Addressing the challenges of sugarcane cultivation

South African Sugarcane Research Institute

SUCCESSFULLY CULTIVATING SUGARCANE IN OUR SOUTHERN LATITUDES IS EVIDENCE ENOUGH OF A HIGHLY COMPETITIVE AND INNOVATIVE INDUSTRY – A SUGARCANE INDUSTRY THAT CONSTANTLY STRIVES TO INCREASE ITS PRODUCTIVITY AND PROFITABILITY. SINCE 1925, THE SOUTH AFRICAN SUGARCANE RESEARCH INSTITUTE (SASRI) HAS BEEN ADDRESSING THIS NEED THROUGH ITS PRIMARY FOCUS ON TECHNOLOGY INNOVATION AND DEVELOPMENT, WHICH TAKES INTO ACCOUNT THE SOCIO-POLITICAL AND ECONOMIC LANDSCAPE, TO ENABLE SUSTAINABLE SUGARCANE PRODUCTION. THE 2010 SASTA PROCEEDINGS PROVIDE AMPLE EVIDENCE OF THIS CONTINUING ROLE.

The recent trend in declining sugarcane production (11.3% since the 2005/2006 season) is cause for concern and requires rigorous interrogation. In the agricultural sector, there are several explanations for this pattern, and amongst them, land tenure and reduced area under sugarcane are contributing factors that largely fall outside the sphere of influence of the research institute. However, the combined effects of climate, water scarcity, pests and diseases, poor crop management practices and the dynamic nature of the services required to meet the technology development needs of the industry are our prime concern, and they represent significant challenges for SASRI.

Rainfall and irrigation

Of the climatic factors affecting sugarcane growth, it is solar radiation (coupled with temperature) and rainfall that are most important. In the 2009 growing season, it has been shown that rainfall for the whole industry was above average, but due to poor distribution patterns (lower than average levels in the Zululand and North Coast mill areas) and relatively low levels of radiation, the industry average yield potential diminished (Singels *et al.*, 2010).

Investigations into more efficient irrigation practices have become necessary to avoid wastage of precious water resources.

Water scarcity in the future is likely to have a significant impact on sugarcane cultivation and in the northern irrigated areas the need to prepare for such water shortages, which will be coupled with escalating electricity tariffs, is essential. For this reason, investigations into more efficient irrigation practices have become necessary to avoid wastage of this precious resource.

In two studies conducted by Jumman and Lecler (2010a and 2010b), specific attention is given to 'deficit irrigation strategies' that entail variations in scheduling, reducing irrigation applications at particular times in the crop cycle and pumping water at off-peak periods when electricity tariffs are lower. Results show that both alone or in combination, irrigation scheduling and also water curtailment yield overall higher profits, but precision in monitoring soil

and crop responses is required. However, off-peak irrigation cost savings were not found to be sufficient to offset the revenues lost through yield penalties associated with this practice. Managing irrigation scheduling is complex, and the ability to make use of models, such as *Canesim*, to simulate various scheduling practices and their impact on water wastage and potential yields are invaluable (Singels and Paraskevopoulos, 2010).

Pest and disease

Pest and disease incursions pose significant challenges for the industry and have the ability to impact severely on productivity. For this reason, close monitoring of pest and disease levels is essential for successful management of this risk, and implementation of strategies to reduce their incidence are necessary. Sustaining a central database for all survey records is the foundation of this process and SASRI serves as the repository for all such data. In their annual review of the season, (Singels *et al*. 2010) note that the sugarcane borer (eldana) appeared to have less of an impact on overall industry production when compared with the previous season and while several diseases such as smut, mosaic and RSD show significant regional differences, their overall effect on industry production is not significant.

Soil health

In view of the key role that soil health plays in driving yields and profitability it continues to be a significant challenge for the industry. Since the early seventies when the only extensive nutrient deficiencies that were identified included potassium and to a far lesser extent zinc and aluminium (van der Laan and Miles, 2010), recent analysis of soil and leaf sample data from the SASRI Fertiliser Advisory Service (FAS) clearly demonstrates concerns associated with acidity levels, nitrogen deficiencies and phosphorous excesses in various regions of the industry. By capturing these analytical data for the industry through FAS, regular and robust analyses of the soils status in the industry can be conducted to enable recommendations that will secure the industry's future soil health.

Soil health plays a key role in driving yields and profitability and continues to be a significant challenge for the industry.

The status of soil health in the industry is assessed using analytical data from soil and leaf samples captured by SASRI's Fertiliser Advisory Service.

Small-scale productivity

Long-term sustainability of small-scale growers is of concern throughout the industry. While the factors affecting the levels of small-scale productivity are to a large extent outside the influence of SASRI (Murray, 2010; Thomson, 2010), as the providers of technology geared to enhance productivity and yield, it requires that we consider the specific nature of the support we provide and the technology we transfer. For this action to be successful, a multi-disciplinary approach is required that accounts for the interventions of several organisations including the milling companies, the SA Cane Growers Association as well as SASA. Examples of such interventions

A multi-disciplinary approach, with the interventions of several organisations including the milling companies, is being used to provide extension and mentorship to small-scale growers.

SASRI's Variety Improvement research programme uses cutting edge technology and molecular approaches to provide the industry with new varieties of sugarcane to meet future challenges.

include CANEGROWERS Phakamisa initiative and also the combined efforts of the milling companies, CANEGROWERS and SASRI to provide extension and mentorship to growers in conjunction with the Department of Agriculture, Forestry and Fisheries.

Plant breeding strategy

With its cutting edge technology and molecular approaches, SASRI's ability to provide the industry with new varieties of sugarcane possibly represents its most significant activity that can enable the industry to meet future challenges. For this reason the plant breeding strategy to breed and select high sucrose yielding as well as high biomass varieties that are able to withstand water stress and that are resistant to prevailing pests and diseases, is a key driver for SASRI's Variety Improvement research programme.

Since sugarcane is the lifeblood of the industry and the search for energy sources is likely to become increasingly influential in the future, management of the plant breeding programme to account for such needs is of vital importance for the industry. To take advantage of new varieties and also to capacitate new grower enterprises, provision of sufficient supplies of good quality, disease-free seedcane poses a significant challenge. SASRI's trademarked tissue culture technology (NOVACANE®) is intended to meet this need and indeed through external service providers, tissue culture plantlets are being made available commercially. The value that such technology provides for our own plant breeding programme is clear (Meyer *et al.*, 2010).

Supply chain management strategy

Finally, significant improvements in efficiency at a mill supply level can be acquired through engagement with a coherent supply chain management strategy. In his review paper that addresses sugarcane material handling from an integrated supply chain perspective at the mill level, Bezuidenhout (2010) indicates that improvements in operations can be achieved if volume and quality of the materials are considered together with improved management of stockpiles. The need for all stakeholders to work together to realise this value and more effectively manage the risk associated with losses incurred through the poor integration of systems, is clear. The impact of precisely aligned strategies on mill function is significant, and the value of controlling system variability is clearly demonstrated.

As *the* knowledge generator and provider for the agricultural operations of the South African sugarcane industry, SASRI plays a key role in identifying both current and future challenges facing the growing sector, and its innovative operations are fully aligned with industry strategy to assist it in attaining its goals.

Papers at 2010 SASTA Congress

The papers referred to in this article are being presented at the 2010 SASTA Congress. They are as follows:

- **Bezuidenhout CN (2010).** Review of sugarcane material handling from an integrated supply chain perspective.
- **Jumman A and Lecler NL (2010a).** Deficit irrigation: a strategy to counteract escalating electricity tariffs and water shortages.
- **Jumman A and Lecler NL (2010b).** Electricity tariff increases: the impact on irrigators?
- **Meyer GM, Banasiak M, Keeping N, Pillay N, Parfitt R and Snyman SJ (2010).** NOVACANE® as a tool for rapid propagation of material for the SASRI plant breeding programme.
- **Murray JJ (2010).** Analysis of small-scale grower returns in Mpumalanga: Tenant farmers or sustainable producers?
- **Singels A and Paraskevopoulos A (2010).** Optimising irrigation scheduling of portable overhead systems: A simulation study.
- **Singels A, McFarlane SA, Way MJ, Ferrer S and van der Laan M (2010).** Review of South African sugarcane production in the 2009-2010 season from an agricultural perspective.
- **Thomson DN (2010).** Enhancing small-scale grower sustainability through institutional change.
- **van der Laan M and Miles N (2010).** Nutrition of the South African sugar crop: current status and long-term trends.

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