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SASRI's plant breeding programme selects new varieties for release each year based on high sucrose yield, desirable agronomic traits such as good ratooning, disease resistance and resistance to eldana borer. This ensures that varieties improve with each new release. In addition, SASRI's Plant Breeders continuously evaluate existing varieties to ensure their optimal performance. This year SASRI has released Varieties N63, N64 and N65. The breeders have also re-evaluated characteristics for Variety N57 (page 3)

In this issue...

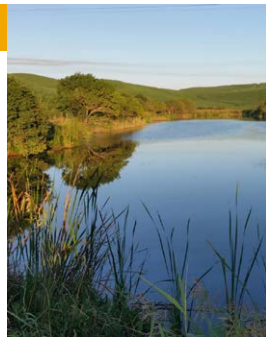
Besproeiing

Om 'n doeltreffende besproeiingsoperasie op 'n plaas te bedryf, moet die mees toepaslike besproeiingstelsel gekoop word en daarmee saam moet die plaas personeel geskikte opleiding kry om die stelsel doeltreffend te bestuur *(bladsy 11).*

Land Use Plans

A successful grower day was held in Felixton on the importance of waterways on farms. Several important take-home messages were imparted to the group attending *(page 14).*

Grower story



Richard Cole is a grower in the Sezela region who is changing the landscape of farming by introducing more environmentally-sustainable methods of growing sugarcane. Read his story on *(page 18).*

SASRI

Unlocking the potential of sugarcane

DIRECTOR'S MESSAGE

CAROLYN BAKER

In the South African agricultural landscape, the sugar industry is unique in many respects. The fact that it fully supports a research institute dedicated to the development and delivery of specialist and technical support and solutions for all sugarcane growers, surely sets it apart from other agricultural enterprises. The success and expansion of the industry was enabled through the development of new and improved varieties that enabled growers to plant and grow sugarcane in the extremely varied and often marginal conditions in KwaZulu-Natal and Mpumalanga. In comparison to global industries, the agro-climatic conditions for sugarcane in South Africa are marginal. Hence the adaptation of our varieties to withstand pest and disease pressures, soil variability and fluctuating rainfall patterns have been instrumental in sustaining the industry, and their value is well known.

Fundamentally however, it is soil health that plays a significant part in enabling sugarcane to withstand poor conditions. In the recent drought, those growers that practised green cane harvesting for example, fared better than those that did not. Similarly in the recent heavy rains, especially on the lower south coast, those growers with good land use plans and well developed conservation structures, were less vulnerable to damaging water runoff and soil loss. As the industry becomes more diversified and growers convert parts of their farms to support other suitable crops, the importance of sustaining soil structure and health and water conservation remains paramount.

For this reason, adoption of SUSFARMS® becomes increasingly relevant. Deployment of the best practices outlined in the farm management system provide growers with the guidance to enable long-term sustainability. Growers are encouraged to embrace this tool to assist them in protecting and conserving their land in a manner that will ensure enduring growth of healthy crops in a responsible manner.

Since it is SASRI's role to assist and support growers to achieve improved and sustainable yields through the delivery of useful and desirable technologies, recommendations and practices, the relevance of partnering with growers to fully understand their needs and requirements becomes increasingly important. It is for this reason that not only our Extension Specialists, but also our scientists, welcome inquiries and feedback regarding our research and development programmes. This interchange enables a more thorough grasp of prevailing issues and the requirements of growers. In reality the expectations and demands placed on SASRI employees to meet every single agricultural need in the industry cannot all be met – however it is undoubted that every effort is made to address growers' needs satisfactorily.

As this season comes to a close, the release of several new exciting varieties that show significant promise and improvement signals the continuing value that SASRI delivers to the industry, and we look forward to tracking their adoption over the next few years.

NEW VARIETY INFORMATION SHEETS

Three new varieties have just been gazetted for the industry. There are three new variety information sheets detailing the characteristics of each of these new varieties. In addition, information pertaining to N57 has just been updated. This can be found in the newly updated N57 information sheet.

Information sheets will be posted to growers shortly. These are also available on our website at:
www.sugar.org.za/sasri.

Disease rating scale

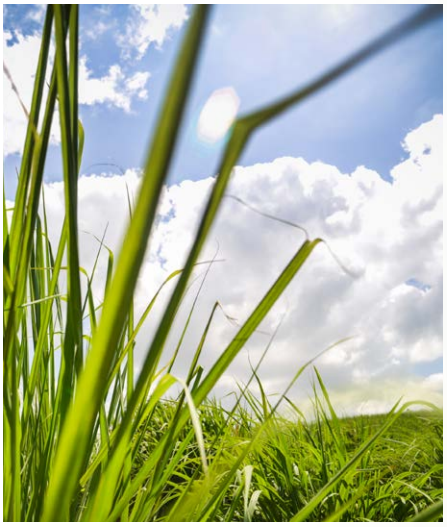
Resistant

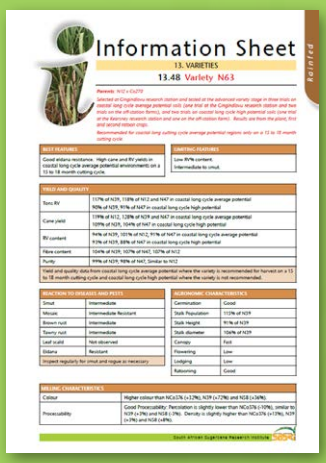
Intermediate—resistant

Intermediate

Intermediate—susceptible

Susceptible



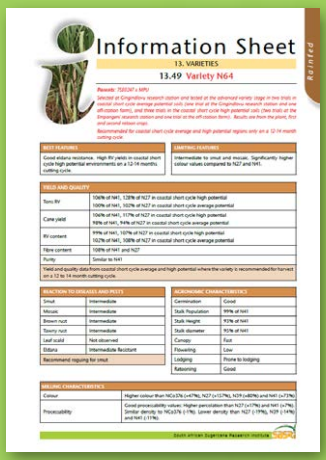


New Variety N63

Rainfed conditions

Best features

- Good eldana resistance.
- High cane and RV yields in coastal long cycle average potential environments on a 15 to 18 month cutting cycle.



New Variety N64

Rainfed conditions

Best features

- Good eldana resistance.
- High RV yields in coastal short cycle high potential environments on a 12-14 months cutting cycle.

New Variety N65

Rainfed conditions

Best features

- Good general disease and eldana resistance.
- High RV yields in coastal short cycle high potential environments on a 12-14 months cutting cycle.

Variety N57 (Updated info)

Irrigated conditions

What's changed?

- Updated best and limiting feature.
- New disease ratings.
- Tawny rust ratings have been included.
  The variety resistance has been regraded to intermediate for mosaic.

TOPICAL TIPS

Rowan Stranack (Extension & Biorisk Manager)

Irrigation

- With irrigation restrictions in place in some regions, it is important to use available water wisely.
- Use capacitance probes to assist in irrigation scheduling.
- Daily weather data such as evapotranspiration are available on the SASRI WeatherWeb (www.sasa.org.za/sasri).
- Harvested fields should have been irrigated to field capacity. Thereafter, they can be left without irrigation for a number of weeks due to low water consumption.
- In summer, when crop water demand is at a peak, it is important to ensure all systems are able to operate at maximum capacity.
- Water requirement is highest on fields in the rapid growth phase which is after canopy closure.

Besproeiing

- Met besproeiingsbeperkings in sekere areas is dit belangrik om beskikbare water op 'n wyse manier aan te wend.
- Maak gebruik van grondwatermeetapperate om te help met besproeiingskedulering.
- Daaglikse weerdata soos evapotranspirasie is beskikbaar vanaf die SASRI weerweb (www.sasa.org.za/sasri).
- Geoeste lande moet tot veldkapasiteit besproei word. Daarna kan die lande vir etlike weke gelos word sonder enige besproeiing as gevolg van lae waterverbruik.
- Gedurende die somer periode wanneer waterverbruik 'n piek berreik is dit belangrik om te verseker dat alle sisteme teen maksimuim kapasiteit werk.
- Waterverbruik is die hoogste in lande waar vinnige groei plaasvind, net nadat die blaredak gevorm is.

Smut control

- Smut pressure is very high this year as a carryover effect of the previous dry seasons. The availability of irrigation water or rain on its own will not result in a decrease in smut pressure. The only way to reduce smut levels is by continuous and effective roguing.

PRAKTIESE WENKE

- All fields below head height must be rogued at least once a month from September to May. Pay special attention to varieties N14, N19, N25, N32, N36, N41 and N43.
- Roguing cannot be combined with hand weeding operations. A well-trained dedicated team is required to continuously move from field to field doing only smut roguing.
- Dig out all infected stools (not only the shoots) and destroy these away from the field. Infected stools can also be killed chemically with a directed glyphosate spray.

Smut beheer

- Gedurende hierdie tyd van die jaar is smut druk baie hoog as gevolg van die oordra effek van 'n droeë vorige seisoen. Die beskikbaarheid van besproeiingswater of reën alleen sal nie die smut druk verlaag nie. Die enigste manier om smut vlakke laag te hou is deur middel van deurlopende uitgrawe en verwydering van besmette plante.
- Alle lande laer as kophoogte moet ten minste een maal per maand vanaf September tot Mei gevrywaar word van besmette stronke deur middel van uitkapping. Spits aandag op veral variteite soos N14, N19, N25, N32, N36, N41 en N43.
- Uitkapping kan nie met onkruidskoffel gekombineer word nie. 'n Goed opgeleide span word benodig om deurlopend van land tot land te beweeg en slegs besmette plante uit te kap en uit die land te verwyder.
- Grawe die hele besmette plant uit (nie net die besmette rietstok nie) en vernietig dit weg van die land af. Besmette plante kan ook vernietig word met 'n direkte glifosaat bespuiting.

Crop nutrition

- Leaf samples are the most effective way to measure the full nutrient status of the crop, including a range of micronutrients. Take leaf samples in actively growing cane between four and six months of age to assist in fertiliser management. Wait at least six weeks after fertiliser has been applied before sampling. If crops are severely stressed by thrips, yellow aphid or any other pest or disease, then rather not take samples from these fields.
- Check fields that appear yellow at this time of the year. This generally indicates a lack of nitrogen, either as a result of not enough fertiliser being applied or nitrogen having been lost as a result of a heavy rainfall event. Take care, though, as yellow, nutrient deficient patches can also be attributed to other factors like yellow sugarcane aphid, thrips, Yellow Leaf Syndrome, white grub or nematodes. Consult your Extension Specialist if in doubt and do not apply fertiliser without determining the cause of the problem.

Gewas voeding

- Neem van blaarmonsters is die mees effektiefste manier om die totale voedingstof status van die plant te bepaal. Dit sluit 'n reeks mikrovoedingstowwe in. Neem blaarmonsters in aktief groeiend riet tussen die ouderdom van vier tot ses maande om met kunsmisbestuur te help. Wag ten minste ses weke na kunsmistoediening voordat blaarmonsters geneem word. Indien die gewas erg onder druk is van blaaspootjie, geel plantluis of enige ander pes moet blaarmonsters liefs nie van hierdie lande geneem word nie.
- Ondersoek lande wat hierdie tyd van die jaar geel voorkom. Oor die algemeen is dit 'n aanduiding van 'n stikstof tekort as gevolg van, nie genoeg kunsmis wat toegedien is nie of die verlies van stikstof as gevolg van baie hoë reenval. Waak egter teen vergeelde areas in lande waar dit kan wees as gevolg van bydraende faktore soos geelplantluis, blaaspootjie, Geel Blaar Sindroom, snywurm of aalwurm. Raadpleeg jou voorligtingsbeampte indien jy sou twyfel en moet nie kunsmis toedien sonder om die oplossing vir die problem te vind nie.

Eldana

In areas where eldana is a problem, scouting should continue throughout the off-season. Identifying fields with high levels of eldana will enable you to prioritise these for harvesting once the mill opens. Scouting will also enable you to decide on the need for further insecticide treatments, particularly during the autumn moth peak.

Eldana

Waar eldana 'n probleem is, moet lande deurlopend gemonitor word in die afseisoen. Identifiseer lande met hoë tellings en prioritiseer hierdie lande om eerste geoes te word wanneer die meul oopmaak in die nuwe seisoen. Monitering sal ook help met die beplanning van verdere chemiese behandelings gedurende die motpiek in die afseisoen.

Weed control

- In summer you need to be working hard at controlling creeping grasses. Under-canopy applications of glyphosate, repeated if necessary, and verge control with imazypr are essential to keep these grasses under control.
- Flag problem spots within fields to keep track of these areas as the cane matures. Large areas where grasses have taken over will require the crop to be re-established.

Onkruidbeheer

- Gedurende die somer moet daar hard gewerk word om kruipendegrasse te beheer. Behandeling onder die blaredak moet herhaaldelik toegepas word met glifosaat indien nodig. Dit is baie belangrik dat land randbeheer met imazypir toegepas word om hierdie grasse te beheer.
- Merk probleem areas binne 'n land om rekord te hou van waar hulle is soos die riet groter raak. Groot areas waar die grasse oorgeneem het sal hervestiging noodsaak.

Ripeners

The planning of ripener application programmes should be well under way. Be aware that varieties differ in their response to certain products and treatments so check with your Extension Specialist if in doubt. The use of the **Pur***Est*™ app can greatly assist in the decision on the suitability of cane for ripening.

Rypmaker

Die beplanning van rypmaker skedulering moet alreeds onderweg wees. Skakel met u voorligtingsbeampte om die

korrekte produk vir die korrekte variteit te bevestig indien u sou twyfel oor die korrekte toedienning. Die gebruik van die **Pur***Est*™ -toep is 'van groot hulp met beplanning of rypmakers toegedien moet word al dan nie.

Record keeping

- Managing your farm more effectively can only be achieved if you have accurate records of production and operations. If you are not using a field record system, think seriously about buying a suitable package. Also get a programme planning sheet from your local Extension office. This will enable you to plan operations for the season, week-by-week, as well as to obtain an accurate estimate of labour and input requirements.
- An accurate crop estimate is vital to be able to budget income and expenditure for the season and to plan the necessary logistics required to move your crop. Your Extension Specialist has access to crop growth data and crop models to help you determine the likely size of your crop. There are also yield benchmarking tools available on the SASRI website (www.sasa.org.za/sasri) such as Canesim and StalkGro.

Rekordhouding

- Die effektiewe bestuur van 'n plaas kan slegs geskied as dit gepaard gaan met akkurate rekordhouding van produksie en alle operasies op die plaas. Indien u nie van 'n erkende veldrekordhoudingsprogram gebruik maak nie moet dit ernstig oorweeg word om so 'n program aan te skaf. U kan ook u voorligtingsbeampte vra vir 'n handige muurbeplanner om u te help met vooruit beplanning vir die volgende seisoen. Die muurbeplanner sal u in staat stel om u beplanning vir die seisoen op 'n week tot week basis te doen en sodoende ook 'n akkurate beraming doen van nodige arbeid om die take te verrig.
- Om u oesskatting so akkuraat moontlik te doen is van kardinale belang vir u begroting om inkomstes en uitgawes en om die nodige logistiek rondom die vervoer van die oes te beplan. U voorligter het toegang tot gewas groei data en gewas modelle om u by te staan met die oesskatting. Daar is ook oesverifikasie hulpmiddels beskikbaar op die SASRI webwerf (www.sasa.org.za/sasri) soos Canesim en StalkGro om van hulp te wees.

Planting

- Planting in late summer and autumn brings some additional risks. High soil temperatures in summer as well as the possibility of the soil drying out as winter approaches leads to the risk of soil borne diseases, such as pineapple disease, affecting germination. Apply a fungicide to protect the setts and adequately cover and compact the soil over the setts.
- The recent heavy rains in some areas has highlighted areas where infield and road drainage needs attention. Plan to rectify these problems, particularly the roads, before the start of the next season. Infield drainage problems are best dealt with at replant, and during the dry times of the year.

Plant

- Plant gedurende laat somer en herfs het addisionele risiko's. Hoë grondtemperature in die somer sowel as die moontlike uitdroging van die grond soos winter nader kom lei tot die risiko van grond onwikkeld peste en plae soos pynappelsiekte. Wat ontkieming beiinvloed. Behandel alle plantmateriaal met 'n swamweerende middel om die saadriet te beskerm en verseker dat die grondbedekking deeglik gedoen is en goed gekompakteer is.
- Onlangse goeie reën in sekere gebiede het duidelike aanduidings gegee waar veldpaaie en lande dreinering benodig. Beplan om hierdie probleme, veral die paaie, voor die volgende seisoen te herstel. Dreineingsprobleme binne 'n land word beste aangespreek tydens herplant van die land of gedurende die droë seisoen.

SKILLED OPERATION AND MANAGEMENT

A KEY TO IRRIGATION SYSTEM PERFORMANCE

Ashiel Jumman (Agricultural Engineer)

Irrigation hardware is always accompanied by very specific operating rules, which differ from system to system. It is therefore essential that staff possess the necessary knowledge and skills to operate and manage the particular systems installed on a farm. Poor management of a well-designed irrigation system will negatively affect system performance, whereas excellent management can make a poor design workable.

Many farms use more than one irrigation system. For example, centre pivots may be the preferred option but hop along sprinklers or drip may have to be used on outfall areas outside the pivot circle. Or, the more affordable hop along sprinklers may be preferred but certain fields with shallow soils or low water holding capacities may have drip. When making use of a variety of irrigation systems, farm staff will require a diverse set of skills and knowledge so that operations are not compromised. For example, if there are several blocks of 3 or 4 ha of drip or hop along sprinkler systems distributed across the farm on pivot corners, this could leave both the labour and the irrigation management team spread thinly on the ground. Time and attention will have to be divided carefully between managing the centre pivots and the outfall systems so that neither is neglected. If not, costly, poor irrigation performance will occur. This poor performance is a result of inefficient management and is not a reflection of the systems' capability.

BEKWAME EN DOELTREFFENDE BESTUUR

DIE SLEUTEL TOT BESPROEIING-STELSEL PRESTASIE

Besproeiing hardeware word altyd vergesel deur baie spesifieke bedryfstelsel reëls wat van stelsel tot stelsel kan verskil. Dit is dus noodsaaklik dat personeel oor die nodige kennis en vaardighede beskik om die betrokke stelsels wat op 'n plaas geïnstalleer is, goed te kan bestuur. Swak bestuur van 'n goed ontwerpte besproeiingstelsel sal 'n negatiewe invloed op die stelsel se prestasie hê, terwyl die goeie bestuur van 'n swak ontwerpte stelsel n positiewe uitwerking op die stelsel se prestasie sal hê.

Op die meeste plase word daar van meer as een besproeiingstelsel gebruik gemaak. Spilpunte kan byvoorbeeld die voorkeur keuse wees, maar meer bekostigbare beweegbare sprinkelstelsels of drupbesproeiingstelsels kan gebruik word op uitval areas buite die spilpuntsirkel. Die meer bekostigbare sprinkelstelsels word gewoonlik verkies, maar sekere lande met vlak grond stelsels of 'n lae grondwaterhoukapasiteit, kan daar eerder van drupbesproeiing gebruik gemaak word. Wanneer daar gebruik gemaak word van 'n verskeidenheid besproeiingstelsels, sal plaas personeel 'n diverse reeks van vaardighede en kennis moet hê sodat besproeiingsbedrywighede optimaal kan werk. Byvoorbeeld, as daar 'n paar blokke van 3 of 4 ha met drupbesproeiing of beweegbare sprinkelbesproeiingstelsels versprei is oor die plaas op spilpunthoeke, kan dit veroorsaak dat beide die arbeid en die besproeiingbestuurspan dun versprei is op die grond. Tyd en aandag moet versigtig verdeel word tussen die bestuur van die spilpunte en die uitloopstelsels sodat produksie nie afgeskeep word nie. Indien nie, sal duur en swak besproeiing 'n negatiewe invloed op produksie hê. Swak prestasie is gewoonlik die gevolg van ondoeltreffende bestuur en is nie 'n weerspieëling van die prestasie vermoë van die stelsels nie.

IRRIGATION SYSTEMS

CAPITAL VERSUS OPERATING COSTS

Ashiel Jumman (Agricultural Engineer)

The cost of an irrigation system can be divided into two components, capital and operating costs. Capital costs are generally the once-off investment required to purchase and install the irrigation equipment. The operating costs represent the ongoing continuous costs payable over the lifespan of the irrigation system. In gravity-fed surface irrigated systems, operating costs include factors such as labour, maintenance and water tariffs. In pressurised irrigation systems, however, operating costs include all of the above, plus the cost of electricity to run the pumps.

Traditionally, capital costs have been the main factor in deciding which irrigation system (or design option) to install, usually without considering operating costs. This explains, to some extent, why the relatively cheaper sprinkler irrigation, especially the dragline and hop along sprinkler systems, have been the most widely used in South Africa. These systems have been installed even though they can have a high operating cost in the long-term.

While affordability and capital costs are important, rapidly increasing electricity tariffs and labour costs have made the operating costs of the irrigation system a crucial consideration. Farmers are recognising the value of higher capital cost systems (or design options) that have lower operating costs over the life cycle of the system. Hence, the expensive, but more accurate, automated, low pressure and water efficient systems such as centre pivots and drip irrigation systems are becoming popular.

The benefit of investing in high capital systems is dependent on the longevity of the irrigation systems. For this reason, monitoring and preventative maintenance to maximise the life span of the irrigation systems is very important.

BESPROEIINGSTELSEL

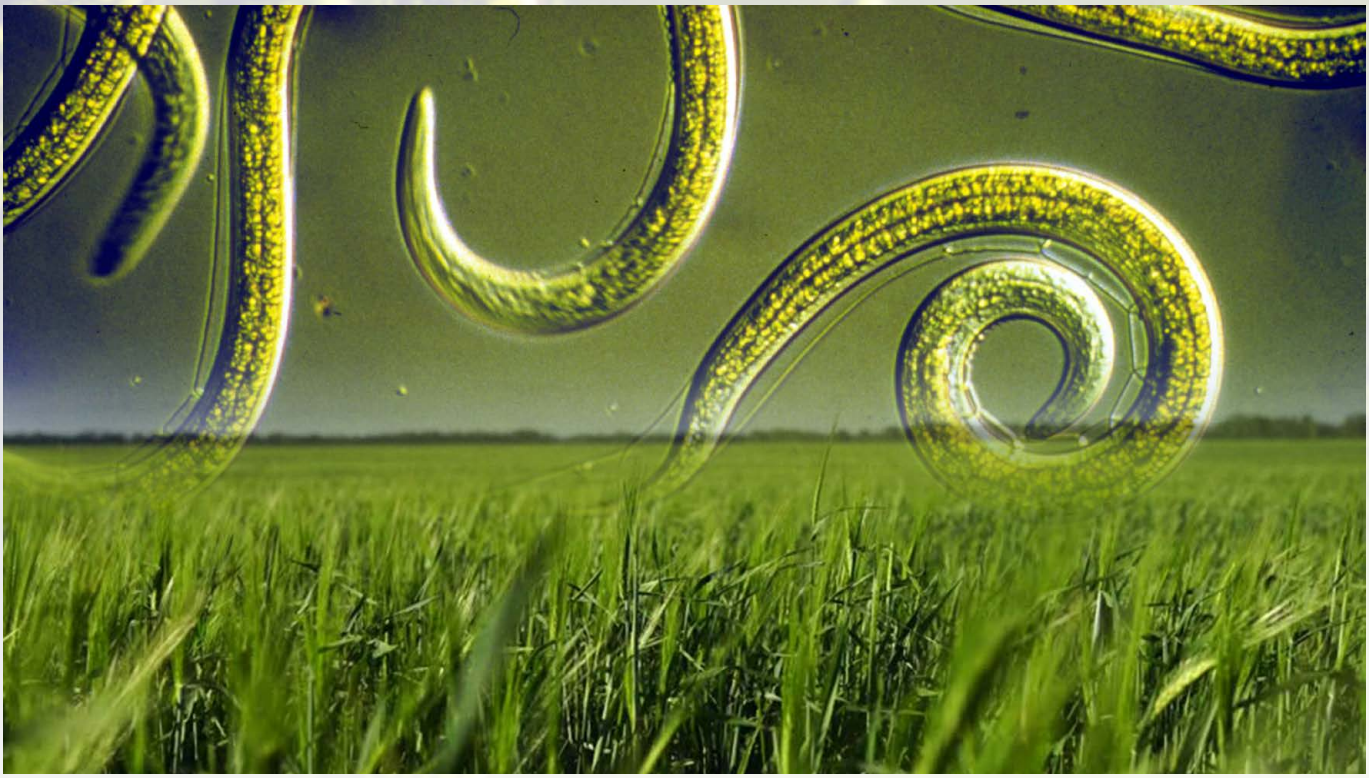
KAPITALE UITLEG TEENOOR BEDRYFKOSTES

Die koste van ‘n besproeiingstelsel kan in twee komponente verdeel word, kapitaalkostes en bedryfskostes. Kapitaalkoste is oor die algemeen die eenmalige belegging wat benodig word om die besproeiingstoerusting te koop en te installeer. Die bedryfskoste verteenwoordig die deurlopende koste wat oor die leeftyd van die besproeiingstelsel betaalbaar is. Waar swaartekrag ondersteunende grond oppervlak besproeiingstelsels gebruik word, sluit dit bedryfskoste faktore soos arbeid, instandhouding en water tariewe in. In drukbesproeiingstelsels sluit bedryfskoste al die bogenoemde in, plus die koste van elektrisiteit om die pompe te laat werk.

Tradisioneel is kapitaalkoste die hoof faktor in die besluitneming van watter besproeiingstelsel (of ontwerp opsie) geinstalleer word, gewoonlik sonder om bedryfskoste te oorweeg. Dit verklaar, tot ‘n mate waarom die relatief goedkoper sprinkelbesproeiing, veral die sleeplyne en sprinkelstelsels, die algemeenste in Suid-Afrika gebruik word. Hierdie stelsels is meestal geïnstalleer, ten spyte van die feit dat hulle op die lang termyn ‘n hoë bedryfskoste kan hê.

Terwyl bekostigbaarheid en kapitaalkoste belangrik is, word vinnig stygende elektrisiteitstariewe en arbeidskostes, die bedryfskoste,‘n ernstige oorweging wanneer daar besluit word watter besproeiingstelsel geinstalleer moet word. Boere erken die waarde van hoër kapitaalkostestelsels (of ontwerp opsies) wat laer bedryfskoste het oor die lewensiklus van die stelsel. Daarom word die duur, maar meer akkurate, outomatiese, lae druk- en waterdoeltreffende stelsels soos spilpunte en drupbesproeiingstelsels gewild.

Die voordeel van ‘n belegging in ‘n hoë kapitaalstelsel hang af van die langlewendheid van die besproeiingstelsel. Om hierdie rede is monitering en voorkomende instandhouding om die lewensduur van die besproeiingstelsels te maksimeer, baie belangrik.



IT PAYS TO MANAGE NEMATODES

Prabashnie Ramouthar (Nematologist)

Plant parasitic nematodes (PPNs) are microscopic worm-like organisms that feed on the roots of plants thereby reducing their yield. In order to minimise losses due to PPNs in an economically viable and environmentally sustainable manner, SASRI's research programme is targeted towards an integrated nematode management system. This entails a careful consideration of all available nematode control measures and subsequent implementation of a combination of appropriate measures, rather than relying on any single method of control.

The first step in this process is to determine the extent of the nematode problem by taking a soil sample for nematodes. A soil sample will provide you with the information required in order to make the appropriate management decision. Once it has been established that the nematodes in the soil should be managed, there are various options available for nematode management. These include the use of green manure crops such as black oats, which reduce plant parasitic nematode numbers in the soil, the use of tolerant varieties, minimising stress to the plant and improving soil health and the use of both chemical nematicides and biological control products.

SASRI constantly researches various aspects of nematode control using both pot trials based at SASRI and field trials planted throughout the industry. One such trial is the variety x nematicide field trial planted at Gingindlovu in October 2014. The soil has a clay content of 6% and a pathogenic nematode community containing both the root knot and dagger nematodes. Under these conditions, yield loss from nematode damage is highly likely, and an economic response to nematicide would be expected. Varieties N47, N51, N52 and N55 were used in this trial to determine their response to nematicides. Variety N12, a known tolerant variety was used as a control. The trial was carried out over three crops (plant crop and two ratoons) and was harvested on an annual cycle.

As expected, all varieties except N12 showed an increase in cumulative RV yields over the three crops due to treatment with a nematicide (Figure 1).

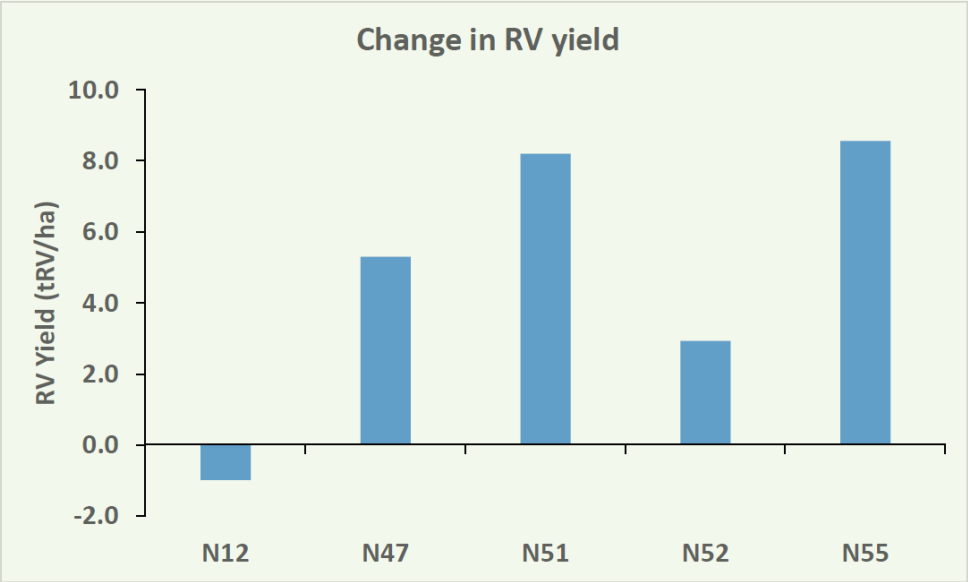


Figure 1: Change in cumulative RV yield (over three crop cycles) due to treatment at planting with a nematicide.

These RV yield results were translated into economic terms taking into account the cost of the nematicide, the cost of application, the increased harvesting cost due to increased yield and the RV price for the year (Figure 2). Once again, except for N12, all other varieties showed an increase in revenue (cumulative over all three crops) due to nematicide treatment.

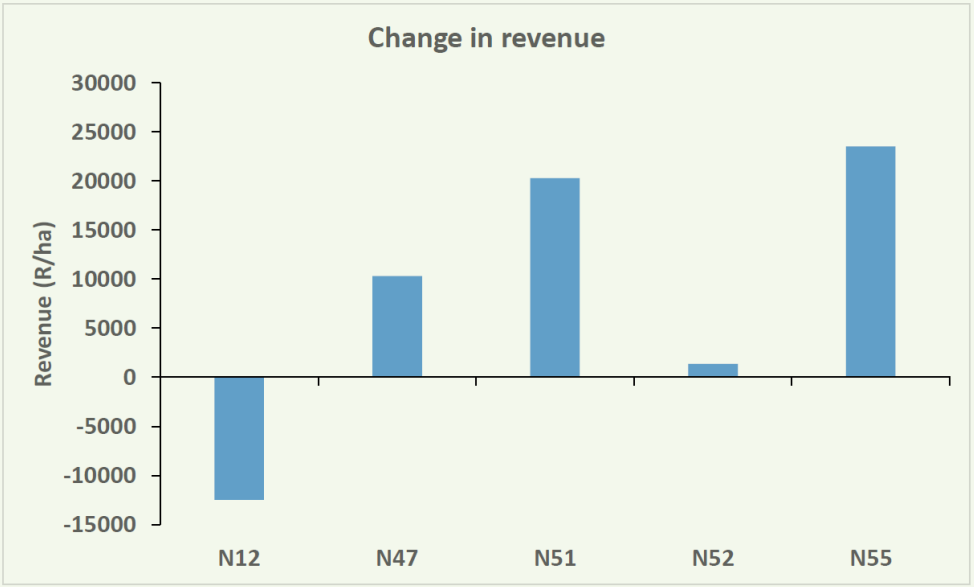
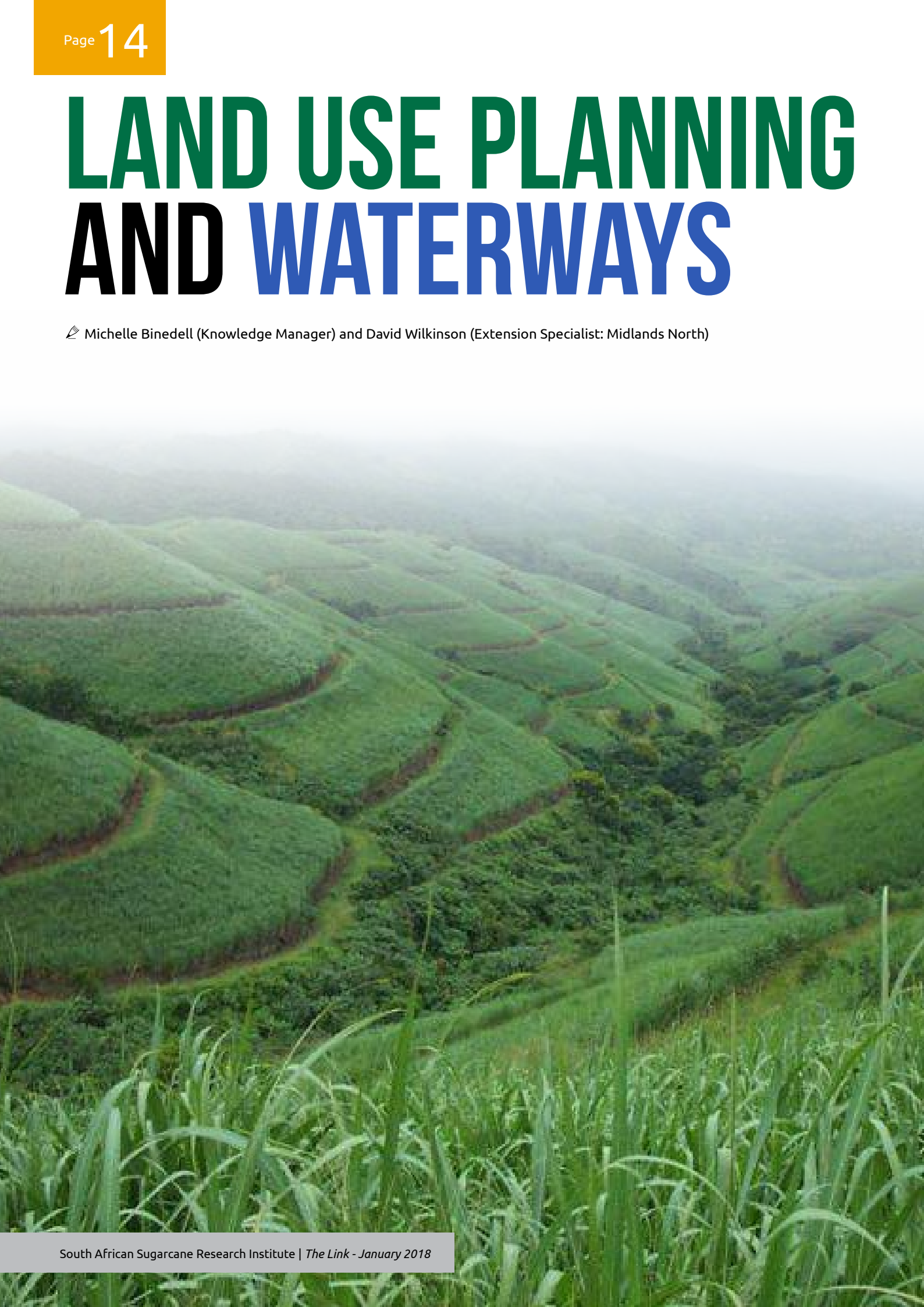


Figure 2: Change in cumulative revenue (over three crop cycles) due to treatment with a nematicide.

Results from this trial contribute to SASRI's integrated management strategy. Varieties N47, N51, N52 and N55 all respond well to a nematicide and this can be used as an effective and economically viable management strategy. Variety N12 on the other hand is a known tolerant variety and will not respond to a nematicide on an annual cycle. Treating this variety with a nematicide under these conditions will result in a loss in revenue.

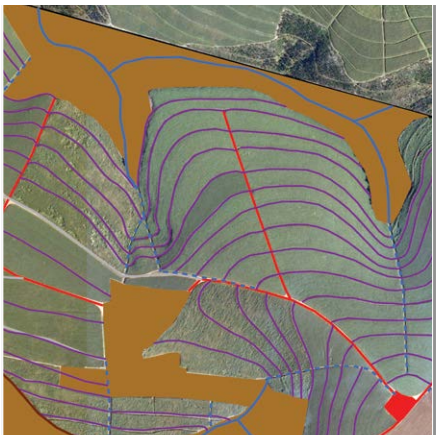
LAND USE PLANNING AND WATERWAYS

Michelle Binedell (Knowledge Manager) and David Wilkinson (Extension Specialist: Midlands North)



Towards the end of last year, SASRI Extension Specialists David Wilkinson (Midlands North), Paul Botha (Midlands South), Tshifhiwa Radzilani (Zululand North) and Alex Searle (Umfolozi) conducted a one-day practical training session on Land-Use Planning in the Felixton area.

The event was attended by 22 growers who learnt about the purpose and importance of Land Use Plans. The training included practical demonstrations on pegging structures and using the abney and dumpy levels. Attention was also given to the construction and use of grassed waterways.



Some important take-home messages from the day:

- Grassed waterways are hydraulically stable structures, protected by grass and designed to safely convey the discharge from storm-water drains, terraces and run-off from infield areas to natural streams and rivers.
- Waterways should be sited as indicated on the land use plan.
- Waterway dimensions are determined by soil type, slope % and the area of the catchment.
- Required dimensions will be shown on the plan, but waterways must start at a minimum of 4m wide, increasing to the width specified by the plan.
- Waterways are best constructed during winter after harvesting, before plough out.
- Waterways should be shaped correctly, with the base as flat and level as possible to encourage the dispersion and slowing of the run-off water. Sides must be angled with final depth of completed waterway a minimum of 300 mm.
- After shaping waterway, plant with a creeping grass suitable to the area to produce a good cover before summer rains. Plant either runners or sods. Sods can be lifted with a purpose-built tractor mounted machine. Once placed, sods should be secured with wooden pegs.
- Where extraction routes cross waterways, provide additional protection in the form of stone packing, without changing the shape of the waterway.
- Where there is a sudden change in slope, the waterway should be adequately protected using gabions and a `Reno' mattresses or similar material to prevent any waterfall action cutting back and forming gullies.
- Mow vegetated waterways and keep free of silt and debris.
- Never use waterways as roads or paths.

Growers are encouraged to speak to their local Extension Specialist if they wish to attend a similar course in their area.

CLIMATE CHANGE:
WHAT'S IN STORE FOR THE SA SUGAR INDUSTRY, AND HOW WE PREPARE FOR IT

Abraham Singels (Principal Agronomist) and Matthew Jones (Systems Modeller)

Recent droughts, unseasonal rainfall, flooding and violent storms have placed renewed focus on climate change. What can the SA sugar industry expect from future climate and what can we do to make the best out of it?

The CO_2 concentration of the earth's atmosphere has increased steadily from 260 parts per million (ppm), prior to the industrial revolution, to present-day values of around 400 ppm. The continued burning of fossil fuel across the globe will increase CO_2 levels even further, to levels of about 570 ppm by 2050 and 700 ppm by 2100. This, and the continued emission of other greenhouse gases (GHGs), is the main cause of recent and future climate change.

Air temperatures, a key driver of sugarcane growth and water use, have increased by about 1 °C in the industry in the last 70 years and are expected to increase even more sharply in the next 30 years. Most climate models predict that temperatures will be about 2 °C warmer by 2050 (and 4 °C warmer in the 2100s). Rainfall projections for eastern South Africa are less certain with a possibility of slight increases in annual total rainfall, especially in the northern parts of the industry.

SASRI researched the impacts of these changes on sugarcane crops in the different agro-climatic regions of the industry using the Canegro simulation model. This research indicates that by 2050:

- Increased temperatures will accelerate crop development, enabling faster canopy closure (15% faster on average for rainfed areas), faster stalk growth and higher rainfed cane yields (on average by about 15%), water status permitting (Figures 1 and 2). Yields in current irrigated regions are not expected to increase by much (i.e. 1 to 4%) (Figure 1). These impacts are expected to be proportionally greater in the current cooler parts of the industry.

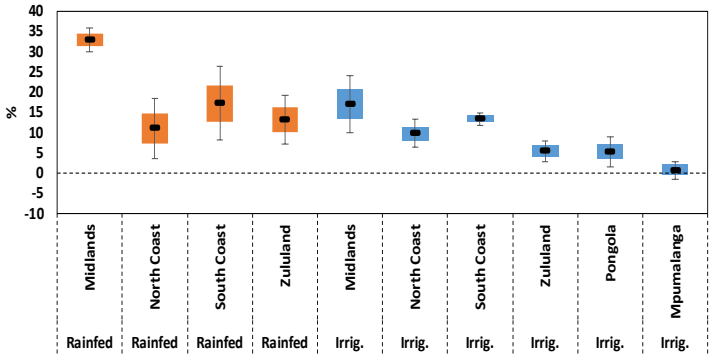


Figure 1. Expected change in cane yields due to climate change (Note: This graph indicates the differences in yields simulated for the periods 2046-2065 and 1971-1990).

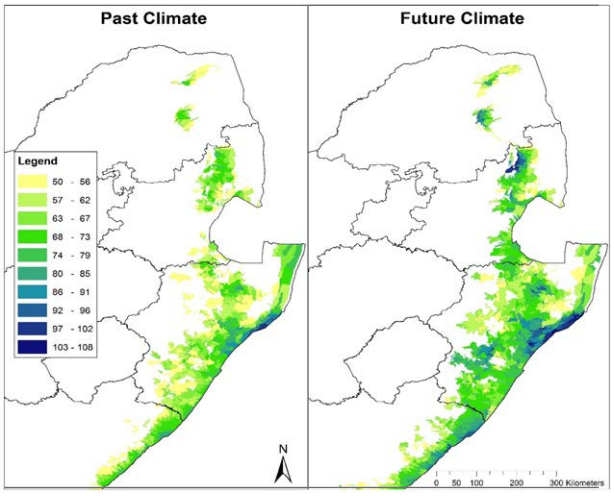


Figure 2. Past and future annualised simulated rainfed cane yields. Only areas with yields > 50 tc/ha/annum are shown.

- Higher temperatures imply a drier atmosphere, which in combination with rapid canopy development, will increase crop water use by between 2 and 14%, despite the inhibiting effect of elevated CO_2 on transpiration. Demand for irrigation water is also expected to increase by between 9 and 14% (Figure 3), putting additional pressure on limited resources.
- New areas are likely to become suitable for sugarcane production as temperatures increase, assuming adequate water status. These include areas in northern Limpopo, in the north-eastern parts of the Eastern Cape and high lying areas of KwaZulu-Natal and Mpumalanga (Figure 4).
- Green cane harvesting and the retention of a residue layer on the soil will become more important under the future climate. The benefits of reducing wasteful evaporation and increasing yields, reducing GHG emissions and improving soil health will apply more widely in future.
- Although all varieties are expected to yield higher under moderate climate change, drought tolerance will remain a desirable trait for those varieties grown under rainfed production, and may become more important as temperatures increase beyond 2 °C.
- Simulations suggest that cane rows could possibly be spaced wider and planting density decreased to reduce costs, in future, without decreasing yields.
- Surprisingly, simulations also suggest that higher annualised yields can be obtained by harvesting crops younger in certain areas under future climate. The financial viability of this practice needs to be confirmed.

Note: The results reported here depend heavily on the assumption of a slight increase in total rainfall in most regions of the industry. The research also has not accounted for the effect of extreme weather events, changes in pest and diseases incidence, and irrigation water availability.

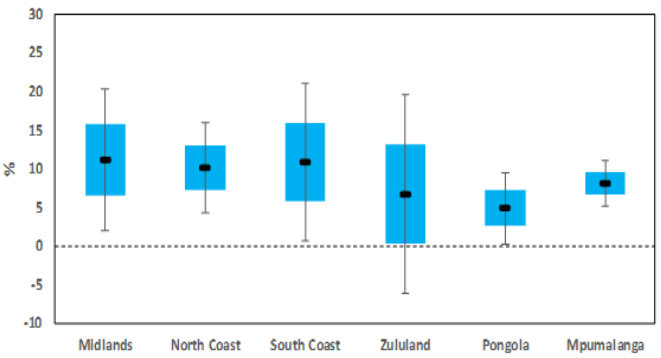


Figure 3. Expected change in irrigation demand due to climate change **(Note: Distributions indicate differences in demand simulated for the periods 2046-2065 and 1971-1990).**

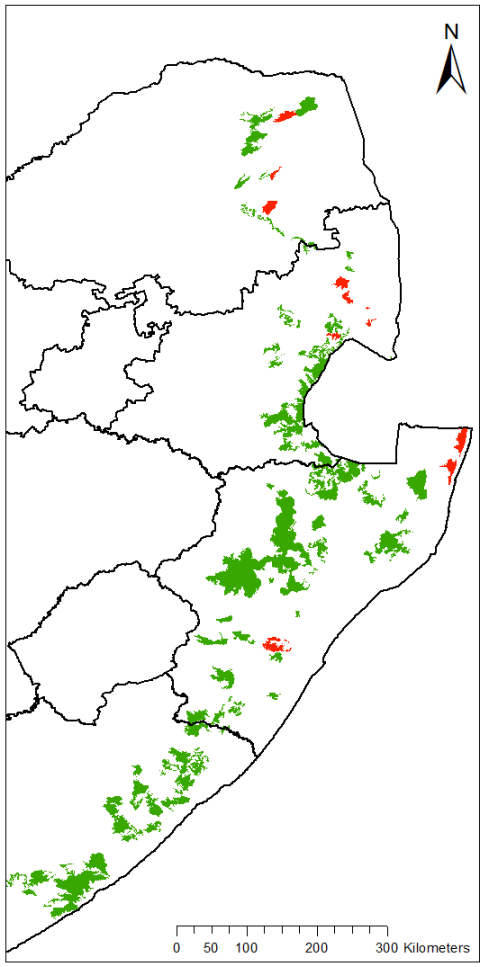
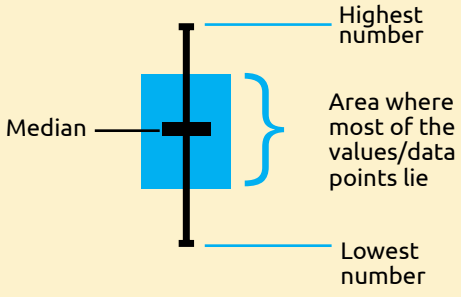


Figure 4. New areas that may become suitable (green) or existing area that become unsuitable (red) for rainfed production (assuming break even LTM annualised cane yield of 50 t/ha).

A box and whisker plot is a special type of graph that is used to show groups of number data and how they are spread. It shows the median, which is the middle value of the numbers in your data, the lowest number, the highest number and the area where most of the values lie.



THE GROWER, THE RESEARCHER, THE MAVERICK...

Kerisha Raghunandan (Publications Officer)

Richard Cole, a grower in the Sezela region, has been farming sustainably for several years with minimal use of agrochemicals. While it may seem hard to believe, Richard has surprised many scientists and peers with his green ideals of growing sugarcane and producing very good yields consistently, even in years of drought. However, his journey toward sustainable farming has been one that required an understanding of the plant (photosynthesis) and soil biology.

Growing pains

Richard began farming in 1990 and came into the business with a large bond and little knowledge on how to maximise his land's potential. Following commonly shared practices of burning, rigorous fertiliser application and agrochemical use, Richard went through years of repeating these methods yet production was static. It was at this point that he realised his farm had hit a plateau and a subsequent slow decline in yields followed with his input costs beginning to increase. Demotivated and frustrated, Richard refused to give in and was forced to question the conventional approach to farming. He describes this period as him "fighting with nature". In an effort to remediate this issue, he decided to follow his gut and teamed up with a few like-minded individuals to instill a change on his farm. This was a courageous effort as his realisation was met with the understanding that this would take time, that input costs would initially increase and the outcome be dependent on "nature". Richard decided to take the research approach and soon realised that the solution lay within the soil. Sugarcane had been grown on the farm year after year since the 1930s and upon further analysis, soil tests revealed areas of variability, high subsoil acidity, low organic matter and low pH. Not wanting to choose the agrochemical route once again, Richard asked himself how ancient civilisations, in the absence of technology, remediated such issues with success.

Farming sustainable soils

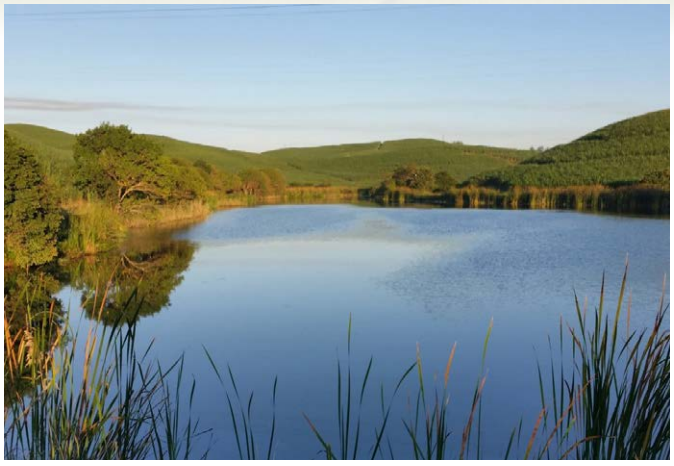
Richard decided to focus on the replant fields, understanding that this would be his "ten year investment". Aggressive lime application was done to reduce soil acidity. Around 4 t/ha was applied to areas with high acidity. Methods of alleviating aluminium toxicity were also investigated. A big yield step change on the farm occurred with the application of gypsum. All replant fields have a 12 month fallow period during which lime is applied and thereafter, no sooner than six weeks later, gypsum is applied. This allows time for the lime to react with the soil before the application of gypsum. The practice of a

fallow in conjunction with cover crops breaks the monoculture cycle and provides a period for the soils to recover. This, in turn, led to drastically increased productivity over the next nine harvests. Green manuring with legumes is also practised to increase soil health and Richard is now researching the impact of growing multispecies cover crops during the fallow period.

The next step to soil remediation was researching methods to increase organic matter on the farm with the long term goal of attaining soil organic matter (SOM) levels of 7%. SOM levels range between 4 and 5 % currently. One of the key drivers of this change was that of green-cane harvesting and the retention of a crop residue blanket – something that used to be practised on the farm in previous years. To confirm that this was a viable decision, and in typical research fashion, Richard decided to trial this idea in a field on his farm before implementing it. The results revealed a great shift in top soil health, reduced weed pressure (which translated into a reduction in herbicide use), better soil temperature regulation and greatly reduced erosion by eliminating rain drop shatter. Despite some resistance from the cane cutters to green cane harvesting, he persevered to implement this important management practice, and today, the cane cutters much prefer cutting the cane green! He also moved away from using urea and LAN to using CMS on his farm and has being doing so for the last 16 years.

In terms of pests, Richard boasts an almost eldana-free farm. This he attributes partly to the incorporation of silicon into his fertilisers. He has also allowed for the grow-back of sedges and plants such as *Cyperus dives*, a natural host of eldana, all of which he believes contributes to the low eldana numbers.

Nature's way



Richard believes in working with nature in order to farm sustainably. By focusing on the farm's natural processes and reducing the range of agrochemicals used, the system corrects itself. However, in order for this to be successful, a very high degree of management is required from the grower. He is now investigating ways to naturally increase micronutrients such as boron, calcium, manganese, zinc, etc. as he believes that in combination, these 'micros' do in fact play a 'macro' role in the soil. Richard's pioneering approach to farming naturally, really does make him a maverick of the industry. In promoting a natural farming system, he is fostering a biodiverse environment rich in wildlife and greenery thereby ensuring long-term sustainability of his farming operation.

Richard Cole (right) and SASRI Director Carolyn Baker (left). Richard gave an inspiring talk at the at the Agronomist's Association Symposium in 2017 were he outlined all practices on his farm and some of his successes.

WEATHER

Phillemon Sithole (Assistant Research Officer) and Abraham Singels (Principal Agronomist)

Review

The 2017 spring rainfall (August and September) was below average for most parts of the industry, with only South Coast recording normal spring rainfall. The industry remained generally dry at the onset of summer rainfall in October, except in South Coast and Midlands areas where above average rainfall was recorded (Figure 1). There was a marked improvement in November when the industry recorded average to well above average rainfall.

Irrigation water supplies in the irrigated regions were critical, with most dams still below 50% of full capacity as of mid-December 2017. However, the dam levels were generally much better than they were during the same period in 2016 and consequently water restrictions in 2017 were not as severe as those of 2016.

Outlook

The El Niño-Southern Oscillation (ENSO) system is currently in a weak La Niña phase, and is expected stay in a weak to possibly moderate La Niña state for the rest of the 2017/18 summer. A La Niña is generally associated with above average summer rainfall for the industry.

The *South African Weather Service* (SAWS) predicts above normal rainfall for the remaining summer months (January to March, 2018) while the *International Research Institute for Climate and Society* and *European Centre for Medium-Range Weather Forecasts* both predict normal rainfall over the same period.

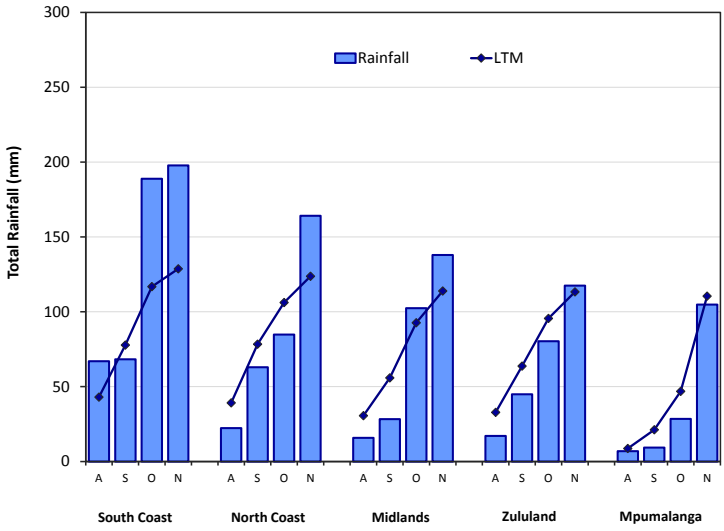


Figure 1: Regional average monthly total rainfall from August to November, 2017 compared to the monthly long term mean (LTM).

Please visit the Weatherweb available via the SASRI website: www.sugar.org.za/sasri for links to up-to- date seasonal climate forecasts and also for the latest rainfall and other weather data.

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