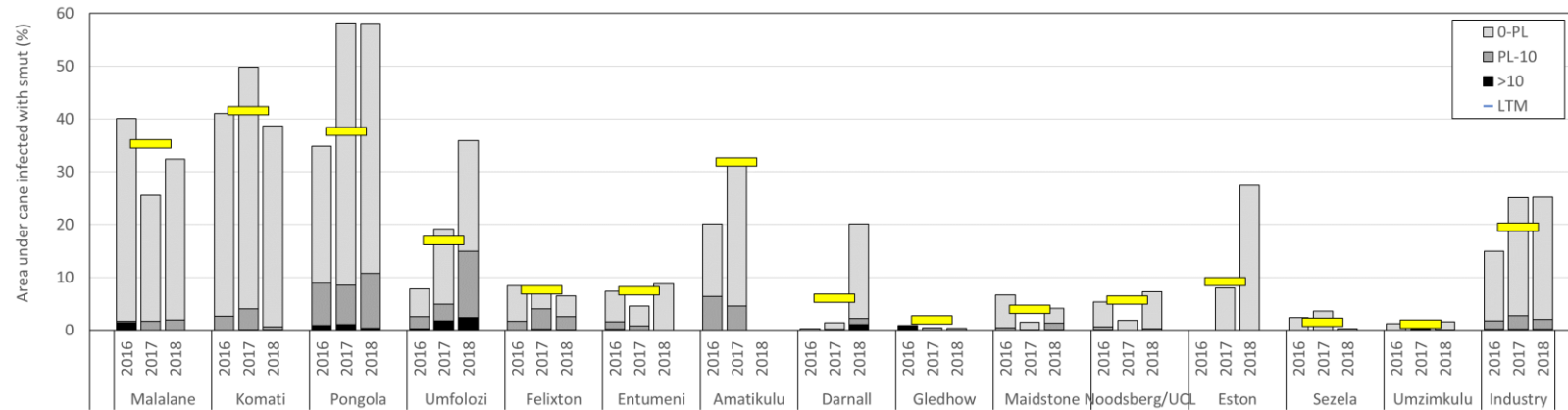


Figure 8. Percentage area under cane infected with smut at three different levels, as recorded from June 2017 to May 2018 (2018) in the different pest and disease areas and for the industry as a whole, compared to that for the corresponding periods in the 2016 and 2017 seasons. The five-season mean smut infested area under cane is also shown (LTM shown as yellow horizontal bars). (PL- area specific permissible level: Malelane, Komati - 4%; Pongola - 2%; all other areas - 1%).

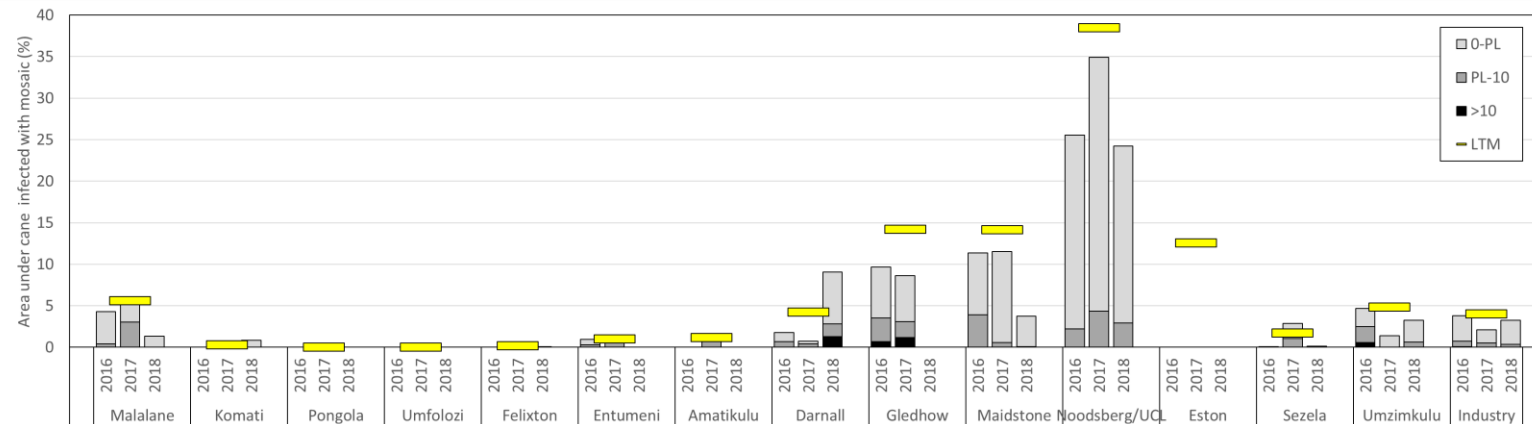


Figure 9. Percentage area under cane infected with mosaic at three different levels, as recorded from June 2017 to May 2018 (2018) in the different pest and disease areas and for the industry as a whole, compared to that for the corresponding periods in 2016. The five-season mean area under cane infected with mosaic is also shown (LTM shown as yellow horizontal bars). (PL - area specific permissible level: Malelane, Komati - 5%; Pongola, Umfolozi - nil; Felixton, Entumeni, Amatikulu, North Coast region - 1%; Midlands and South Coast region - 3%)

Rust

Rust did not appear to be as common or severe as in 2017 and early 2018. Based on limited records for the 2017/18 season, brown rust was observed on varieties N27 (moderate to severe), N39 (mild), N42 (moderate to severe) and N44 (mild). Tawny rust was observed on N12 (mild) and N16 (moderate-severe) and N57 (severe). Mild to moderate rust was reported on N31 and N52 but was not identified.

Ratoon stunt (RSD)

RSD levels for the industry were lower than the five and ten-season means in both commercial fields (3.2%) (Figure 10) and intended seedcane sources (1.1%) (data not shown). While RSD incidence was higher in commercial fields than the industry average in Umfolozi (10%), Pongola (8%) and Mpumalanga (4.5%), levels were below the five- and ten-season means. The situation should continue to improve with the renewed focus on developing strategies to ensure an adequate supply of certified and approved seedcane in the industry by 2023.

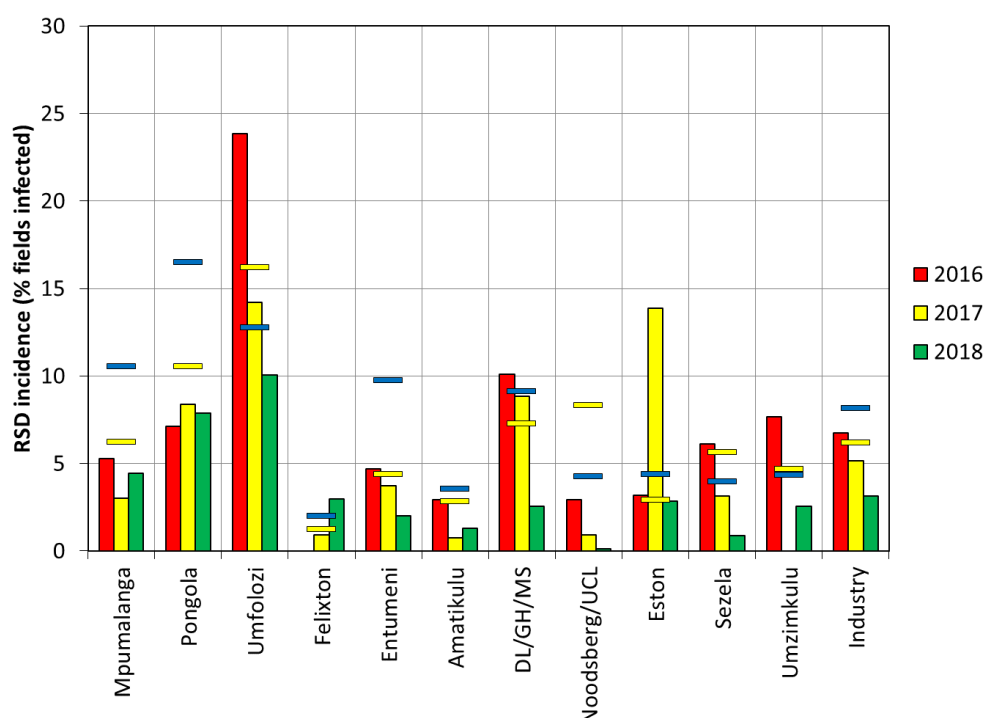


Figure 10. Ratoon stunt (RSD) incidence for different pest and disease areas and for the industry as a whole for the period June 2017 to May 2018 (2018) compared to that of the corresponding periods for the 2016 and 2017 seasons. The mean values over the past five (yellow horizontal bars) and ten seasons (blue horizontal bars) are also shown. (DL/GH/MS – Darnall/Gledhow/Maidstone)

Cane yield and quality

MSA average cane yields (Figure 11) increased markedly in the northern irrigated MSAs from 2017, due to much improved irrigation water supplies. Most mixed and rainfed MSA yields also increased from 2017, with the exception of Amatikulu, Sezela and Umzimkulu MSAs. Industry average yield increased further to more than 76 t/ha, the highest yield achieved since 1988, matching closely the high yields of the 1988, 2002 and 2013 seasons (Figure 12).

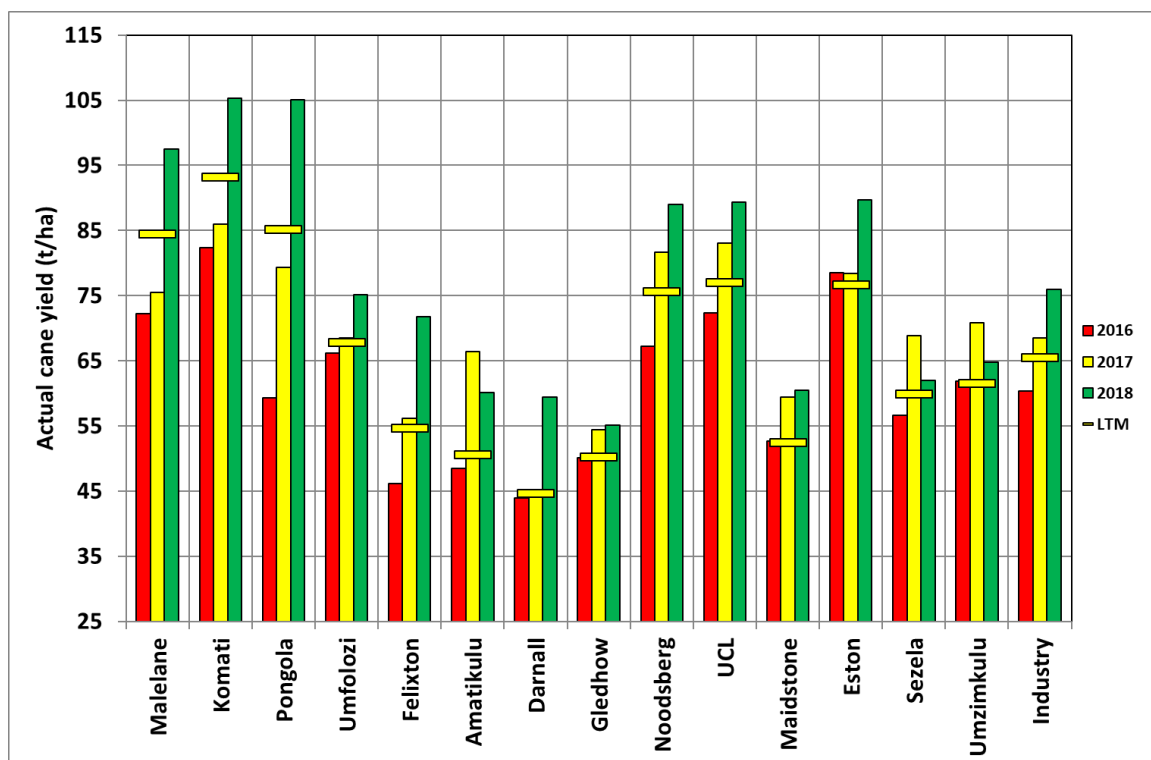


Figure 11. Average cane yields in the 2018 season for different mill supply areas and for the industry as a whole, compared to the 2016 and 2017 seasons and the five-season mean yield (LTM), shown as yellow horizontal bars.

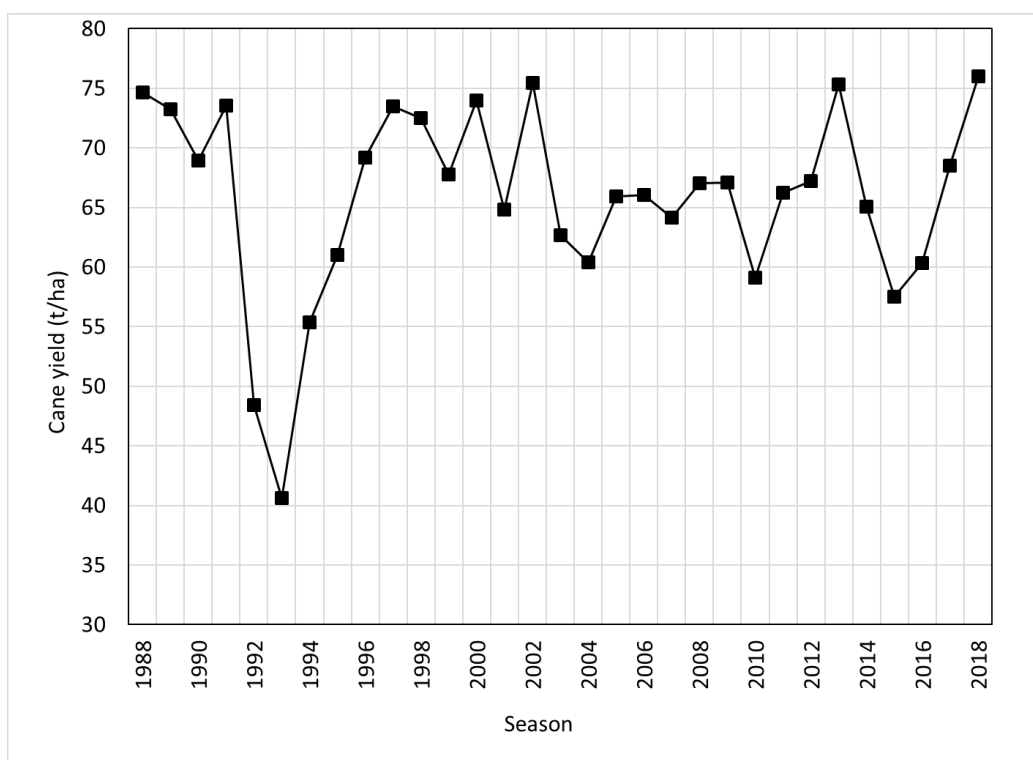


Figure 12. Industry average cane yield since 1988.

Cane quality, as quantified by estimated recoverable crystal (ERC) content of cane (fresh mass basis), declined slightly from 2017 in the northern irrigated and Midlands MSAs, while it increased in MSAs in Zululand, and the North and South Coast regions (Figure 13). Below average cane quality in Pongola can be ascribed to relatively high levels of Eldana damage (Figure 7), and reduced application of ripeners due to wide spread lodging of high yielding crops.

The industry average ERC content increased slightly to 11.5% from 2017 (Figure 13). Generally, the 2018 season produced cane of good quality, exceeding the five season mean in most MSAs. Although harvesting at the start of season was challenging in some rainfed MSAs, most had little wet weather interruption of harvesting operations, especially towards the end of the season.

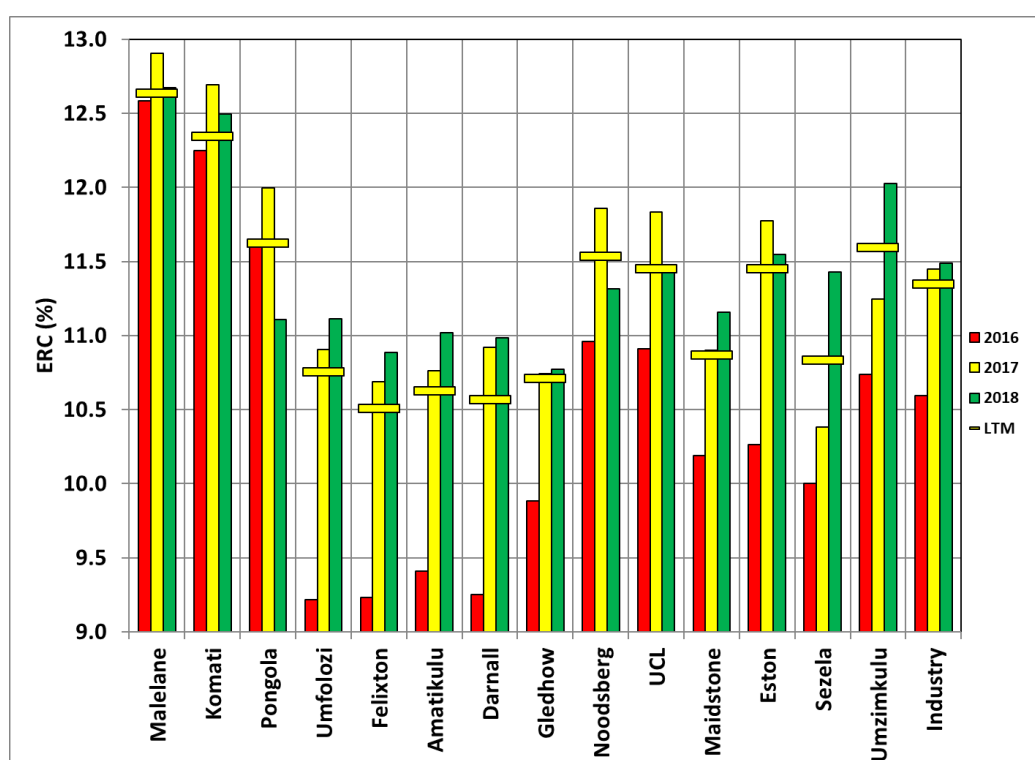


Figure 13. Estimated recoverable crystal content of cane (ERC%) on a fresh mass basis for different mill supply areas and for the industry as a whole for the 2018 season, compared to the 2016 and 2017 seasons and the five-season mean (LTM), shown as yellow horizontal bars.

Industry and farm economics

Sugar production increased by 10% from 2017, while local market demand for sugar dropped by 4% (Table 2). The latter was partly caused by product reformulations by industrial users of sugar, in response to the implementation of the Health Promotion Levy (HPL) on 1 April 2018. In addition large amounts of sugar imported in 2017 displaced local sugar on the world market. Increased production and decreased demand therefore required large amount of locally produced sugar to be exported on the weak world market. Sugar exports grew by 31% from 2017.

Although sugar imports dropped from 2017 due to the increase in the Dollar Based Reference Price used to calculate the import tariff, this could not prevent further 15% decline in the

Recoverable Value (RV) price due to a devastating low level of R3 574.41 (Table 2). It is estimated that the newly introduced HPL on its own took about R300 (~7%) off the RV price.

Table 2. Key economic indicators for the South African sugar industry (SACGA, 2018a, 2019).

Season	2017	2018
Gross sugar production (t)	1 994 607	2 193 321
Local market demand (t)	1 190 281	1 140 990
Sugar imports (t)	417 225	138 149
Sugar exports (t)	795 434	1 042 831
#11 World price (USc/lb)	12.65	12.52
R/US\$ exchange rate	13.10	14.02
World sugar price (R/t)	3654.02	4016.85
RV price (R/t)	4187.11	3574.41

Table 3 summarises recent trends in profitability for typical large-scale sugarcane enterprises. Although average yields improved for rainfed and irrigated growers, gross income declined further, while costs increased (e.g. fuel price rose by 21%). Profitability declined even further from the low levels of 2017, with net farm income levels for rainfed and irrigated growers close to zero. Long term sustainability is under threat for all growers. Although there is some protection for the local market this is being eroded by the effects of the Health Promotion Levy which is reducing demand for sugar and therefore negatively affecting the price.

Table 3. Gross income, operating costs and net farm income (defined as the difference between gross income and total operational cost, and excluding managerial costs, interest, rent and leases, depreciation, and tax) per ton of cane harvested for a typical rainfed and irrigated large scale grower (derived from SACGA, 2018b).

Season	Rainfed			Irrigated		
	2016	2017	2018	2016	2017	2018
Gross Income (R/t)	609.61	507.06	449.10	653.95	546.00	487.88
Total Operating Costs (R/t)	437.70	469.14	499.58	475.27	479.16	485.50
Net Farm Income (R/t)	171.91	37.92	-50.48	178.68	66.83	2.38

The situation is even more depressing when looking at the small-scale grower section (Table 4), which is unable to utilise economies of scale and size, and relies heavily on contractor services due to the lack of farming resources. Hence, operating costs for the typical small-scale grower are substantially higher than that of the typical large-scale commercial grower (Table 3), who is able to negotiate more favourable contractor fees. Gross income per ton of cane produced is also often lower for small-scale growers than for large-scale growers because lower yields are achieved.

Table 4. Gross and other income, operating costs and net farm income per ton of cane harvested for a typical rainfed and irrigated small-scale grower during the 2018 season.

	Rainfed	Irrigated
Gross Income (R/t)	R421.97	R457.73
Operating Costs (R/t)	R632.46	R706.54
Net Farm Income (R/t) before other income	-R210.49	-R248.81
VAT* Refund (R/t)	R47.00	R47.00
Intervention Income (R/t)	R68.46	R68.46
Net Farm Income (R/t) after other Income	-R95.03	-R133.35

*VAT – Value added tax.

The expected yield improvement and various transformation intervention incomes recently introduced by the industry were expected to bring the much-needed relief for small-scale growers but the very low RV price of R3 574 has reversed those benefits, causing net farm incomes to be negative (Table 4). The low RV price, and high electricity and labour costs pose a major risk to small scale sugarcane farming going forward.

Conclusion

Well distributed rainfall led to above average cane yields in rainfed areas, while much improved irrigation supplies enabled excellent yields in most irrigated areas. As a result, the highest industry average yield was achieved since 1988. Favourable harvesting conditions promoted good cane quality, especially in coastal regions where the dry winter allowed rapid sucrose accumulation.

Overall, the pest and disease situation was well controlled. Eldana infestation levels declined, with the notable exception of Pongola. The longhorn beetle appears to have been contained to a large degree, although it has not been eradicated from the Entumeni area. Although the impact of yellow sugarcane aphid on yields has not been quantified, the threat is on the rise. Smut levels were similar to that of 2017, while the prevalence of other diseases was relatively low.

High yields unfortunately did not translate into good profits. The cost of production for large and small scale cane growers could not be recovered due to the very low product price caused by a low demand for locally produced sugar. The sustainability of many growers in rainfed and irrigated areas is under severe threat, and every effort must be made to increase production efficiencies. Adoption of technologies, such remote sensing and precision agriculture that enables more efficient use of resources and inputs could play an important role. Uneconomical sugarcane production operations due to marginal climate, soil and water supply conditions should be phased out and replaced with alternative more profitable farming operations. Exploration of cogeneration of electricity and bio-ethanol production could also assist in creating more demand for South African sugarcane.

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