

Ninety Years of Service Excellence in Sugarcane Research, Development and Innovation

INNOVATING OVER THE YEARS

The South African Sugarcane Research Institute (SASRI) was established in 1925 in response to a very real and pressing need of the sugarcane growing community – the control and quarantine of imported sugarcane planting material to halt the entry of foreign pests and diseases. The provision of relevant and innovative solutions to industry challenges was continued with the establishment of the SASRI Fertiliser Advisory Service in 1954 and the world-leading SASRI sub-tropical sugarcane breeding programme in 1971, which has gone on to produce over 50 sugarcane varieties specifically adapted to local growing conditions and which are also in high demand across sub-Saharan Africa.

Ever forward-thinking, the industry leadership in the early 1990s embraced the potential of the then emerging field of crop biotechnology by establishing the state-of-the-art SASRI Biotechnology Facility, which went live in 1993. Over the years, the research outcomes from the facility have become part-and-parcel of the industry's agricultural landscape, including the NovaCane® sugarcane propagation technology, variety DNA fingerprinting tests and a host of rapid and reliable sugarcane pathogen and pest diagnostic tests.





OVERCOMING CHALLENGES IN PARTNERSHIP

Farming sugarcane sustainably under the arguably marginal conditions of the SA sugar belt is demanding and the grower community is beset by ongoing and emerging challenges, including spiralling input costs, new sugarcane pests and diseases and soils that need continual remediation to retain fertility. Working hand-in-hand with growers to uncover solutions to these and other problems is the major focus of the SASRI research, development and innovation (RDI) programme. The institute is well-placed to do so, given the seamless integration of SASRI's research, knowledge management, biosecurity and extension functions, which is the envy of many sugarcane research institutes and organisations across the globe. Working closely together, through both formal and informal means, SASRI researchers, extension and biosecurity specialists, and knowledge management practitioners engage with growers to develop a deep

understanding of their needs, as well as to uncover the innovations that growers themselves have developed and implemented to increase efficiencies and profitability. It is this knowledge base that guides the development, direction and execution of the SASRI annual programme for research, technology development and knowledge exchange.

Although consultative, needs-driven RDI is a major SASRI focus. Certain challenges facing the industry are sufficiently complex to require detailed strategic plans to guide the holistic RDI activities that are required over several years to provide growers with sustainable solutions. Two such weighty, inextricably-linked and currently highly topical issues are eldana management and water-use efficiency. Finding solutions to both issues is currently at the centre of concerted, multi-disciplinary research efforts at SASRI.

FIGURE 1: The SASRI Eldana IPM Research Framework spans research in the SASRI Crop Protection, Crop performance & Management, Systems Design & Optimisation and Variety Improvement programmes and encompasses Knowledge Management, Extension and Biosecurity.



A raft of multi-disciplinary solutions are required to enable sustainable, resilient and innovative eldana IPM on an area-wide (eco-zone) basis.

FIGURE 2: The SASRI Eldana IPM Research Framework has six Focus Areas corresponding to the required technology components of the eldana IPM toolkit

- 1 **CROP STRESS MANAGEMENT** To develop technologies that enable the reduction, avoidance or priming of plant stress such that plant innate resistance to Eldana is not compromised or is potentially enhanced.
- 2 **PLANT RESISTANCE** To harness native and foreign genetic sources of resistance to Eldana and implement technologies to increase the efficiency of Eldana resistance breeding.
- 3 **HABITAT MANAGEMENT** To develop cost-effective technologies that permit the establishment of agro-ecological environments in which Eldana populations are suppressed to low levels by benign biological means.
- 4 **CHEMICAL CONTROL** To develop a suite of effective insecticidal Eldana control agents and responsible application tactics that are agriculturally, environmentally, ecologically and economically sustainable.
- 5 **SPATIAL PLANNING & MONITORING** To implement digital spatial mapping (GIS) that facilitates the collation and interpretation of environmental and biological data that are central to effective and proactive Eldana management.
- 6 **IMPLEMENTATION** To enhance adoption of Eldana IPM through practical demonstration of efficacy and promote the approach as an integral component of sustainable sugarcane farming practice.

ADDRESSING THE ELDANA CHALLENGE

The multi-disciplinary research and technology development that SASRI undertakes to provide growers with the necessary repertoire of tools for effective eldana integrated pest management (IPM) is conducted across four research programmes (Variety Improvement, Crop Protection, Crop Performance and Management and Systems Design and Optimisation) and encompasses the activities of the Knowledge Management Unit, Extension Services and Biosecurity Inspectorate. These research, technology development and knowledge exchange activities address six specific areas of eldana IPM technology – crop stress management, plant resistance, habitat management, chemical control, spatial planning and monitoring.

See figures 1 and 2

IMPROVING WATER-USE EFFICIENCY

The SASRI RDI portfolio aims to provide growers with a suite of technologies to promote the sustainable management of irrigation and surface water. The water management portfolio is tied to issues relating to climate change and potential future bioenergy

applications. Consequently, the RDI programme aims to develop:

- adaptable, drought-tolerant sugarcane cultivars to sustain the industry into the future;
- systems for the sustainable management of: (a) reduced water availability and quality; and (b) increased frequency of extreme climatic events; and
- best management adaptations to maximise yield and profitability under the expected mid-century climate.

Through these outcomes, SASRI has the goal of supporting a prosperous sugarcane grower community that manages available water resources in a sustainable manner.

See figure 3

CLIMATE-PROOFING THE INDUSTRY

The institute commenced model-based studies in 2011 to assess the potential impacts of climate change on sugarcane production in SA and to explore adaptation strategies to optimise production methods under future predicted climates. These studies currently

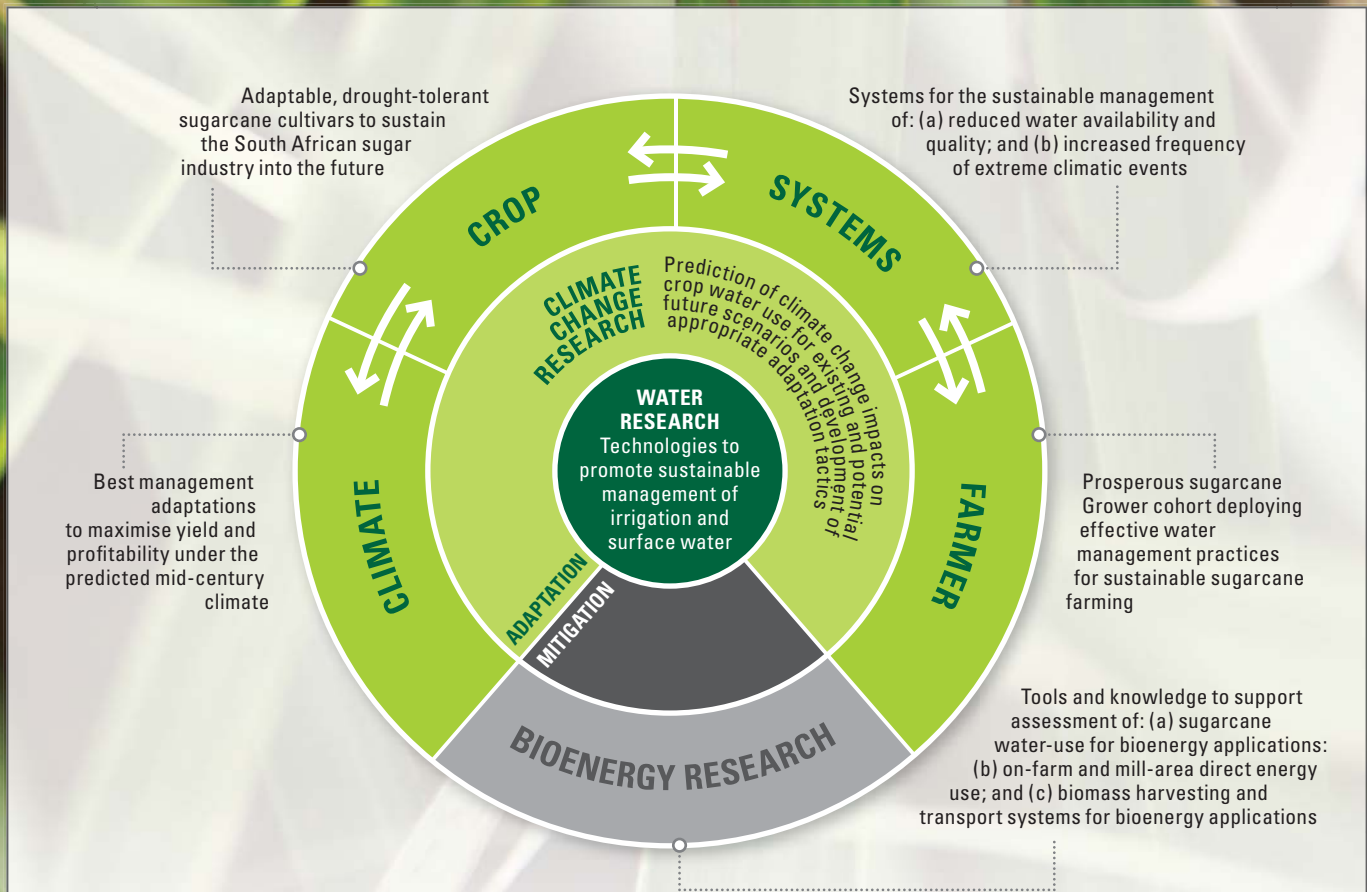


FIGURE 3: SASRI Water Use, Bioenergy and Climate Change Integrated Research Portfolio

indicate that the mid-century (2040 to 2070) climate is expected to be warmer by approximately 2°C, on average, with no significant change to average total annual rainfall. Although the temperature predictions have a high level of confidence, predictions of potential alterations in total rainfall are less certain. However, although significant changes in the quantum of rainfall are not indicated statistically, a consensus view exists amongst climate change specialists that the pattern of rainfall is likely to change, with an anticipated increased frequency of high rainfall events alternating with longer dry spells. Under such a future mid-century climatic scenario of increased temperature, higher evapotranspirative demand and sporadic rainfall, sugarcane cultivated under rainfed conditions in SA is likely to be increasingly exposed to water-deficit stress.

The SASRI RDI programme aims to assist, as far as is possible, in climate-proofing the industry against the potential negative effects of the predicted mid-century climate. The current climate change RDI portfolio focuses on the development of adaptation tactics,

which include: (a) development of mathematical models to assess the ameliorative effects of changes in agronomic tactics - changes to cane age at harvest and a shift from cane burning to green-cane harvesting; (b) the development through conventional breeding of varieties with improved resilience to abiotic stress.

The phrase “There is nothing permanent except change”, attributed to Heraclitus, may have become something of a cliché but, nevertheless, it still rings true for the SA sugar industry, as it continuously overcomes significant challenges; past, present and future. Looking to the past, it becomes clear that the highly functional partnership between SASRI and the SA grower community will enable the future to be faced with confidence and optimism.



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