



September 2024

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Director's Message

Dr Shadrack Moephuli (*Director*)

Published: 17th Sep 2024

It is now spring when we're expecting rainfall and warmer temperatures, particularly in the

sugarcane growing parts of South Africa. This should be good for enabling sugarcane growth and ripening, leading to increased sucrose content – all through natural means.

However, we know that environmental and natural processes are not always synchronised or sufficient to effectively enable good yields in sugarcane or any other crop. Traditionally and historically, sugarcane growers have utilised drying-off as a natural ripening strategy and synchronised this with harvesting schedules. To achieve this requires good environmental conditions with sufficient water supply. Unfortunately, different weather conditions could lead to poor ripening and low yields at harvest.

In this edition of the *Link* we discuss innovative approaches towards sustainable agricultural production.

Recently, we have explored an innovative approach of participatory research methodology between sugarcane growers in the Midlands South region and SASRI scientists. The focus is on deploying chemical ripening techniques to increase culm sucrose content in plants. Previous scientific studies have shown that sucrose content in the more mature parts of the culm, where the internodes have already fully elongated at the time of application of chemical ripener often result in the largest improvement in sucrose content. Responses to chemical ripeners has also been previously observed to be dependent on various factors, in particular, cultivar characteristics. We discuss in this article sugarcane varieties N41 and N48 trials through participatory research that chemical ripening induced higher sucrose content, which led to better financial returns for growers.

Pests and diseases are known factors that can adversely affect crop growth, production and yield. To ensure sustainable production and productivity, growers adopted agrochemicals known to protect crops, including sugarcane. However, the use of some agrochemicals has been demonstrated to be harmful to non-target species and in some instances led to unintended biological or environmental consequences. In response, SASRI is leading efforts towards enabling good management practices for environmental stewardship. Hence the need to explore the use of alternatives to traditional agrochemicals, such as resistance inducers and agricultural biologicals. Developing alternatives to agrochemicals for sustainable crop protection could ensure production and productivity; that in turn, could accelerate better management practices on farms.

In South Africa there are no less than 23 900 small-scale growers of sugarcane distributed from the Lowveld, Midlands to South-Coast. Sugarcane small-scale growers are known to experience various challenges that negatively affect production and productivity, that consequently result in lower incomes. In this article we explore the use of participatory research methodology by SASRI to facilitate learning by growers to increase their yields and productivity. Demographically diverse small- scale growers from 11 sugarcane communities

(lowveld to south-coast) participated in this study. Through this interactive approach, small-scale growers appreciated learnings that identified various constraints, such as weed management, knowledge of various agrochemicals for weed management, cultivar selection and identification, harvest synchronisation with contractor's haulage, to mention a few. Although still work in progress, we hope that insights developed through this methodology will enable small-scale growers to increase their yields and productivity – and lead to higher incomes.

Sustainable sugarcane production and productivity requires attention to soil health and good crop nutrients. Growers need to select appropriate fertilisers that provide the correct elements with the right application rates at lowest cost for sugarcane production. To enable growers to achieve their goals for optimal sugarcane production and productivity, SASRI has developed a decision support tool, named OptiFert. The aim is to assist growers to calculate the cheapest fertiliser option that will supply the required nutrients to their crops within specified upper and lower range limit that are based on recommendations they received from SASRI's Fertiliser Advisory Service (FAS). In this article we announce the availability of OptiFert and how growers could make use of this important decision-support tool for their production.

Our regular feature “Topical Tips” carries seasonal advice on sugarcane production, including managing pests, diseases, weeds and nutrition. Our other regular Weather article provides a weather review and outlook for the months ahead.

It is our considered hope that this edition of the *Link* will provide insights for sustainable sugarcane production with improved profitability. At SASRI we aim to continuously improve our offerings for better management practices.



Topical Tips

*Ruth Rhodes (Extension Specialist, Zululand South) and
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Published: 17th Sep 2024

Spring has sprung, and the weeds have started to emerge within hours of the welcome, widespread rains in the last week of August. Most growers will already have started thinking about planting, weed control and fertiliser, whilst keeping an eye on the end of the looming mill closure dates.

Weed Control

- Be sure to spread trash and tops evenly over the whole field immediately after harvesting to ensure effective weed control and improve soil health. If practically possible, use cooler, morning burns to retain more dried leaf residues and tops.
- Inspect each field weekly to determine your weed control programme.
- Identify problem weeds in each field and prepare to carry out an appropriate spray programme, for example, for creeping grasses, purple watergrass, digitaria etc.
- Pre-emergent and early post-emergent chemicals, i.e. long-term herbicides, are the most cost effective.
- Fields identified for ploughing out using minimum tillage should be sprayed with glyphosate starting in October.

Carryover Cane: Decisions to be made

- With some mills closing earlier than expected this year, decisions about carry-over cane need to be made early.
- Fields likely to be infested with eldana should not be carried over. **This includes susceptible varieties**, even if they don't currently show high levels.
- Consider spraying for eldana in those fields being carried over.
- In areas and varieties where **flowering** has been severe, remember not to carry over any fields where more than 20% of the stalks have flowered.
- **Avoid carrying over flowering fields showing signs of eldana damage** [$>1.1\%$ stalk length red (%SLR)]. Harvesting of these fields is a priority.

Eldana

- In many regions, **eldana damage has been exacerbated** by both the carry-over scenario over the last two to three seasons and the dry winter conditions experienced throughout the industry.
- Moth peaks are typically in September, October and November. Increase your scouting activities (over and above routine P&D surveys) to help formulate any eldana spray programmes during this period.
- Consider spraying fields with a history of severe eldana infestation, or evidence of eldana

damage in young cane (e.g. dead hearts and frass), even if there is a very small amount of stick. Discuss this with your Extension Specialist.

- Choose a targeted approach on specific fields/sections of the farm where spraying is needed. The “shotgun” approach of spraying everything is not only expensive, but also not environmentally friendly!



Yellow Sugarcane Aphid (YSA)

- Yellow Sugarcane Aphid is already present in many fields. Keep an eye out for them: early detection will allow for early intervention.
- Look for older (lower) leaves that are starting to turn yellow-orange; YSA are likely to be hiding underneath.
- Be aware that natural predator populations will start to increase. Before spraying, consider your options carefully and discuss these with your Extension Specialist. Avoid unnecessary spraying.



Fertiliser top-dressing

- Top dressing of ratoon cane should now be in full swing. By the end of September, you should have addressed the backlog of fields harvested during winter.
- Ensure your fertiliser programme is up to date by the end of October
- Too much nitrogen fertiliser can reduce your RV% unnecessarily and increase eldana damage.
- When applying gypsum for subsoil acidity (according to your soil analysis), ensure you also apply at least one ton of dolomitic lime to replace the magnesium that gypsum can draw out of the topsoil.

Planting

- Moisture conservation is crucial at planting. Open your furrows shortly before planting and close them again immediately. Furrows do not need to be more than 200 mm deep.
- Wait for rain before planting fields that were ridged in winter.
- Remember that healthy, variety-pure seedcane is essential.

Harvesting and flowering

- Let's hope for some good early summer rains! Keep sandy, well-drained fields – or those fields near weather-proof extraction routes – for harvesting during spells of wet weather.
- Harvest flowering fields before the end of September if more than 20% of the stalks have

flowered.

Late-season ripening

- In the rainfed areas, late-season ripening should not be considered this year, due to the dry winter conditions.
- In the irrigated areas, only the best-potential soils should be considered for late season ripening, IF rainfall starts as usual in spring. Using the PurEst app as a guide is highly recommended. If it remains dry, do not consider ripening.

Disease Scouting

- Smut is often worst when long, dry and warm winters are followed by good spring rains. Growers in the irrigated regions and coastal Zululand should start scouting for smut. Consult Information Sheet 9.2 on the SASRI website for symptoms.
- Be vigilant for other diseases which may start to crop up during spring and early summer and begin your roguing operation. Consider chemical roguing for smut.





Genetically modifying sugarcane for insect resistance and herbicide tolerance

**Gwethlyn Meyer (Molecular Biologist) and
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Published: 17th Sep 2024

SASRI is working on developing genetically modified (GM) sugarcane that can tolerate the herbicide imazapyr and resist insects, particularly the stalk-boring eldana. Finding GM sugarcane with the right traits is challenging – out of 700 plants tested from 95 experiments, only 4% meet the criteria we are looking for. However, everything is on track to release the first GM sugarcane to the South African sugar industry by 2032.

Modern biotechnological methods are used to insert specific genes into the sugarcane's DNA. Selected sugarcane varieties are chosen based on their response to tissue culture. Once transformed with the genes of interest and these plants reach 5-8 cm in height, we begin our analysis. First, we test for the presence of the herbicide tolerance gene. Analysis by PCR indicates that about 70% of the plants contain the gene. Next, we establish that those plants are also able to produce insect resistance proteins.

The number of GM insertion events is then measured, and only plants with a low number of gene copies are chosen for further analysis. Ten months after gene insertion, the number of remaining plants drops significantly (to about 14% of original plants), and there are still two more lab tests to go. We cut off the roots and only herbicide tolerant plants can regrow in a medium containing imazapyr. These plants will then progress to the final test. Here, in test tubes, we expose clones of promising plants to second-stage eldana larvae. After five days, plants are deemed eldana resistant when there is no evidence of feeding by the hungry larvae.

Only 4% of the initial GM plants produced make it through the lab screening and progress into pot trials. Three years after gene insertion, we can evaluate the plant's resistance to eldana under conditions that mimic real field conditions. It will take another year, along with more molecular tests, to get regulatory approval to release one or two of these GM plants to the sugar industry.





Enhancing sugarcane quality through farmer-driven research

*Dr Riekert Van Heerden (Senior Scientist: Sugarcane Physiology) and
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Published: 17th Sep 2024

this farmer has worked alongside the two SASRI specialists in what is known as Participatory Research (PR), a hands-on approach where farming practices are tested directly in the field. This partnership has led to significant improvements in sugarcane quality and has provided valuable insights into the benefits of chemical ripening under Midlands growing conditions.

Starting in 2014, two long-term demonstration trials were established on commercial sugarcane fields of varieties N41 and N48 on the farm of Brad O'Neill in the Midlands South by SASRI's Riekert van Heerden and Paul Botha. These trials were designed to compare the effects of chemical ripening against a treatment where no ripener was applied. The process involved spraying crops with a ripening chemical containing the active ingredient fluazifop-p-butyl, which helps to increase the Recoverable Value (RV) content of the cane.



Brad O'Neill on his farm in the Midlands South.

Over multiple 24-month crop cycles (plant and 4 ratoon crops), the trials consistently demonstrated that ripened sugarcane produced higher-quality cane with better RV content and RV yield, even though the cane yield slightly decreased. The increase in RV yield translated into better financial returns for Brad. For example, in some years, the RV yield increased by as much as 3.25 tons per hectare compared to the untreated cane with a benefit to cost ratio as high as 28.8.

The results from these demonstration trials had an impact on cane quality at individual farm level. Brad has gained confidence in using chemical ripening as part of his crop management

strategy. Initially uncertain about the financial benefits of ripening, Brad now implements a targeted approach, ripening certain portions of his crop based on factors such as summer rainfall and variety.

This targeted use of ripening has paid off for Brad. By focusing on the early part of the harvest season, Brad has been able to deliver cane with significantly higher RV content than the average for his mill. Over the period 2018 to 2023, his farm consistently outperformed the mill average by up to 3.10 RV percentage points during April, when cane quality is typically low.

The success of these trials has not only benefited Brad but has also led to wider adoption of chemical ripening practices across the Midlands South region. As more farmers saw the positive results from the PR trials through targeted knowledge exchange (e.g., extension newsletters and grower days), the area of sugarcane being ripened with fluazifop-p-butyl in the Midlands South expanded significantly. By 2021, over 4 500 hectares were being treated, a substantial increase from the 648 hectares in 2018.

However, the adoption journey has not been without challenges. External factors, such as the recent unplanned carry-over cane dilemma, have impacted the consistency of adoption. Yet, the ongoing collaboration between farmers and SASRI researchers and extension specialists has ensured that these challenges are addressed, and that cane quality management practices are aligned accordingly.

Farmer-driven research in our industry has shown that collaboration between farmers and SASRI researchers and extension specialists can lead to practical, profitable outcomes. The insights gained from these trials have not only improved sugarcane quality on individual farms but have also driven broader adoption of best practices across the region. As the sugarcane industry faces ongoing challenges, the lessons learned from this participatory research will continue to play a crucial role in ensuring its future success.

Economic analyses of ripener results obtained in crops harvested between 2020 – 2024 in the two participatory demonstration trial fields

Year	RV yield increase (t/ha)	RV price (R/t)	RV Income (R/ha)	Ripening cost (R/ha)	Benefit to cost ratio	Gross margin (R/ha)
2020	0.96	4 525	4 344	579	7.5	3 765
2021	3.25	5 196	16 887	587	28.8	16 300
2022	2.34	5 685	13 303	603	22.1	12 700
2023	1.88	6 810	12 803	638	20.1	12 165
2024	0.77	7 475	5 756	700	8.2	5 056

The economic analyses of ripener results obtained in crops harvested between 2020 and 2024 in two participatory demonstration trial fields.



SASRI research leads the way in sustainable crop protection

Dr Stuart Rutherford (Principal Scientist: Integrated Pest Management) and Kalisha Naicker (Publications Officer)

Published: 17th Sep 2024

The farming landscape is undergoing significant changes, both globally and in South Africa, as regulations and sustainability goals reshape agricultural practices. One of the driving forces behind these changes is the European Union's (EU) ambitious targets to reduce chemical use in farming by 2030. While these targets directly affect European farmers, they also have implications for farmers worldwide, including those in South Africa who export produce to the EU.

The EU's new regulations aim to reduce the use of chemical pesticides and fertilisers by 50% and 20% respectively by 2030. These changes are not just limited to European farms; they also apply to agricultural imports into the EU. This means that South African farmers, especially those who export their crops to Europe, must adapt to these stricter standards. Certain agrochemicals, even if still approved for use in South Africa, might no longer be acceptable for produce exported to the EU due to stricter residue limits.

South Africa's Regulatory Response

In line with global trends, South Africa is also tightening its regulations on agrochemical use. In April 2022, the Registrar of Act No. 36 of 1947 announced plans to phase out certain chemicals classified as hazardous under international standards. By mid-2025, key fungicides like epoxiconazole and cyproconazole, and herbicides like glufosinate-ammonium and halosulfuron-methyl, will no longer be available. However, alternatives do exist for these chemicals, and some, like glyphosate, will continue to be available for use.

One notable change is the planned ban on paraquat, a herbicide that, while not classified as highly hazardous, has been associated with poisoning incidents. The Registrar announced this decision in February 2024, though it has yet to be officially gazetted, which means public comments are still being invited.

In response to these regulatory pressures, the agricultural industry in South Africa is already beginning to shift towards more sustainable farming practices. One of the most promising areas of innovation is the use of agricultural biologicals – products derived from natural materials that help improve crop growth, soil health, and pest management without relying on traditional chemicals.

SASRI's leadership in sustainable farming

SASRI is at the forefront of this transition. Recognising the need for more sustainable crop protection methods, SASRI is launching a project in 2025 to explore the use of resistance inducers. Unlike traditional pesticides and fungicides, resistance inducers work by activating the plant's natural defences against pests and diseases.

The project will investigate several commercially available resistance inducers combined with fungal and bacterial biological control agents. These combinations will be tested for their effectiveness in controlling major sugarcane pests and diseases such as nematodes, eldana and smut. The goal is to develop a more sustainable approach to crop protection that reduces the reliance on chemical inputs while maintaining high levels of crop productivity.

Through innovative approaches such as the use of agricultural biologicals and resistance inducers, South Africa's farmers can continue to thrive while protecting the environment and meeting international standards.





Sustainable sugarcane farming: Empowering small-scale growers

**SSG Project Team*

Published: 17th Sep 2024

Empowering small-scale growers (SSGs) to increase profitability of their agricultural operations is a priority for the South African sugarcane industry. A key factor in SSG empowerment is to allow farmers to identify their major sugarcane production challenges and define practical solutions for enhanced adoption of sustainable agricultural practices.

The South African Sugarcane Research Institute (SASRI) is conducting an SSG initiative aimed to help growers increase their sugarcane productivity and sustainability using various participatory research methods and social learning processes within a number of community engagements. Eleven sugarcane growing regions were visited in 2022-2023. These regions were Gcumisa, Ndwedwe, Umbumbulu, Amatikulu, Umfolozi, Pongola, Makhathini, Komati, Malelane, Gcilima, and Mnini-Mfume. Through this participatory approach, SSGs reflect on and share their farming knowledge, practices, achievements, and challenges. The involvement of representatives from SASRI (scientists and SSG extension team), KwaZulu-Natal Department of Agriculture and Rural Development (KZN DARD), local mills, South African Canegrowers' Association (SACGA), and South African Farmers' Development Association (SAFDA) in the study, facilitated adequate information sharing between industry stakeholders that support SSGs.

In each region, a random sample of thirty growers was invited to participate in a series of interactive activities conducted in break-away groups. Each group was allocated a facilitator, a co-facilitator and a note-taker. The activities facilitated deep reflection on growers' agricultural journeys and allowed peer learning through detailed discussions. Visual aids such as posters and seasonal calendars stimulated interest and kept participating SSGs engaged.



Grower participation in activities.

Growers responded positively to the community engagements. This was evident through their eagerness and willingness to participate, resulting in rich and transparent information sharing. Moreover, SSGs in all regions expressed their yearning for more knowledge and training. The community engagements helped the SASRI team to understand sugarcane farming through the eyes of an SSG. Furthermore, it allowed the stakeholders to appreciate the role these growers play in their respective communities, while highlighting their specific areas of need and the challenges they face as small-scale growers.

Growers confidently identified priority problems and concerns. Weed infestation in the sugarcane fields were the key issue by a significant majority of growers, with 100% of the growers in six regions (Malelane, Gcumisa, Umfolozi, Pongola, Makhathini and Mnini Mfume) highlighting it as their primary concern. In comparison, between 63% and 94% of growers in the other five regions noted weed management as a priority. Growers indicated that they manage weeds by using cultural methods, such as hand-weeding, as well as chemical control. However, growers voiced factors such as financial constraints, the need for practical training, and a lack of knowledge of the different available chemical products negatively influenced their weed management practices. Additionally, growers raised concerns regarding the contractor's implementation of farming practices, with an emphasis on harvesting and haulage.

Future work involves conducting a second series of community engagements, encompassing

feedback sessions with SSGs and other stakeholders. This will allow the team to delve deeper into the problems previously indicated as high priority issues and work hand in hand with SSGs to co-create sustainable solutions through interactive activities. The result of these researcher-SSG collaborations will promote the adoption of management practices, which will be practical and helpful for SGGs.

**Tholoana Mofurutsi (Assistant Research Officer), Lindani Mchunu (Assistant Research Officer), Khanyisile Buthelezi (Assistant Research Officer), Surashna Jithoo (Agrochemical Scientist) and, Dr Lawrence Malinga (Research Entomologist).*



Optimum fertiliser combinations at the touch of a button!

Published: 17th Sep 2024

SASRI has developed a user-friendly internet-based application called OptiFert. This tool enables growers to quickly determine the most cost-effective and suitable fertiliser options for specific NPK requirements. Given that fertilisers represent one of the largest expenses in sugarcane farming, optimising their use is crucial.

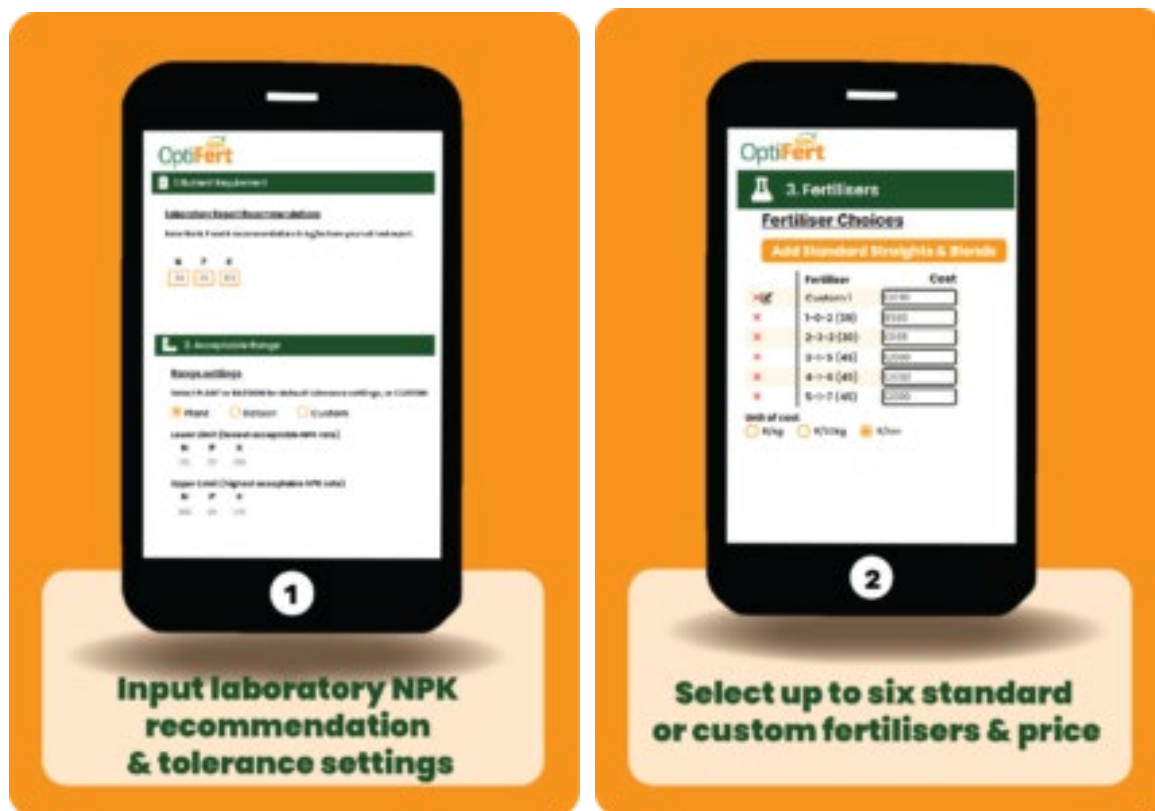
While calculating fertiliser types and rates is typically straightforward, it becomes complex when comparing multiple products and prices across various fields with different nutrient needs. OptiFert simplifies this process, providing answers within a few clicks.

Users input their nutrient requirements (as determined by a laboratory), select preferred or available fertilisers, and input current fertiliser costs. OptiFert then displays recommended fertilisers, required volumes, expected nutrient surpluses or deficits, and the total cost of the combinations. Selections can be easily modified to compare different choices.

Even when external nutrition service providers are used, OptiFert allows growers to conduct their own assessments and cross-check the advice received, thereby ensuring optimal decision-making.

Try OptiFert now and send us your suggestions for improvements:

<https://www.sasrioptifert.co.za>





3

**Review Recommendations,
compare and adjust**



Weather

Phillemon Sithole (Agrometeorologist)

Published: 17th Sep 2024

Review

The industry received below average rainfall during autumn and winter 2024 (Figure 1). Despite parts of the industry recording some heavy downpours in April and early June, as

reported in the previous edition of *The Link*, the extended dry conditions resulted in considerable crop water stress in most rainfed areas during the winter period.

Minimum temperatures during the 2024 winter season were generally mild, but a cold spell in early July resulted in parts of the Midlands, Zululand and Mpumalanga recording sub-zero temperatures and subsequent crop damage from back frost.

All major irrigation water sources remain well replenished.

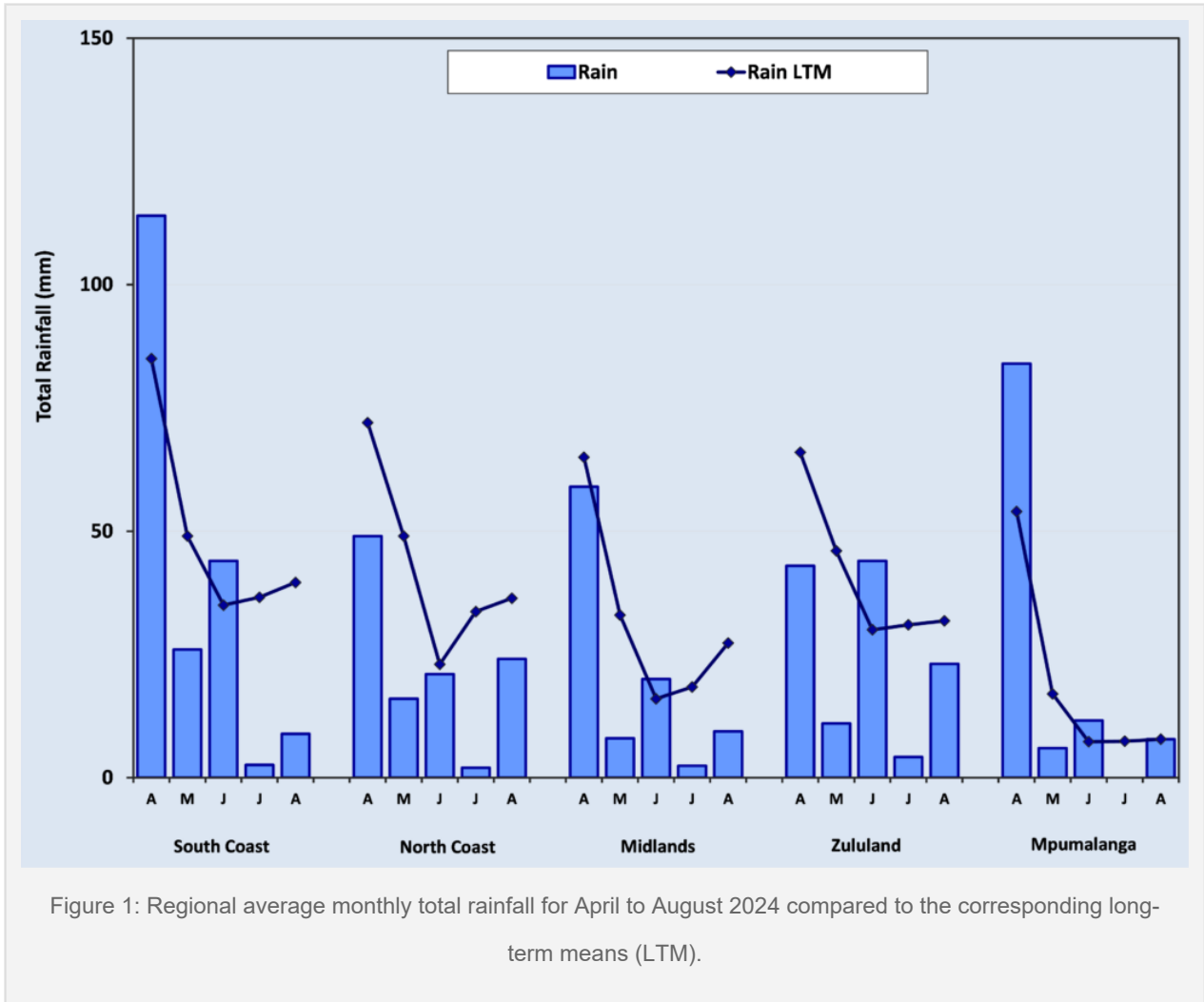


Figure 1: Regional average monthly total rainfall for April to August 2024 compared to the corresponding long-term means (LTM).

Outlook

The El Niño-Southern Oscillation (ENSO) status is currently in a neutral state. Borderline La Niña conditions are expected for October to December, but with uncertainty in the predictions.

The *South African Weather Services* predicts slightly above normal rainfall while the *International Research Institute for Climate* and the *European Centre for Medium-Range*

Weather Forecasts both predict normal rainfall for the eastern parts of the country during the 2024/25 summer season. Above average temperatures are expected.

Please visit the SASRI WeatherWeb <https://sasri.sasa.org.za/weatherweb> for the latest industry weather reports and links to up-to-date seasonal climate forecasts.