REFEREED PAPER

REVIEW OF SOUTH AFRICAN SUGARCANE PRODUCTION IN THE 2011/2012 SEASON FROM AN AGRICULTURAL PERSPECTIVE

SINGELS A[1], LESLIE GW[1], McFARLANE SA[1], SITHOLE P[1], FERRER SRD[2] AND MAHER G[1]

[1]*South African Sugarcane Research Institute, P/Bag X02, Mount Edgecombe, 4300, South Africa*
[2]*South African Cane Growers' Association, Flanders Drive, Mount Edgecombe, 4300, South Africa*
abraham.singels@sugar.org.za

Abstract

The South African (SA) sugar industry produced 16.8 million tons (Mt) of cane and 1.83 Mt of sugar in the 2011/12 milling season from an estimated 270 705 ha harvested. The objective of this paper is to characterise this production by relating yield and quality trends to the main production factors, namely climate, irrigation water supply, pests and diseases and economic conditions. This is done in order 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.

Rainfed cane yields in 2011 were higher than in 2010 for all mill supply areas (MSAs) except for Pongola, Midlands North and South Coast MSAs. The very dry conditions during the start of the 2011 growing season caused poor ratooning and canopy development and excessive weed pressures in many rainfed areas, with consequent negative impacts on yields. The drought of 2010 also caused a proliferation of *Eldana* infestation and damage in 2011 crops, especially in coastal areas.

The most outstanding characteristic of the 2011 season was the very poor quality of delivered cane in rainfed MSAs. This was caused by frequent periods of very wet weather during the milling season, lower than average radiation, less carry-over cane at the start of the season and high levels of *Eldana* damage in coastal and Midlands MSAs.

Industry average grower revenues improved in 2011 by 6%, mainly due to a higher RV price, and this partially offset increases in the cost of production inputs that exceeded the general inflation rate. Farmers in regions that have maintained average RV yields (e.g. irrigated MSAs) have benefited from higher RV prices, whereas growers with low RV yields (e.g. Midlands and South Coast MSAs) did not.

The sharp increase in *Eldana* incidence in coastal regions and its gradual long term rise in the Midlands regions is a cause of concern for the future, and requires intervention to limit its negative effects on the 2012 crop. Widespread symptoms of brown rust developed towards the end of 2011 and the potential negative impact on yields in the 2012 milling season is another cause for concern. The 2011 experience highlighted the need for better knowledge of

drought effects on subsequent ratoon crops. This could improve the relevance and accuracy of crop estimates and recommendations for replanting strategies.

Keywords: sugarcane, production, diseases, pests, modelling, review

Introduction

The South African (SA) sugar industry produced 16.8 Mt of cane and 1.832 Mt of sugar in the 2011/12 milling season from an estimated 270 705 ha harvested. The objective of this paper is to characterise this production from an agricultural perspective. Cane yield and quality are related to the main production factors, namely climate, irrigation water supply, pests and diseases and socio-economic conditions. Where possible the analysis was done at mill level. Although soil health and nutritional status is a major factor in determining yield, this was not analysed due to lack of appropriate data. It is envisaged that the study will provide some insight into the successes and failures of recent production management strategies. It should also provide useful information for identifying research and management priorities for more efficient production of high quality sugarcane in SA.

Methods

The sugarcane produced in the 2011/12 milling season grew mostly from between April 2009 (long cycle cane) and December 2010 (annual cane), to between April 2011 and December 2011, when it was harvested. Both the growing and milling season are referred to as the 2011 season.

A similar methodology was followed to that used in previous reviews (van den Berg *et al.*, 2009; Singels *et al.*, 2010; Singels *et al.*, 2011).

Climate and water

The impact of climate was assessed by assuming that climatic conditions over the 12-month period leading to harvest influenced the status of the crop for all mill supply areas (MSAs). Although some of the cane harvested in 2011 was already growing prior to April 2010, it was decided to exclude this period from the climate analysis to allow meaningful comparisons between MSAs. Rainfall and temperature records from various weather stations, averaged per MSA, and solar radiation records from a representative station in each MSA, were obtained from the South African Sugarcane Research Institute (SASRI) weather database. Twelve-month totals or average values leading up to each month of the 2011 milling season (e.g. April 2010 to April 2011, May 2010 to May 2011, 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 2010 and 2009 seasons.

The average annual irrigation water supply per MSA was calculated from weekly water allocations supplied by the respective Water User Associations and expressed as a percentage of the maximum, unstressed water allocation for a given water source (as determined by the Department of Water Affairs).

Pests

A number of insect pests impact production in the SA sugar industry. These include the stalk borer *Eldana saccharina* Walker (Lepidoptera: Pyralidae) (*Eldana*), sugarcane thrips

(*Fulmekiola serrata* Kobus (Thysanoptera: Thripidae)) (thrips), white grubs (various species of Scarabaeidae) and grasshoppers (Acrididae). Of these, the *Eldana* stalk borer and sugarcane thrips are the most widespread and serious threats to sugarcane production. Local Pest, Disease and Variety Control Committee (LPD&VCC) field survey results were used to provide information on *Eldana* infestations. *Eldana* infestation was expressed as the number of larvae per 100 stalks. Damage is quantified as the length of stalk tissue with a red colouration (caused by a fungal infection at the site of the borer damage) expressed as a percentage of total stalk length examined (% stalk length red). Both infestation and damage levels are determined through random sampling of stalks. Infestation and damage data were averaged over the 12-month period from June 2010 to May 2011 and compared to the corresponding period in 2009/10, as well as to the average of the previous five seasons.

Information on the seasonal incidence of thrips was obtained from routine monitoring of this pest on the Umfolozi Flats, as industry-wide surveys are not routinely conducted for thrips.

Diseases

Smut (*Sporisorium scitamineum*) and mosaic (Sugarcane mosaic virus) surveys are conducted by LPD&VCCs annually, usually when the cane is three to six months old. A total of 8413 commercial fields covering approximately 41 500 ha (11% of the industry) were inspected for smut and mosaic between June 2010 and May 2011. This was done by inspecting a number of 50 m lengths of cane row in each field. The number of row sections inspected was dependent on field size. Disease incidence is expressed as the percentage of stools examined that were infected. MSA average infection is calculated by dividing the total number of infected stools by the total number of stools inspected in each MSA.

The selection of fields for inspection varies between MSAs. In some cases fields are randomly selected for survey, while in other cases, fields planted to varieties known to be susceptible to smut or mosaic are targeted. Generally, LPD&VCCs aim to visit each farm at least once a year, but this depends largely on the number of teams operating in the area and the size of the MSA to be covered. For these reasons, it is not possible to make comparisons between MSAs, but trends over the years within mill areas can be analysed.

Since ratoon stunting disease (RSD) does not have any obvious external symptoms, diagnosis is based on the serological analysis or microscopic examination of xylem sap extracted from stalk samples (McFarlane et al., 1999). Routine surveys of commercial fields are conducted annually by the LPD&VCCs to identify RSD-infected fields.

Other information

Sugar industry extension specialists provided additional information on factors that affected the growing, harvesting and delivery of cane in the different regions to further assist the interpretation of cane yield and quality trends.

Economic information

Changes in in industry total real grower revenue (computed as the product of recoverable value (RV − see Groom, 1999 for explanation of the term) production and the RV price, and adjusted for general inflation) and the cost of key production inputs (obtained from DAFF, 2012) from the 2010 to 2011 season were used as loose indicators of grower profitability (lack of appropriate data at the time of writing prevents a more thorough synthesis).

Cane yield and quality data

Actual cane yield and quality data (MSA average) were derived from cane production data (SA Sugar Association Cane Testing Services database) and area harvested data (SA Sugar Association Industrial Affairs annual survey). It should be noted that area harvested for the 2011 season is an estimate and will be adjusted for the next review when accurate, verified data become available. Actual yield data (computed by dividing home mill production with estimated area harvested) were compared to yields estimated by the Canesim yield forecasting system (Bezuidenhout and Singels, 2007) using observed weather data. Time trends in actual cane quality as reflected by estimated recoverable crystal content of cane on a fresh mass basis (ERC%) was compared to time trends in the RV index (see Singels *et al*., 2012 for an explanation) calculated by the Canesim forecasting system. Model estimates provide a benchmark of the agro-climatic potential for sugarcane production, taking into account soil properties, radiation, temperature and effective rainfall as well as irrigation water supply. Large differences between trends in actual and estimated yields and quality were investigated by considering pest and disease information, as well as information provided by extension specialists.

Results and Discussion

Cane production, area harvested and cane quality

The SA sugar industry produced 16.8 Mt of cane in the 2011 season, harvested from an estimated 270 705 ha. Corresponding amounts of cane for 2009 and 2010 were 18.65 and 16.01 Mt of cane harvested from 278 133 and 271 080 ha, respectively.

Trends in production and harvested area for individual MSAs are shown in Figure 1. North Coast MSAs increased cane production substantially from the very low production levels achieved in the dry 2010 season, but South Coast MSAs were not able to follow this trend. Production decreased from 2010 for the Midlands MSAs. Most rainfed MSAs were not able to restore production levels to those of 2009, except for Felixton. Production in all irrigated MSAs increased from that in 2010 and were also higher than in 2009 (Figure 1).

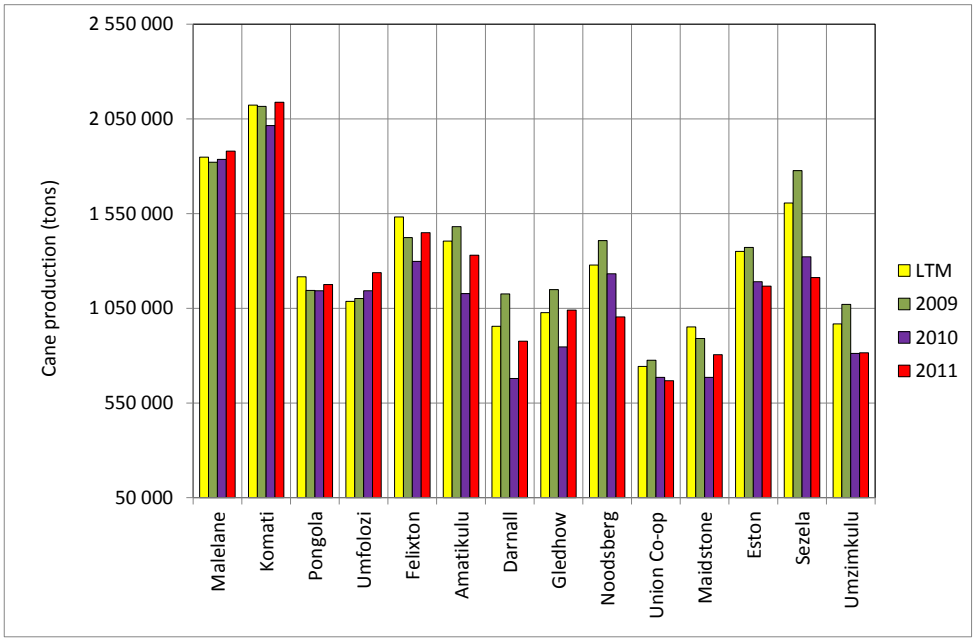

Figure 1. Cane production for different mill supply areas for the 2011 season compared to the 2009 and 2010 seasons and the five-season mean (LTM).

The estimated area harvested in 2011 declined from that in 2010 for Gledhow, Noodsberg, Maidstone, Eston and Sezela, while it increased for the other MSAs (Figure 2).

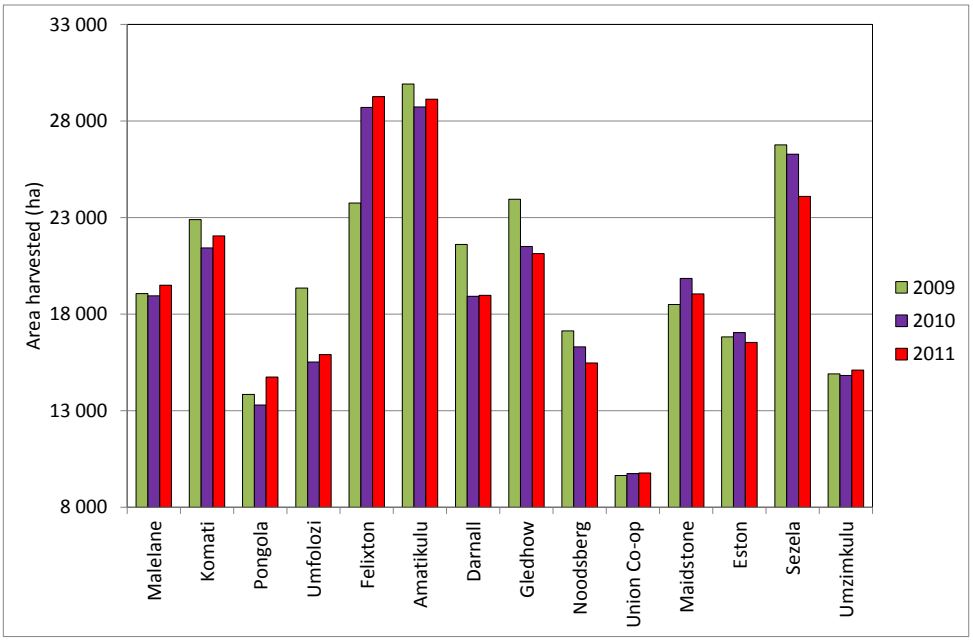

Figure 2. Estimated area harvested in the 2011 season for different mill supply areas, compared to the 2009 and 2010 seasons.

Cane quality, as quantified by estimated recoverable crystal (ERC) content of cane, declined significantly from 2010 and was well below the five-season mean for all MSAs, but particularly for rainfed MSAs (Figure 3). The industry average ERC content for the 2011 season was 11.02%, more than one unit below the five-season mean of 12.07%.

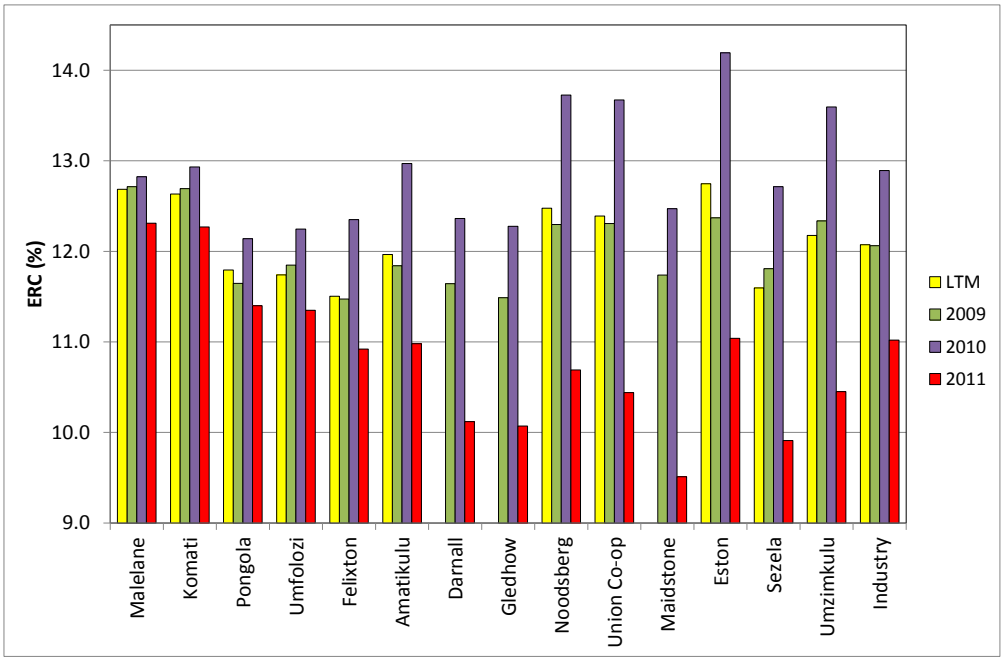

Figure 3. Estimated recoverable crystal content of cane (ERC%) on a fresh mass basis for different mill supply areas and for the whole industry for the 2011 season, compared to the 2009 and 2010 seasons and the five-season mean (LTM).

Factors that may have caused the changes in production and area harvested will now be discussed, and their impacts on cane yield and quality analysed.

Climate

Twelve-month rainfall totals for the 2011 growing season were generally above the LTM for most MSAs (Figure 4), and were also mostly higher than those of the previous two seasons. The growing season started poorly, however, with very low rainfall being recorded between May and September 2010 (Figure 5), with negative consequences for ratoon establishment. This was followed by normal to above normal rainfall for most months from October 2010 to December 2011, with June 2011 rainfall unusually high. However, rainfall was below average in February and March of 2011 – two crucial months for rainfed cane growth, especially for the establishment of plant crops.

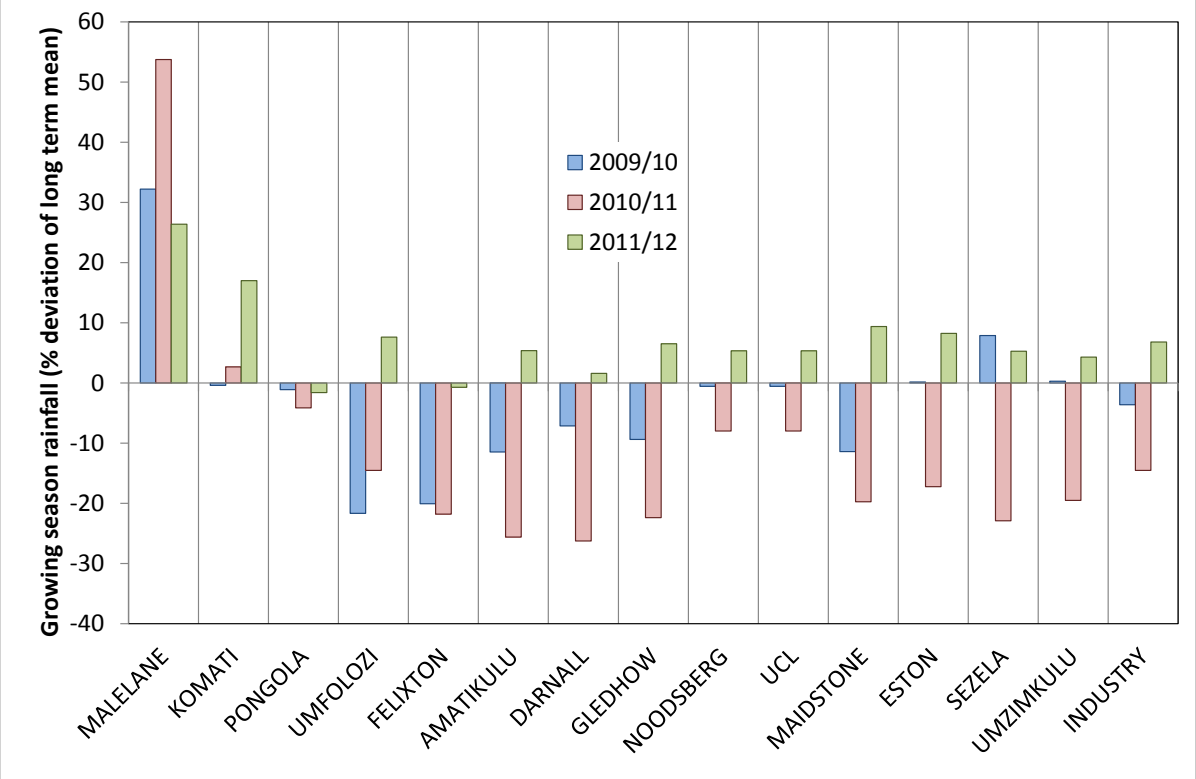

Figure 4. Total 12-month rainfall expressed as a percentage deviation from the long term mean, averaged over each month of the harvest season for the different mill supply areas and the industry as a whole.

Twelve-month average temperatures for the 2011 growing season was mostly lower (0.08-0.82°C) than the LTM except for the coastal MSAs (Amatikulu, Maidstone and Sezela), where temperatures were close to the LTM (data not shown). Temperatures in the winter of 2011 were well below LTM across the whole industry, with an industry average deviation from the LTM of -1.53°C for the period June to August 2011, making it one of the coldest winters in recorded history. A few severe frost events occurred in the Midlands and Sezela MSAs and frost was even recorded in Mpumalanga (see Table 2).

Twelve-month average solar radiation was below LTM for most MSAs (exceptions were Pongola and Umzimkulu), as was the case in the previous two seasons (data not shown). The industry average deviation from the LTM was -2.9%. Radiation was well below (more than 4%) the LTM in Malelane, Komati and the North Coast MSAs. This would have slowed the rate of sucrose production of crops growing in these regions.

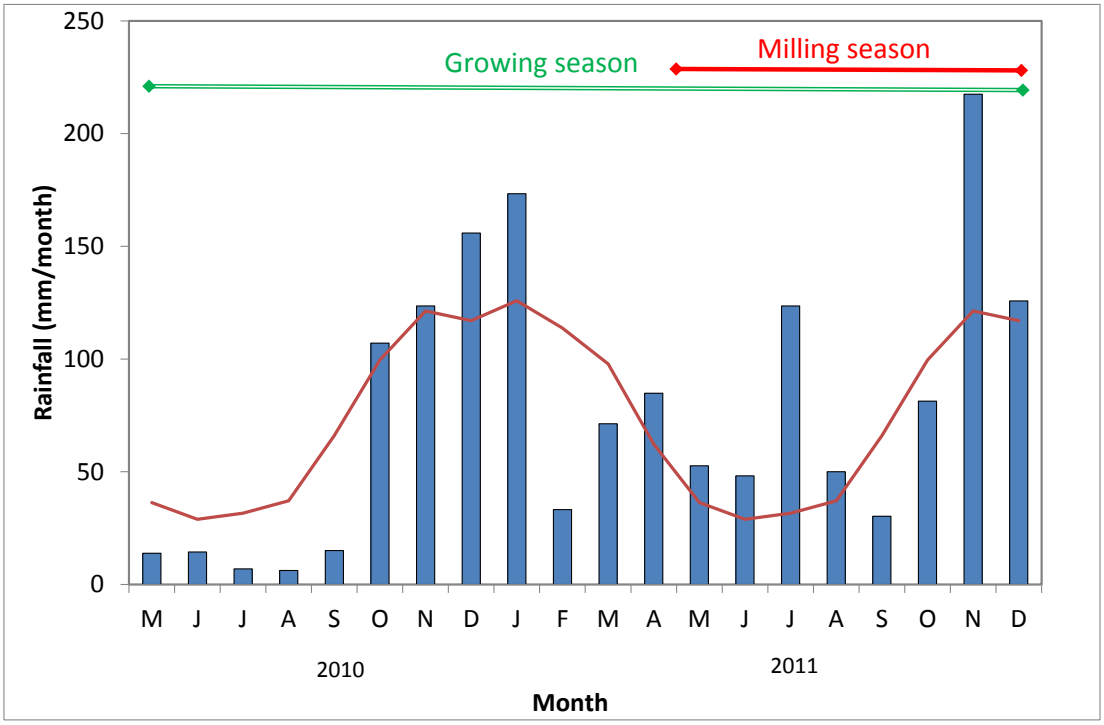

Figure 5. Monthly rainfall averaged for Kwazulu-Natal from May 2010 to December 2011 (bars) compared to the long term mean. The periods during which annual crops were growing and harvested are also shown.

Irrigation water supply

Irrigation water supply during the 2011 growing season was slightly better than in the 2010 growing season in the Umfolozi and Felixton MSAs, and slightly worse in Mpumalanga (see Table 1). This was believed to have a negligible effect on irrigated cane yields.

Table 1. Irrigation water supply in the different mill supply areas (MSAs), expressed as a percentage of the annual allocations as determined by the Department of Water Affairs.

MSA	2009	2010*	2011
Malelane	73	80	78
Komati	67	75	70
Pongola	100	100	100
Umfolozi	63	82	90
Felixton	86	90	98

*Data for 2010 was incorrectly reported by Singels *et al*. (2011); correct data given here.

Pests

Eldana

Trends in infestation for the various MSAs are shown in Figure 6 (top graph). Generally, larval numbers for the 2011 growing season increased significantly from 2010 and were also significantly higher than the five-season mean. The largest increases were recorded for the Maidstone, Sezela and Umzimkulu MSAs. While larval numbers were the lowest in the Midlands MSAs compared to other MSAs, infestation levels in the 2011 season were also

greater than those in in the 2010 season and the five-year mean. While it is probable that such increases can be related to the 2010 drought, they indicate the potential of *Eldana* becoming an important strategic risk to this region, which could increase with probable future warming of the Midlands climate.

In some MSAs, there was no or a very slight increase in *Eldana* numbers, compared to the five-season mean (Entumeni, Gledhow and Darnall). Thus, while the latest values may be of concern, they are within the expected range. Mpumalanga MSAs had larval numbers below the five-season mean. Reasons for low infestation levels compared to rainfed MSAs may well be related to the fact that these crops are irrigated, thus avoiding the *Eldana* risk arising from drought conditions prevailing in 2010.

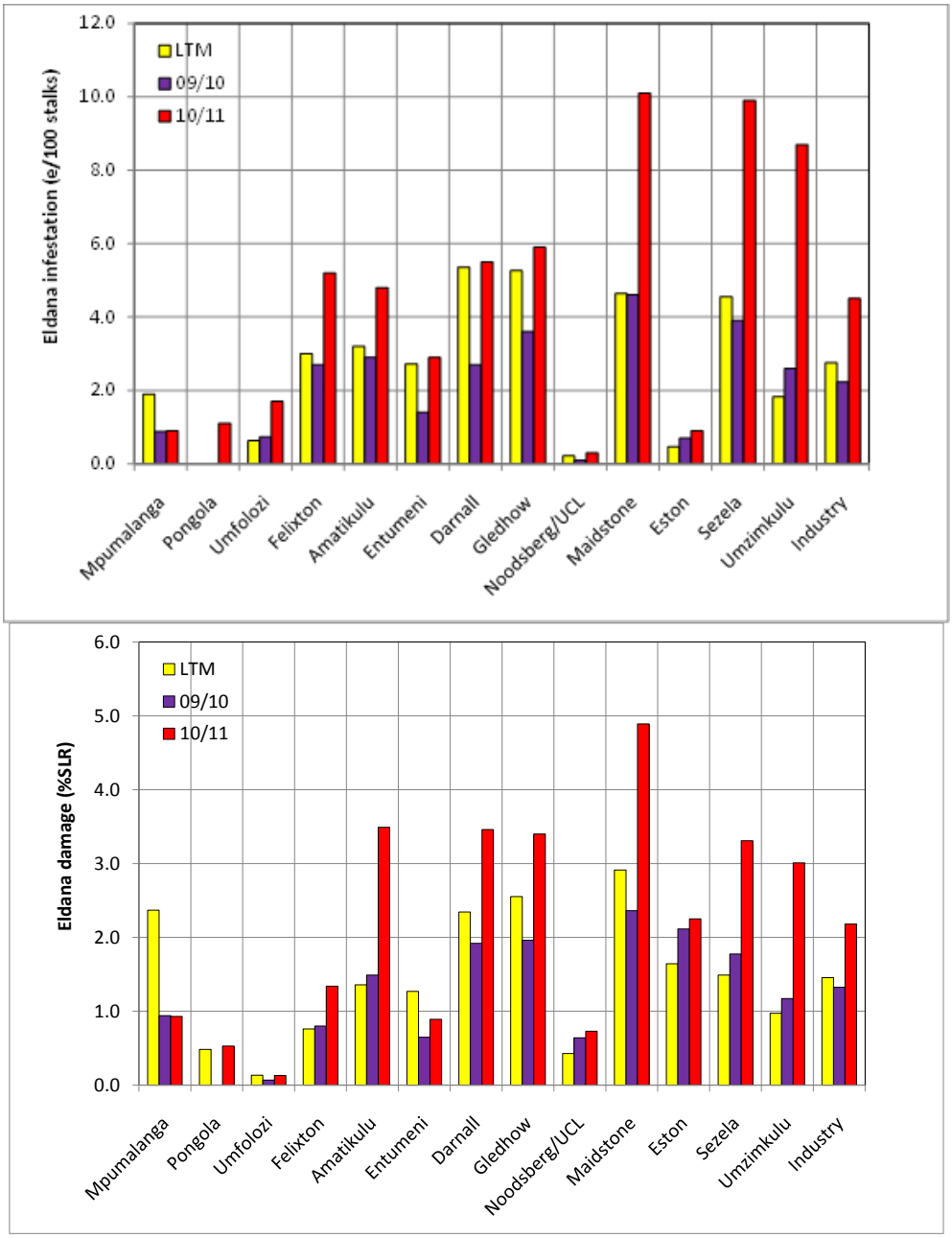

Figure 6. *Eldana* infestation (top) and damage (bottom) for the different mill supply areas for the 2011 growing season (10/11), compared to that for the 2010 growing season (09/10) and to the five-season mean (LTM).

Figure 6 shows that the trend in *Eldana* damage in the various MSAs mirrors that of *Eldana* infestation. In all but three areas (Mpumalanga, Pongola and Entumeni) damage was greater in the 2011 season compared to the 2010 season and the five-season mean. Differences between damage levels in 2011 and 2010 were greatest in the Amatikulu, Maidstone and Umzimkulu mill areas. It is noteworthy that the industry average damage level in 2011 was the highest in the last decade (data not shown).

Sugarcane thrips
Information from sampling in the Umfolozi MSA has shown that thrips numbers typically peak in December, and that the size of this peak has declined since the 2009 growing season. The cause is unclear but may reflect long term population cycles. Another factor may be the widespread use of the insecticide Bandit against thrips in this region since 2008/09. Decreased thrips numbers were also reported for Sezela. Further comments on thrips are given in Table 2.

Diseases

Mean disease levels in the 2011 growing season were similar to the 2010 growing season, with 0.25% and 0.14% of the stools inspected being infected with smut and mosaic, respectively.

Smut
Smut incidence was below 0.5% stools infected in all MSAs and survey results indicate that the overall smut situation in the industry is currently stable (Figure 7a). Although the disease was widespread in Malelane, Komati and Pongola, with more than 40% of the fields inspected being infected to some degree (Figure 7b), the situation appears to have improved in these areas when compared to previous seasons. The LPD&VCC in the Zululand and Umfolozi MSAs tend to target smut-susceptible varieties, particularly NCo376, so actual smut levels were lower than those indicated in Figure 7a. Smut incidence in the rest of the industry was acceptable. The overall impact of smut on 2011 cane production is estimated at 0.1% based on the results from Bailey (1979, 1983) and de Lange and McGugan (1989).

Mosaic
Surveys over the past three seasons have indicated a steady increase in mosaic incidence in the industry, with marked increases in Malelane, Darnall, Maidstone, Noodsberg/UCL and Umzimkulu (Figure 7c). Mosaic was particularly widespread in Noodsberg, Maidstone and Eston, with the disease being recorded in over 40% of the fields inspected (Figure 7d). Yield losses of 0.3% can be expected for every 1% stalks infected with mosaic (Bailey and Fox, 1987). Based on the surveys conducted during the past season, mosaic is estimated to have reduced total production by 0.1%.

Ratoon stunting disease
RSD incidence in commercial fields has remained relatively stable over the past ten years with an average of 10% of the fields tested being infected. Based on intensive surveys conducted during this ten-year period, yield losses due to RSD are estimated to be 1% of total production.

Brown rust
The cool, moist conditions in the southern and inland regions of the industry towards the end of 2011 were highly conducive to the development of brown rust. Symptoms were severe and

persistent in many fields with varieties with an intermediate or susceptible rust rating. Rust has been shown to cause yield losses of 26% in moderate to severely infected sugarcane (McFarlane *et al.*, 2006). A new rust species affected a number of varieties during spring and summer with infection being particularly severe in Pongola and Umfolozi. The effect on yield is currently unknown.

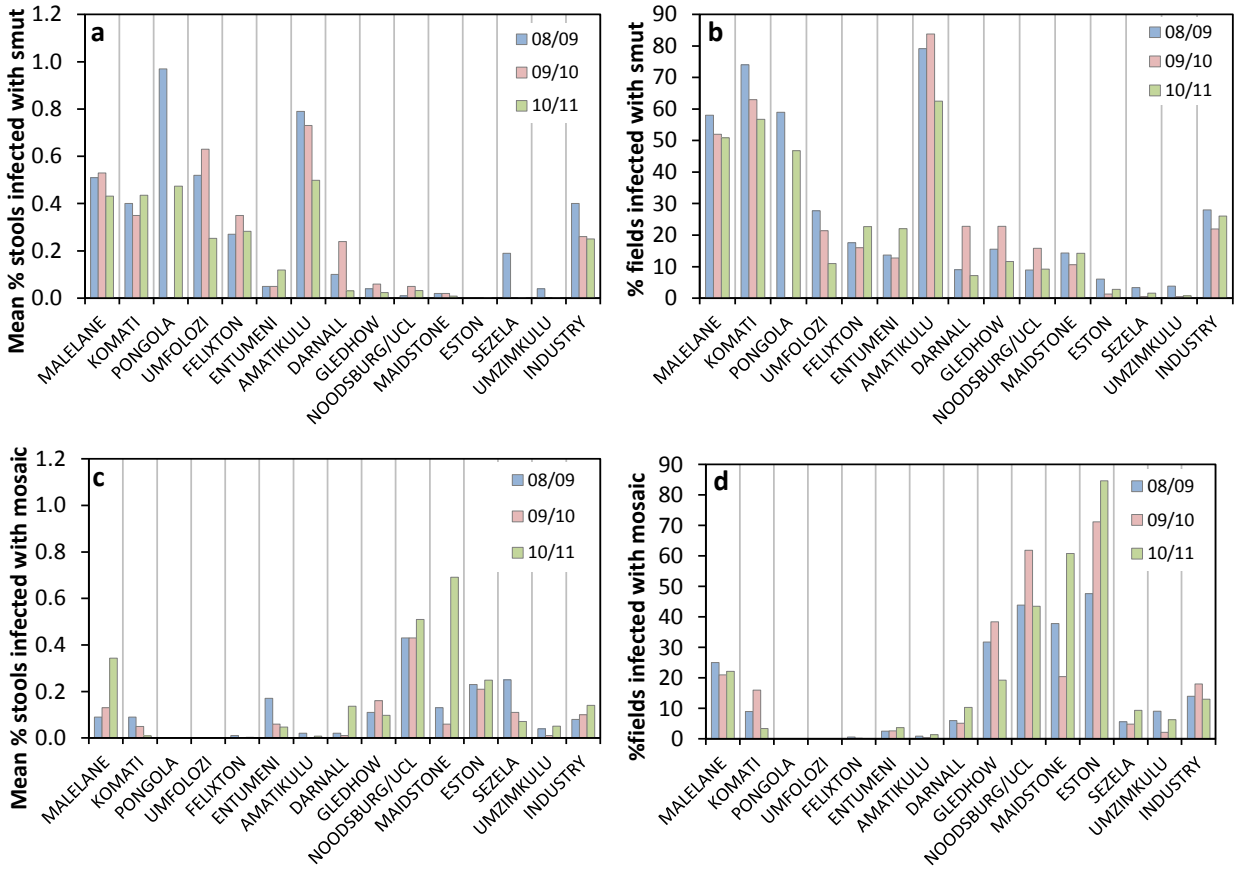

Figure 7. Smut and mosaic virus infections in the different mill supply areas for the 2011 growing season (10/11) compared to the 2010 (09/10) and 2009 (08/09) seasons.

Additional information

Table 2 provides anecdotal information from local extension specialists on factors that may have impacted on the crop production process and affected yield and quality in each of the regions.

Table 2. Information from extension specialists regarding agro-climatic and other factors in the different mill supply areas (MSA) that had an impact on sugarcane production in the 2011 growing season.

MSA	Comments
Mpumalanga (P. Cronje)	**Frost:** Unusually cool temperatures and frost occurred in the early part of the milling season. **Ripening**: Increased ripening (9000 ha more) led to improved cane quality.
Pongola (M. Adendorff)	**Frost:** About 700 ha cane was affected by frost and had to be cut back. **Hail:** About 200 ha was affected by hail and had to be cut back. **Replanting:** A number of neglected farms have changed hands and large areas have been replanted.
Umfolozi (A. Searle)	**Weeds:** Hardy weeds such as as *Cyperus natalensis* and *Rottboellia conchinchinensis* were problematic in some areas. **Thrips**: Caused slow canopy development that allowed weed pressure to develop.
Felixton (T. Fortmann)	**Lodging:** Strong winds on 26 August 2011 caused most of the standing crop to lodge badly. **Harvesting and milling operations:** Wet weather in October/November 2011 made harvesting and extraction difficult. Consequently, the milling season length was increased by three weeks.
Amatikulu (G. Lagerwell)	**2010 drought:** The 2010 drought left a legacy that will continue for some years to come, particularly in coastal areas like Nyoni where about 45% of the area under cane has to be re-established. ***Eldana*:** Many coastal and some hinterland farmers carried droughted cane from 2010/11 into the 2011/12 season. This was severely infested with *Eldana* and resulted in extremely poor quality. **Harvesting and milling operations**: Wet weather in November/December 2011 and lodging in July resulted in delays in cane delivery.
Darnall/ Gledhow/ Maidstone (I. Hlongwa, A. Naude)	**Weeds:** Creeping grasses were problematic especially in fields with poor stands. ***Eldana*:** High levels of infestation, even in young cane, and widespread. **Mosaic:** Increased number of fields with severe mosaic infestation.
Noodsberg (D. Wilkinson)	**Frost:** More frequent and more severe frost in 2011 compared to 2010 events. Cane frosted in 2010 and milled in 2011 contributed to poor quality. **Hail**: Caused damage in March, April and December of 2011. Loss of canopy lead to increased weed pressure. **Harvesting and milling operations**: Only 47% of area under cane was harvested during 2011 compared to the usual 52%. This is ascribed to low yields, substantial areas under fallow and green manure crops. **Crop husbandry:** Approximately 1000 ha of area under cane has been poorly managed (minimum or no fertiliser, weeding and replanting) and production on these farms has declined steadily over the last couple of years, some because of pending transactions with government.

Eston (O. de Haas)	**Frost:** Frost occurred more widely than in 2010. **Mosaic/Yellow leaf:** Mosaic was widespread in N12 and yellow leaf (*Sugarcane yellow leaf virus*) was detected in 14% of the fields tested. ***Eldana*:** Increased *Eldana* numbers impacted negatively on cane quality. Several fields had to be harvested prematurely (10 000 tons).
Sezela (D. McElligott)	**2010 drought:** Growers cut 90% of their crop in 2010, leaving very little carry-over on the coast, resulting in delayed deliveries at the beginning of the season. Poor ratooning led to the formation of bull shoots which negatively affected cane quality. **Replanting:** Much needed planting was delayed due to the late onset of the rainy season. Poor establishment of fields planted in January 2011 due to dry conditions in February/March 2011. **Weeds:** Herbicide probably leached during the wet spell in Dec 2010/Jan 2011, resulting in increased weed pressure in February and March 2011. **Frost:** Two major frost events occurred in Highflats/Ixopo area which negatively affected about 20 000 tons cane. **Hail:** Devastating hail event in March 2011 negatively affected growth and quality of approx. 10 000 tons of cane. ***Eldana*:** *Eldana* infestation was widespread and severe (approx. 30% of area surveyed recorded *Eldana* numbers above the threshold, average infestation level 12.1 e/100 stalks – the highest since 1999, some fields as high as 200 e/100 stalks). Potential carry-over cane had to be harvested and quality was affected badly. **Harvesting and milling operations:** Negatively affected by early season delays, and high winter and spring rainfall. Diversion of entire Umzimkulu mill supply caused milling delays. Approx. 75 000 tons of cane scheduled for harvest in 2011 will be carried over. **Crop husbandry:** Late application of fertiliser on many emerging growers' fields. Poor husbandry on some land reform farms.
Umzimkulu (J. Bowen)	**2010 drought:** Poor establishment of plant crops required gapping up and replanting. **Hail:** Two hail storms in December 2011 resulted in 4000 tons of unscheduled cane harvested prematurely. ***Eldana*:** High *Eldana* infestations required premature harvesting to comply with the P&D thresholds. **Harvesting and milling operations:** Approx. 50 000 tons of cane was not harvested due to wet weather, mill stoppages and logistic problems associated with the diversion of cane from Umzimkulu to Sezela. (The Umzimkulu mill was closed in 2011.) **Crop husbandry:** Some farms have not been managed optimally due to lack of skills, funds and/or equipment.

Farm economics

The 2011 season was characterised by producer price inflation in excess of the general inflation rate. In particular, nominal prices of fertilisers and herbicides increased from 2010 by 23.6% and 10.9%, respectively, and prices of tractors, lorries and implements increased by 14%, 15.4% and 10.6%, respectively (DAFF, 2012). The agricultural minimum wage continued to increase at a higher rate than the general inflation rate. The cost of capital, however, remained low, with the prime interest rate remaining constant at 9% throughout the season.

Real grower revenue increased by 6.2% in the 2011 season relative to the 2010 season, but by less than 2% relative to the 2009 season. Both the 2010 and 2011 seasons were characterised by low RV production. Growth in real grower revenue since 2009 is attributable to an increase in the RV price. Table 3 identifies key determinants of the RV price in 2009, 2010 and 2011. Growth in the RV price from 2010 to 2011 is the result of an increase in in the local market demand and a substantial increase in the weighted average price received for sugar exports.

Table 3: Recoverable Value (RV) price and RV price determinants.

Season:	**2009**	**2010**	**2011**
Sugar : RV ratio (tons/tons)	94.23	92.94	93.40
Gross sugar production (tons)	2 187 542	1 919 116	1 832 438
Local market demand (tons)	1 412 273	1 583 456	1 685 312
#11 World Price (wt avg USc/lb)	16.47	17.41	28.44
R/US$ exchange rate (wt avg)	8.14	7.53	7.35
RV price (R/ton)	2 284.20	2 572.14	3 017.51

Growth in grower revenue has partially offset the combined impacts of below average RV production and high producer price inflation for sugarcane growers. The analysis of aggregate industry figures masks regional variation in the fortunes of growers. Farmers that achieved average RV yields (e.g. in irrigated MSAs) have benefited from higher RV prices, whereas growers with low RV yields (e.g. in Midlands and South Coast MSAs) did not.

Cane yield

Mill average cane yields in 2011 were higher than in 2010 for Zululand and North Coast MSAs and Komati, and were similar for all other MSAs except for Pongola, where there was a decline (Figure 8). Yields in 2011 were higher than the five-season mean for Malelane, Komati and Umfolozi and were similar or lower than the five-season mean yield for other MSAs.

Actual yield trends (change from 2010 to 2011) matched the trends in Canesim simulated yields for most MSAs, suggesting that climate was the main driver of these trends. The exceptions were Noodsberg, and North and South Coast MSAs (see Figure 9), where the change in yield from 2010 to 2011 was significantly less than the simulated change, suggesting that non-climatic factors may have had a negative impact. All these MSAs had high levels of *Eldana* incidence, as reflected in P&D surveys (Figure 6) and in comments from regional extension specialists (Table 2). Maidstone and Sezela also had very little carry-over cane because an unusually large area was harvested in 2010 to compensate for

low yields. Unusually high weed pressure from creeping grass was also highlighted as a problem in the North Coast and Sezela MSAs. The 2010 drought caused poor ratooning that allowed weeds to exploit the lack of canopy cover during the wet spell in December 2010. The weeds then competed very strongly with sugarcane for scarce soil water during the dry spell in February 2011. The Noodsberg and Sezela MSAs also experienced more frequent and more severe frosts in 2011 than normal.

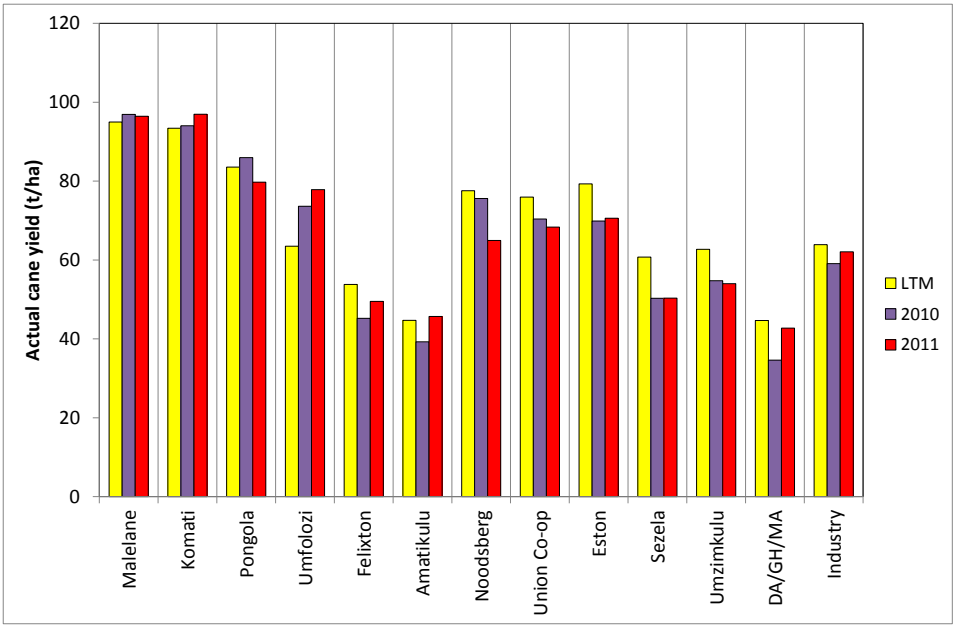

Figure 8. Mean cane yields for different mill supply areas (Darnall, Gledhow and Maidstone grouped as DA/GH/MA) and for the industry for the 2010 and 2011 milling season, compared to the five-season mean yield (LTM).

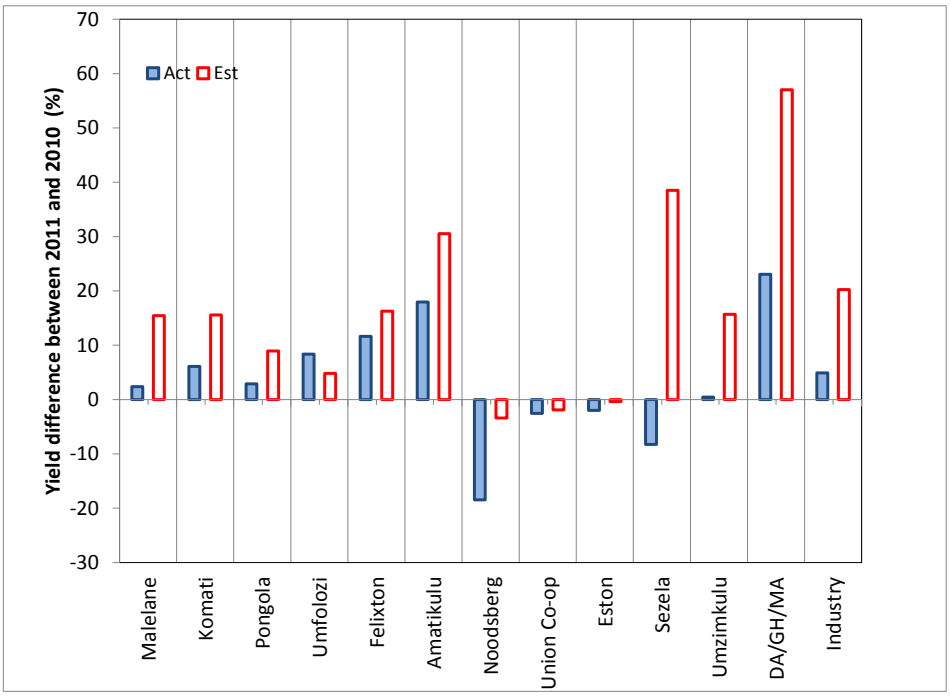

Figure 9. Yield difference between the 2011 and 2010 seasons for the different mills (Darnall, Gledhow and Maidstone grouped as DA/GH/MA) and for the industry, expressed as a percentage of the 2010 yield. Differences in actual yields (Act) and in the Canesim model estimated yields (Est) are shown.

Cane quality

As stated before, cane quality, as quantified by ERC content of cane, declined significantly from 2010 and was well below the five-season mean in all MSAs, especially in rainfed MSAs (Figure 3). In many cases ERC content was the lowest recorded since 2000 (industry average values shown in Figure 10). This was mainly due to low sucrose and dry matter contents, and high fibre contents in all rainfed MSAs. In most cases sucrose and dry matter contents were lowest, and fibre contents highest, since 2000 (industry average values shown in Figure 10). ERC contents for irrigated MSAs were also lower than in 2010, but not by as much as in rainfed MSAs (Figure 3). In all but one case (Pongola), trends in actual cane quality correspond to simulated trends in the RV index (data not shown), suggesting that climate was the main driver. It is believed that the low sugar to fibre ratios observed for rainfed mills was the result of below average radiation and favourable water status conditions that prevailed for most of the milling season.

Other contributing factors to the poor quality of cane were delays in delivery of harvested cane due to wet weather (Umfolozi, Amatikulu, Sezela, Umzimkulu), excessive *Eldana* infestation and damage (Amatikulu, North and South Coast MSAs and Eston), unusually low amounts of more mature carry-over cane (Sezela) and frost (Eston, Noodsberg and Komati) (see Table 2).

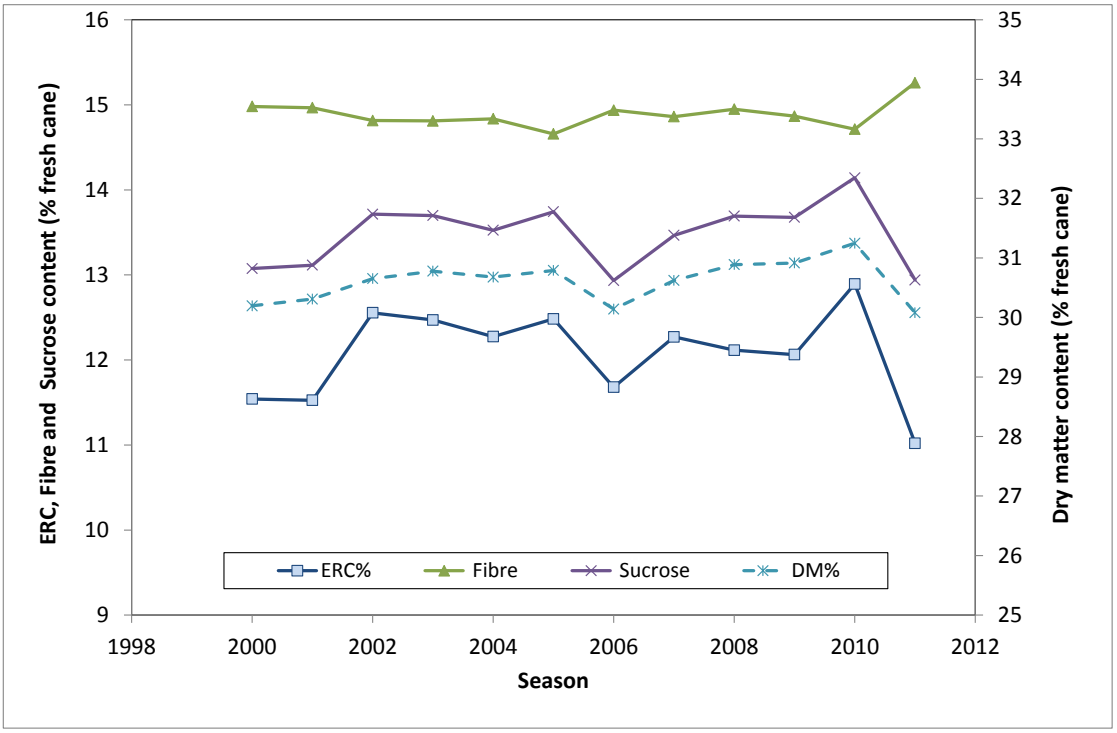

Figure 10. Industry average estimated recoverable crystal (ERC), fibre, sucrose and dry matter contents of cane for the past 11 milling seasons.

Conclusions

The very dry conditions at the start of the 2011 growing season caused poor ratooning and canopy development and excessive weed pressure in many rainfed areas, with consequent negative impacts on yields. The drought of 2010 also caused a marked increase in *Eldana* infestation and subsequent damage to 2011 crops, especially in coastal

areas. The drought was broken in October 2010 and more favourable growing conditions prevailed from then until January 2011. This was unfortunately and unexpectedly followed up with a severe mid-summer dry spell in 2011 that delayed the recovery of crops from the 2010 drought. Good rains and favourable soil water conditions from late March 2011 up to December 2011 created conditions that promoted growth rather than sucrose accumulation.

Rainfed cane yield in 2011 was higher than 2010 for all MSAs except for Pongola, Midlands North and South Coast MSAs. A comparison of actual yield with the simulated climatic yield potential suggests that yields in the Noodsberg and North and South coast MSAs were also affected by non-climatic factors. Information from extension specialists suggests that *Eldana* damage and weed pressure were the major culprits, while frost affected yields in Noodsberg and Sezela.

Higher 2011 yields contributed to increased production for Komati, Umfolozi, Felixton, Amatikulu and North Coast MSAs, while lower yields contributed to production declines for the Midlands MSAs. Significantly less area was harvested in 2011 compared to 2010 in the Noodsberg, Eston and Sezela MSAs, further contributing to the decline in production for these MSAs.

The most outstanding characteristic of the 2011 season was the very poor quality of delivered cane in rainfed MSAs. This was caused by frequent periods of very wet weather during the milling season causing delays in delivery, lower than average radiation, less carry-over cane at the start of the season and high levels of *Eldana* damage in coastal and Midlands MSAs.

Industry average grower revenue improved in 2011 by 6%, mainly due to a higher RV price, which partially offset increases in the cost of production inputs that exceeded the general inflation rate. Growers that achieved average RV yields (e.g. in irrigated MSAs) benefited from higher RV prices, whereas growers with low RV yields (e.g. in Midlands and South Coast MSAs) did not.

The sharp increase in *Eldana* incidence in coastal regions and its gradual long term rise in the Midlands regions is a cause of concern for the future and requires intervention to limit its negative effects on the 2012/13 crop. Severe symptoms of brown rust developed towards the end of 2011 in fields with susceptible varieties and the potential negative impact on yields in the 2012 milling season is another cause for concern. The problems experienced in 2011 with cane harvesting and delivery will result in an above normal amount of cane to be carried over to 2012 in some areas, which will require some planning to deal with it effectively.

The 2011 experience highlighted the need for better knowledge of drought effects on subsequent ratoon crops. This could improve the relevance and accuracy of crop estimates and recommendations for replanting strategies. The review also highlighted the need for more reliable estimates of area harvested being made available sooner after harvest, so that actual yields can be determined more accurately sooner.

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