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**Chair: Steve Davis**



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**Chair: Neil Miles**

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# AGRICULTURE SESSIONS

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**15:00-16:25 AGRICULTURE SESSION 9: Crop Protection III**

**Chair: Shaun Berry**

## GUEST SPEAKER

### CONSIDERING THE CURRENT NUTRITION AND HEALTH ENVIRONMENT, IS THERE A FUTURE FOR THE SUGAR INDUSTRY?

**Professor Esté (HH) Vorster** is a Public Health Nutritionist with a D.Sc in Physiology. Her research has focused on the nutrition transition and the consequences of overnutrition in South African populations. She has initiated and executed the THUSA study which provided basic knowledge on changing nutrient intakes during urbanisation and the health consequences thereof.

She obtained her degree from the Potchefstroom University for Christian Higher Education in 1987 with a thesis on nutrition and haemostasis. She started the Nutrition Research Group at this University, now the North-West University, and is at present the Director of the Centre of Excellence for Nutrition.

Vorster has served as President of the Nutrition Society of South Africa from 1995 to 1998 and again from 2003-2006. She was also President of ILSI South Africa from 1997 to 2001, served on the National Board of the IUNS/IUFoST for 15 years and ICSU for 2 years. She is a member of the IUNS Task force for the Nutrition Transition, has served as invited expert and chair of several WHO/FAO expert consultation groups, and is part of an international group who is redefining nutritional science (The New Nutrition Science Project) and another UNU/WHO/FAO/UNICEF group that harmonized global nutrient recommendations.

Vorster has conceptualised nutrition research as a holistic, transdisciplinary but integrated action "from molecules to society" and has brought together a group of scientists that are studying health outcomes as a consequence of how individuals, groups, communities and populations respond and adapt to changing environments. She has published more than 200 papers in peer-reviewed scientific journals and is author, co-author and editor of 5 books and chapters in textbooks on Human Nutrition. Vorster is the first woman who received the NSSA award for "Outstanding Contributions to Nutrition Research" (in 1996) and her group was awarded the 5-yearly NNIA award for their sustainable contribution to Nutrition Research in Africa in 2005."
In March 2007, Professor Vorster was awarded, by the Board of the South African Academy for Science and Arts, the prestigious Havenga prize for Medicine.

Vorster has recently been appointed as Director of the new Centre of Excellence for Nutrition at the North-West University, Potchefstroom campus. Researchers in this centre developed a transdisciplinary approach over recent years towards nutrition research and practice which is supported and taught around the world. This is the only Centre of Excellence at the North-West University and the only one for nutrition in Africa.

Vorster received the **North-West University (NWU)– Award** as Director of the Africa Unit for Transdisciplinary Health Research (AUTHeR) as Research Entity of the Year, 2007.

## GUEST SPEAKER

### THE ROLE OF NUTRITION RESEARCH IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT – USING THE EXAMPLE OF BIOFORTIFICATION

**Dr Mieke Faber**

Dr Mieke Faber is a nutritionist and senior specialist scientist at the Nutritional Intervention Research Unit of the Medical Research Council. She obtained her PhD in Pediatrics and Child Health from the University of Stellenbosch. Her thesis examined community-based growth monitoring in a rural area that lacks health facilities.

Her current research focus is food-based interventions to address micronutrient malnutrition, particularly in infants and small children in rural communities. She collaborates with the Agricultural Research Council, thereby conducting research at the interface of human nutrition and agriculture. She is a member of the steering committee of the Vitamin A for Africa initiative, which promotes the production and consumption of orange-fleshed sweetpotato to address vitamin A deficiency in Sub-Saharan African countries.

Dr Faber has received numerous awards for her research. Amongst her many scientific outputs she has authored and co-authored more than 60 articles in peer-reviewed journals, and been involved in over 100 national and international Congress presentations.

She serves on the Ethics committee of the Faculty of Applied Sciences of Cape Town University of Technology, as well as the editorial board of two international journals. She frequently reviews papers for national and international scientific journals.

Mieke will be addressing SASTA Congress on “The role of nutrition research in the context of sustainable development – using the example of biofortification”. Biofortification is the promising new strategy targeting the rural poor who have limited access to formal markets or health care systems. Biofortification uses plant breeding techniques to enhance the micronutrient content of staple foods, without compromising agronomic traits. It is foreseen that once the nutritionally improved seeds have been developed and adopted, the strategy could be sustained without a need for additional funding. Biofortification is a long-term agricultural approach that complements existing nutrition strategies such as supplementation and food fortification.

# EIGHTY-FOURTH ANNUAL REVIEW OF THE MILLING SEASON IN SOUTHERN AFRICA (2008-2009)

DAVIS SB, SMITH GT and ACHARY M

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**Abstract**

Performance, throughput and other relevant aspects of the sugar industries in southern Africa are presented and discussed. Data from sugar mills in South Africa, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe are included. The 2008-2009 milling season in South Africa was slightly better than the 2007-2008 season in terms of cane quality and recoveries, although the tonnage of cane harvested was lower. Time efficiencies showed general improvement, with less No-cane and Other stops. However, extraction performance was not as good as previously, showing a substantial decline in the last two seasons. Losses to molasses were much reduced, although undetermined loss results were mixed. Overall, though, the 2008-2009 season showed improved results in terms of overall recovery and value recovery.

Regarding the Affiliate mills in neighbouring countries, those in Zambia and Zimbabwe experienced poorer recoveries than in the previous season, while the Maragra mill in Mozambique showed the most notable improvement over previous seasons.

*Keywords:* sugarcane, sugar factories, cane quality, crop size, performance, recovery

## *Biography: Steve Davis*

*Steve Davis is the Head of the Process Engineering Division at the Sugar Milling Research Institute. A Professional Chemical Engineer, he studied for his BSc and MSc in Engineering at the University of Natal in Durban.*

*His research interests include clarification processes, colour removal from sugar juices and syrups (raw house and refinery), separation technologies and tracer testing. He has presented the Annual Review of the Milling Season in Southern Africa at the annual SASTA Congress since 2002.*

*He is currently Chairman of the Factory Control Advisory Committee, which advises the industry on matters relating to factory calculations and performance parameters.*

# SOUTH AFRICAN SUGARCANE PRODUCTION AND QUALITY IN THE 2008-2009 MILLING SEASON

VAN DEN BERG M[1], SINGELS A[1], ARMITAGE RM[2], GILLITT CG[2], WAY MJ[1] and MCFARLANE SA[1]

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## Abstract

Sugarcane production and quality during the 2008/09 season are discussed at the South African industry and mill area levels. The Canesim crop estimates are used as the benchmark, and an attempt is made to explain differences between these model estimates, calculated from daily weather data across the industry, and actual mill records and Mill Group Board estimates. Aspects looked into include weather conditions, water sufficiency in the irrigated areas, the pest and disease situation and farm economics, and how these factors may have favoured or constrained farm practices and supply chain operations.

While weather conditions during the 2008/09 season were, in general, slightly less favourable for sugarcane growth than in 2007/08, in most areas they were more favourable for smooth functioning of the supply chain, resulting in a more modest decline in production than predicted by SASRI, as well as an improvement in cane quality. However, a strong recovery in production as initially anticipated by the Mill Group Boards was not realised. This is attributed to continued deterioration of already unfavourable socio-economic conditions to on-farm production capacity maintenance and new investments; and possibly aggravated by a further increase in the incidence of thrips (*Fulmekiola serrata*). These factors are expected to continue to have a negative impact over subsequent seasons. Other pests and diseases occurred at a fairly low level in most production regions.

In the small-scale grower (SSG) sector, sugarcane production continued its dramatic decline by more than 7% per annum over the past decade. Analysis of SSG production and area records suggests that, what appears to be extremely low yields in the Zululand and North Coast areas could in reality be a reflection of land abandonment, which would be more difficult to reverse.

Overall, the analysis provides a plausible explanation for the gaps between actual production and Canesim estimates which could contribute to better informed strategic industry decision making. Firmer conclusions and predictions, enabling a more proactive industry response, would require supplementary data and a better understanding of the impacts of specific constraints (e.g. thrips) on sugarcane production and quality. Timely, accurate estimates of areas under cane and areas harvested would be particularly useful to improve the analysis.

*Keywords:* sugarcane production, agronomics, economics, model, yield forecast, pests, diseases

## *Biography: Abraham Singels*

*Dr. Abraham Singels is a research agronomist with the South African Sugarcane Research Institute and has honorary appointments at the University of Pretoria (extraordinary Professor) and the University of Kwazulu-Natal (Honorary Research Fellow). He obtained a Ph.D. in Agrometerology from the University of the Free State in 1991, where he also worked as researcher and lecturer for 10 years. His interests are crop response to climate, crop modelling and decision support systems for crop production.*

# RELATIVE CANE PAYMENT: REALIGNING GROWER INCENTIVES TO OPTIMISE SUGAR RECOVERIES

WYNNE AT, MURRAY TJ and GABRIEL AB

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**Abstract**

Cane payment is a sensitive issue and is seldom debated and documented in the public domain. As a result, misunderstandings arise over time. In the South African sugar industry, much confusion has arising between relative cane payment and the Recoverable Value (RV) cane payment. The objective of this paper is to clarify these terms and to revisit the appropriateness of the current relative cane payment approach. Multiplicative relative payment is the preferred approach because it creates a clear incentive for each and every grower to deliver cane with the highest possible RV% relative to the mill weekly average RV% and thereby optimises the mill weekly average RV%. Consequently, the current additive relative payment approach should be replaced with the multiplicative relative payment approach. However, both millers and growers are 'blinded' to the consequences of the rapid drop off in RV% at the beginning and ends of the season as a result of relative payment. This can be overcome if both millers and growers collectively agree to a defined season length in their mill area during which multiplicative relative payment shall apply. The penalty for poor delivery performance post the defined season length is payment on actual RV%. This system can be accommodated within the ambit of existing Mill Group Board policies and procedures. Essentially it sharpens the incentive for growers to collectively ensure that no-cane stops are minimised and milling capacity and harvesting equipment are optimised. Not only does this reduce costs, but it results in increased sugar recoveries from an equivalent tonnage of cane, enhancing revenue for both millers and growers!

*Keywords:* relative cane payment, cane quality, season length, incentives, Recoverable Value

## *Biography: Adey Wynne*

*Adrian has a PhD in Agricultural Economics and a Masters in Business Leadership (MBL). He joined the sugar industry in 1999 as CANEGROWERS North Coast Regional Manager and departed as CANEGROWER's Director: Industrial Affairs. In June 2009 he accepted the position of Commercial Director at the Umfolozi Sugar Mill. He is currently the Chairman of the National Steering Committee for the Biofuels and other Clean Alternative Fuels Initiative under auspices of the South African National Energy Research Institute (SANERI), Commissioner of the International Society of Sugar Cane Technologists (ISSCT) Management Commission and Chairman of the ISSCT Management Technical Section. He has presented and published 18 papers in various national and international peer reviewed journals and congress proceedings.*

# A REGIONAL ANALYSIS OF LABOUR TRENDS IN THE SOUTH AFRICAN SUGAR INDUSTRY

MURRAY JJ

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**Abstract**

A regional analysis of time series data trends (1972/73 to 2007/08) in Number of Labour Units, Labour Productivity and Real Wages within the South African sugar industry initially displays a counterintuitive result. Economic Literature proposes that increasing labour market rigidities will result in an increase in transaction and wage costs with resultant decrease in employment. The results show an increase in employment in the industry, since the bundle of labour legislation was first extended to agriculture. This increase is explained by an increase in the Area under Cane. Reasons for the increased Area under Cane are complex and are an avenue for further research.

*Keywords:* regional analysis, labour productivity, real wages, market rigidities, labour legislation

## *Biography: Justin Murray*

*Justin Murray is the Grower Affairs Manager for the Mpumalanga Cane Growers Association and is based in Malelane, Mpumalanga. He completed his undergraduate studies at Rhodes University and completed his MComm (economics) at the University of Cape Town in 2006. Although Justin has a particular interest in labour market issues he spends much of his time institutional economics arena. Justin has recently joined SASTA and this is his second congress.*

# LINKING AGRONOMIC AND ECONOMIC MODELS TO INVESTIGATE FARM-LEVEL PROFITABILITY UNDER A BIOENERGY-ORIENTED SUGAR INDUSTRY IN SOUTH AFRICA

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**Abstract**

In South Africa, the opportunity for bioenergy production from sugarcane is becoming increasingly realistic. However, many questions remain regarding the extent to which agronomic practices need to be adapted, and the related economic impacts and tradeoffs, bearing in mind that future economic conditions are highly uncertain. To address these issues, a model chain was developed consisting of the Canesim crop growth model, the Economics of Trashing model, and the farm and sector-level models of the Bureau for Food and Agricultural Policy (BFAP). The model chain was applied to construct a virtual, plausible farm for each of the main South African production regions (irrigated north, midlands and coastal dryland). Agronomic practices for each farm were set up according to current practices, and were varied to suit different mill processing strategies, including sugar production, electricity co-generation from bagasse with or without trash, and bio-ethanol production. Yields were simulated using historical weather data for the period 1998 to 2007. The BFAP sector model was used to simulate four plausible macro-economic scenarios for 2008 to 2017, for which the different agronomic and mill processing strategies were compared. Results suggest that the additional revenue from co-generation or bio-ethanol production will increase farm-level profitability, while requiring few adaptations. The performance of these production strategies was surprisingly robust across the strongly contrasting economic scenarios. The model chain could be further developed and used as an interactive tool to contribute to farm and mill level discussion and decision making regarding alternative sugarcane production and processing strategies under future economic and policy conditions.

*Keywords:* farm-level economics, scenario modelling, bioenergy, co-generation, bio-ethanol

## *Biography: Degert Botha*

*Mr Degert Botha is a Junior Research Assistant at the University of Pretoria's Department of Agricultural Economics, Extension, and Rural Development. He functions part-time under the umbrella of the Bureau for Food and Agricultural Policy (BFAP), while working full-time as a Market Agent at the Johannesburg Fresh Produce Market. Mr Botha is currently completing his MSc dissertation in Agricultural Economics.*

# THE SOUTH AFRICAN SUGAR INDUSTRY IN THE 2010S: A LOOK INTO THE FUTURE USING SCENARIO PLANNING

WYNNE AT

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**Abstract**

The global financial crisis that broke in late 2008 has had widespread impacts on the global economy, including developing countries like South Africa. Other uncertainties within the context of the South African sugar industry include slow implementation of government land reform policies and poor progress in reviewing sugar related legislation. Such uncertainty is not conducive to future investment and innovation. This paper aims to clarify key uncertainties using a classic scenario planning process, comprising three steps: (1) defining the rules of the game, (2) understanding the key uncertainties and (3) developing possible scenarios that emanate from them. The paper constructs possible scenarios for both the global and South African sugar industries looking forward into the next decade. There is not much that the current South African sugar industry stakeholders can do about the global economic situation, but they can influence the investment climate within the South African sugar industry. To do this, stakeholders need to foster internal harmony, which to a large extent requires an appropriate legislative framework, where only some elements of the current legislative framework require urgent review. Furthermore, stakeholders need to actively mitigate the threat of slow land restitution progress by collaborating with each other and government. If these two concerns are attended to, the future of the South African sugar industry is bright given (i) the recent rally in world market sugar prices, (ii) the relatively consistent demand for sugar in the medium to long term and (iii) the prospects of participating in the renewable energy arena that has large growth potential.

*Keywords:* scenario planning, future, competitiveness, framework, uncertainties

## Biography: Adey Wynne

*Adrian has a PhD in Agricultural Economics and a Masters in Business Leadership (MBL). He joined the sugar industry in 1999 as CANEGROWERS North Coast Regional Manager and departed as CANEGROWER's Director: Industrial Affairs. In June 2009 he accepted the position of Commercial Director at the Umfolozi Sugar Mill. He is currently the Chairman of the National Steering Committee for the Biofuels and other Clean Alternative Fuels Initiative under auspices of the South African National Energy Research Institute (SANERI), Commissioner of the International Society of Sugar Cane Technologists (ISSCT) Management Commission and Chairman of the ISSCT Management Technical Section. He has presented and published 18 papers in various national and international peer reviewed journals and congress proceedings.*

[1] The views expressed are not necessarily those of the South African Cane Growers' Association.

SHORT COMMUNICATION

# A GLOBAL REVIEW AND SYNTHESIS OF LITERATURE PERTAINING TO INTEGRATED SUGARCANE PRODUCTION SYSTEMS

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**Abstract**

Many researchers have investigated the impacts of changes to certain processes, such as mechanical harvesting, on other processes in the supply chain, such as milling. These studies sometimes do not mention the term *supply chain*, but inherently highlight important relationships and system properties that regulate sugarcane handling and processing. To date, few researchers in the world have comprehensively reviewed sugarcane handling and processing chains. This review characterises the sugarcane supply and processing chain along five different dimensions, namely, value, material handling, collaboration, information and innovation. The literature was subsequently scanned to identify universal trends and characteristics pertaining to these different dimensions. Interestingly enough, while many researchers considered value and material handling issues, few addressed the complexities related to supply chain collaboration. Also, few researchers evaluated how these supply chains should be managed and what information needs to be shared in order to stimulate an overall drive towards supply chain efficiency. The paper concludes that a lack of literature relating to supply chain improvement systems suggests that this area of research may still be relatively unexplored.

*Keywords:* sugarcane, supply chain, value chain, collaboration, information

## *Biography: Carel Bezuidenhout*

*Prof Carel Bezuidenhout is the SASRI Senior Research Fellow based in the School of Bioresources Engineering and Environmental Hydrology at the University of KwaZulu-Natal. He specialises in systems analyses in the forms of transportation and integrated agricultural production systems research. Prof Bezuidenhout authored 22 research publications in international journals and has to date supervised 18 MSc and PhD graduates. He is a member of SASTA council and has made 32 contributions to previous SASTA workshops and congresses.*

SHORT COMMUNICATION

# AN INVESTIGATIVE STUDY OF SIX SIGMA AS A POSSIBLE SOLUTION TO SUPPLY CHAIN INEFFICIENCIES IN THE SEZELA MILL AREA

ALING MR[1], NAUDE MJ[1] and BEZUIDENHOUT CN[2]

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**Abstract**

The supply chain, from the grower to the mill, is currently experiencing costly and inconvenient bottlenecks which can stop the whole supply chain from functioning. The industry allows each party to be responsible for its own quality and process management. Many researchers have called for the consolidation of the fragmented supply chain into a more cohesive unit. Six Sigma, a supply chain management system that originates from the electronics industry, is renowned for stimulating integrated systems thinking and improvements. Six Sigma is defined as the 'relentless and rigorous pursuit of the reduction of variation in all critical processes to achieve continuous and breakthrough improvements that impact the bottom line of the organisation and increase customer satisfaction'. However, in the sugar industry Six Sigma faces some challenges, including a high risk environment as a result of the weather, and the high level of segmentation in the supply chain. This study aimed at testing whether or not it would be feasible to adopt a Six Sigma management approach in the South African sugar industry as a means of improving the value chain. Research was carried out at Sezela with a survey that involved explanatory and exploratory aspects of the system. Questions that were asked focused on issues of supply chain efficiency, problem areas, possible solutions, management capabilities, integration strategies, performance measures, stakeholder relationships, costs, information sharing, process control and centralised management. The research showed that, although perhaps viable in the future, it would not currently be feasible to adopt a Six Sigma management approach in the Sezela milling area. There may also be better alternatives to use to pursue continuous improvement within the sugarcane supply chain. The '5 Whys' exploratory tool may be a strong candidate because of its flexibility and strength.

*Keywords:* sugarcane, supply chain, six sigma, management, Sezela

## *Biography: Micheline Naude*

*Mrs Micheline Naude is a lecturer at the University of KwaZulu-Natal, Pietermaritzburg. She lectures Chain Management at both undergraduate and postgraduate level. Apart from her teaching, she is also the Discipline Coordinator for Supply Chain Management at the University of KwaZulu-Natal. Mrs Naude has published in the fields of Supply Chain Management in academic textbooks and journals. Prior to her academic career she worked for 12 years in the private sector. Currently Mrs Naude is working towards her Doctorate in Supply Chain Management.*

AGRICULTURE SUCCESS STORY SUMMARY

# RESULTS OF OVERLOADING AND THE EFFECTS OF VARIETY ON PAYLOAD

COLE AK[1] and LYNE PWL[2]

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**Summary**

This paper examines the loading statistics of three vehicles' deliveries for the 2008 cane season. Two of the vehicles were fitted with Loadtech on-board weighing systems, and the third had a trailer with an air bag suspension. Data are analysed from four different farms, three different loading methods and five different varieties: N12, N41, N37, NCo376, N31 and N39. The data summarise 2451 loads, which total 76 000 tons of sugarcane.

The results examine the effect of variety on payload, the cost thereof and the cost of topping up a crane operation with a Bell loader to achieve maximum legal payload. The payback period of an on-board weighing system is examined and calculated for the above operation. Loading accuracy and both overloading and under-loading are analysed.

Data from the 2008 season are then used to extrapolate the cost benefit of an on-board weighing system over a variety of lead distances.

*Keywords:* sugarcane, variety, overloading, loadcell, transport, transloading

## *Biography: Kevin Cole*

*Kevin Cole obtained a BSc. Engineering (Agricultural) degree from UKZN and worked at SASEX, (now SASRI) in the agricultural Engineering Department before moving to Unitrans Sugar to take up the position of project manager - operations. He left Unitrans to start Agri-Man, an agricultural consultancy business specializing in transport and mechanization. In 2000 he started his farming career and farms at Glen Rosa on the KZN South Coast. His farming enterprise consists of sugar, timber and a small transport fleet.*

AGRICULTURE SUCCESS STORY SUMMARY

# WATER WEED BIOCONTROL THROUGH HIGH STOCKING RATE RELEASES OF MASS REARED INSECT HERBIVORES

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## *Biography: Denise Gillespie*

*Denise Gillespie is currently the Weed Biocontrol Supervisor at the Sugarcane Research Institute (SASRI). She obtained her Honours Degree in Entomology from the University of KwaZulu in Pietermaritzburg. Denise was employed by SASRI and involved in the Biological Control programme against the sugarcane stalk borer Eldana saccharina. Her current work involves contract rearing of biological control agents against alien invasive weeds for various stakeholders.*

**Summary**

*Wewe Siphon Dam, Tongaat, KZN.*
In 2007, Tongaat-Hulett Agricultural Operations contacted SASRI to investigate biological means to control *Pistia stratiotes* (water lettuce) on a dam in the Tongaat area. *Neohydronomus affinis* (a weevil) (Figure 1a) was obtained and rearing began in August 2007. Releases from September (Figure 1b) until October 2007 (Figure 1c), of 8700 *N. affinis* cleared the weed. However, because of lack of competition, water hyacinth (*Eichornia crassipes*) flourished, and by early December 2007 covered the water surface (Figure 1d). Three biocontrol agents (another weevil, *Neochetina bruchi,* a mirid, *Eccritotarsus catarinensis* and a mite, *Orthogalumna terebrantis*) were obtained from northern KZN, and rearing commenced in mid-December, after an initial release of the agents in the dam in mid-December. Agents were released weekly, on infested plants, from the mass rearing centre at SASRI. In March 2008, the water hyacinth was brown in colour (Figure 1e), and by September 2008, large water areas were visible in the impoundment (Figure 1f).

*Various sites, Kruger National Park, Mpumalanga*
In May 2008, Working for Water approached SASRI for *N. affinis* to be released at sites heavily infested with water lettuce in the Kruger National Park. On 7 June the first of 10 000 adults were released on Orpen Dam (Figure 2a). By mid-August, the dam was clear of the weed (Figure 2b). Releases were moved to the Sabie River, and the first 5000 adults released there in mid-August (Figure 2c). By mid-October this site was also cleared of the weed (Figure 2d). Emphasis moved to water hyacinth on Engelhard Dam, where releases of the same suite of hyacinth agents commenced in mid-October 2008 (Figure 2e). In January 2009, impact on the water hyacinth was evident (Figure 2f).

A cost comparison at Wewe Dam between herbicide treatment of water lettuce in March 2007 (Roundup and Midstream used = R56 390) compared to biological control (July-October, including colony establishment = R18 000) showed a 31% cost reduction. In addition, biocontrol will prove more sustainable, as the herbicide effect lasted for less than three months, necessitating further control action. The release of biocontrol agents at high levels shows that an impact can be demonstrated in a very short time (similar to herbicide impacts) at a much reduced cost. This will give land managers the confidence to consider biocontrol as an effective management action against alien weed invaders.

*Keywords:* water lettuce, water hyacinth, weevils, mirids, mites, biological control

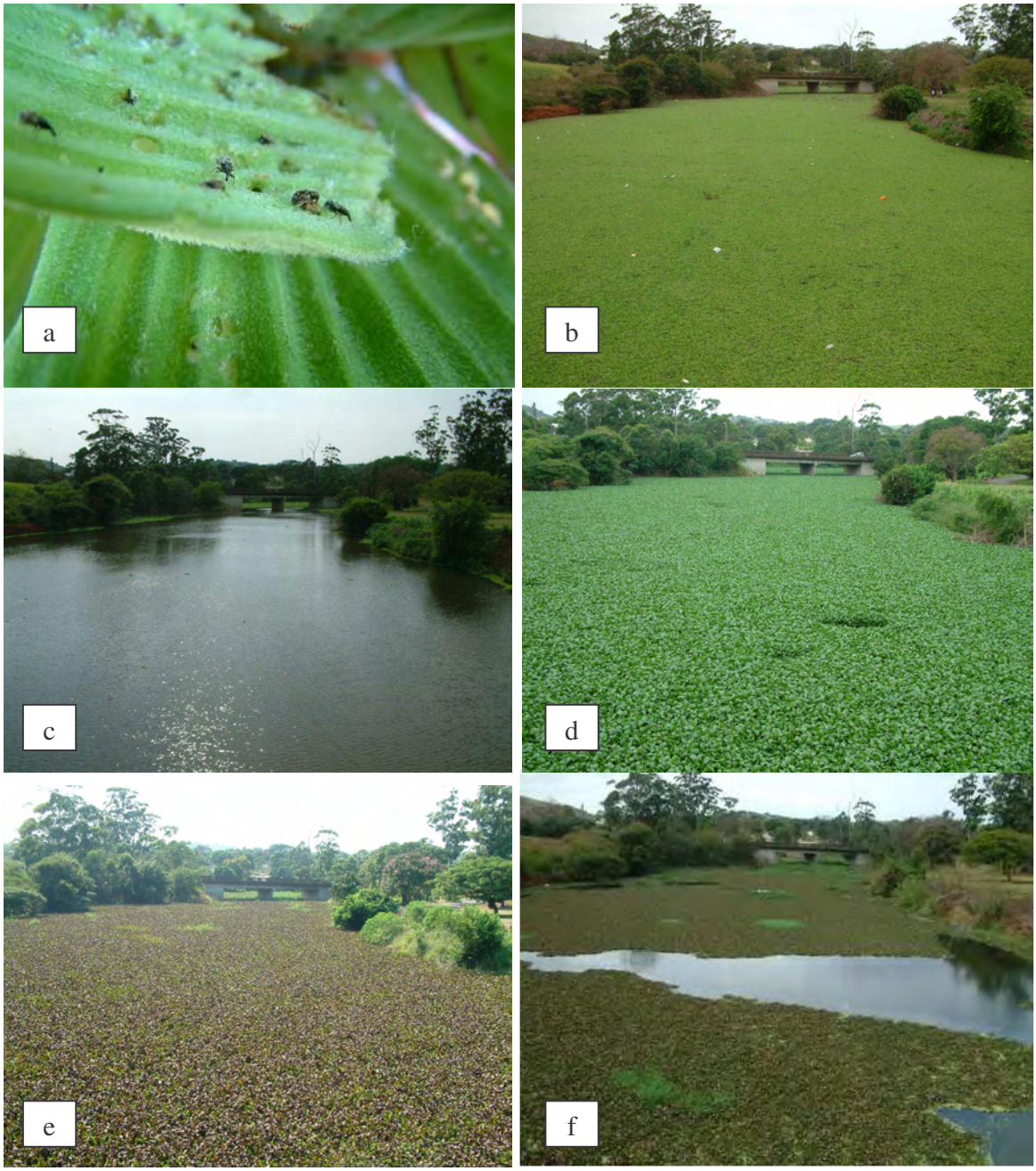


**Figure 1. Waterweed biocontrol at Wewe Dam.**

a=The agent for water lettuce, *Neohydronomus affinis*; b=The water lettuce infestation at the commencement of the project on 13 September 2007; c=The dam surface (22 October 2007) after the release of the agent; d=Water hyacinth colonisation on 11 December 2007; e=Impact of the weevils and mired bug on 11 March 2008; f=Die back of the water hyacinth caused by the agents, resulting in open water areas (18 August 2008)

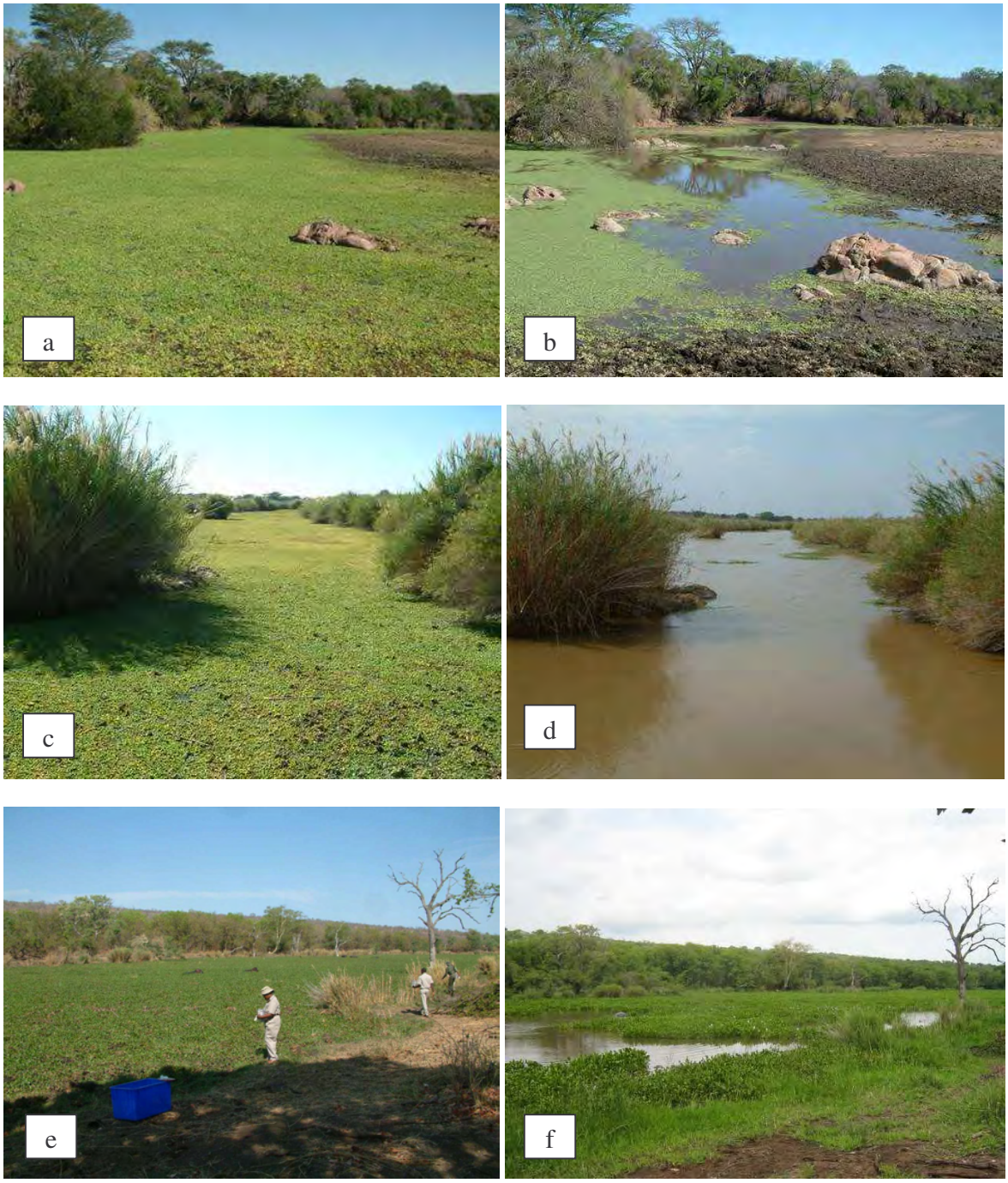


**Figure 2. Waterweed biocontrol in Kruger National Park.**

a=Orpen Dam covered with water lettuce prior to release of *N. affinis* on 7 June 2008; b=Orpen Dam on 13 August 2008 after the release of 10 000 *N. affinis*; c=Sabie River on 13 August prior to release of *N. affinis*; d=Sabie River on 18 October after the release of 5000 *N. affinis*; e=Mkhadzi Spruit covered with water hyacinth prior to the releases of *Neochetina bruchi* and *Eccritotarsus catarinensis* on 27 October 2008; f=Openings in water hyacinth mat on Mkhadzi Spruit on 7 January 2009, after releases of close to 10000 adults each of both species of biocontrol agents.

# COMBINED FARMING OF SMALL-SCALE SUGARCANE GROWERS IN SOUTH AFRICA: EXPERIENCES LEARNED?

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**Abstract**

This paper describes the process applied and experiences encountered in setting up combined sugarcane farming projects in South Africa. The target area in Zululand is managed by the Uthungulu District Municipality, with projects in the uMlalazi Local Municipality. The paper will further discuss the benefits of the projects, and the problems that may compromise the success of combined farming.

Organising people to work together as a group is a challenge, as this is contrary to current practice and new to rural communities. To make a success of combined farming requires commitment, dedication and a strong drive to bring about fundamental change through development. Many challenges facing rural communities hinge on poor levels of education, which are a barrier to accepting developmental progress. In the past, many projects failed because decisions were taken without any consultation with the stakeholders, therefore it was imperative that the entire community become involved.

In the project initiation stages, the community leaders were informed of the benefits of block farming and a participatory approach was adopted. These sensitising visits were a necessary process in obtaining community leadership acceptance, and for the information to be filtered down from the leaders to the rest of the sugarcane farming community. Different ideas and approaches were explored, with the innovators organising themselves into legal entities (agricultural co-operatives).

Funding to initiate the projects was made available by the European Union (EU) through the KwaZulu-Natal Gijima Project. Co-operative members were trained in agronomics as well as business management, capacity building and in managing HIV/AIDS. Despite the many challenges, mostly of a social nature, the benefits are tangible and communities are fast becoming less interdependent, making bold decisions about their own futures.

*Keywords:* sugarcane, growth, harvesting, small-scale growers, co-operatives, combined farming

## *Biography: Thulani Masondo*

*Thulani Masondo is the South African Sugarcane Research Institutes' Sugarcane Extension Specialist for the Small-Scale Growers of the South Zululand region based in Eshowe. He received his agricultural training at Owen Sithole Agricultural College, University of Fort Hare and PE Technikon, he has diplomas in Agriculture Plant Production, Agricultural Extension and Rural Development and a B. Tech Degree in Agricultural Management. He is currently doing his Masters Degree in Agriculture at Nelson Mandela Metropolitan University. Thulani is the co-ordinator and the chairperson of the development committee in his region (Zululand South) and member of the Local Economic Development Committee of the uMlalazi Municipality within the Uthungulu District*

# THE EFFECT OF GREEN CANE ON DOWNSTREAM FACTORY PROCESSING

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**Abstract**

There is a world-wide shift from burnt to green cane harvesting. In many countries, including the United States and South Africa, certain areas are changing to green cane harvesting due to public, tourism and environmental pressures against open field burning, increasing labour costs, and the potential use of sugarcane trash as biomass for the production of bio-products. While some countries have already converted to total green cane harvesting, of the 23 million tonnes of cane that is annually processed in South Africa, almost 85% is still burnt.

Since the 1940s there have been factory trials all over the world on green cane processing but, due to the sheer magnitude of such trials, none have managed to shed much light on the effect on downstream processing beyond clarification. This paper reports on the effects of harvesting green billeted sugarcane compared to burnt billeted and/or whole-stalk sugarcane on factory front end processes and on downstream processing in a pilot plant. Pilot plant processing was done on samples collected from two factories situated in the Midlands area of South Africa. Sufficient cane of each treatment was harvested and processed to purge the extraction plant of other cane. Trash materials and mixed juice were collected and analysed. The effects of trash levels on prepared cane, bagasse and mixed juice are reported. Factory mixed juice (300 L) was transported to the SMRI in Durban and further processed in the SMRI pilot plant to clarified juice, syrup, A-massecuite, A-molasses, A-sugar, and affinated sugar. Various differences in physico-chemical parameters including colour and ash are presented.

*Keywords:* tops, trash, harvesting, burnt cane, green cane, billets, processing, clarification, evaporation, boiling house, pilot plant

## *Biography: Barbara Muir*

*Dr Barbara Muir is a Senior Research Officer at the Sugar Milling Research Institute (SMRI). She has a Doctoral Degree in Applied Organic Chemistry. Her current work includes the development of a new method for slurry preparation, and the screening of chemicals and other additives for the removal of non-sucrose (for example colour or starch) from cane sugar processing streams.*

*Barbara has authored, co-authored or presented eight SASTA papers and nine SASTA posters and has been a member of the SASTA Council since 2004.*

# WHOLE STALK GREEN CANE DETERIORATION INDICATORS TO ASSESS MIXED JUICE QUALITY

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**Abstract**

A deterioration trial was conducted in Reunion Island on two main sugarcane CERF varieties (R570 and R579). Whole stalk green canes were harvested, left in the field and sampled every two days. This trial was carried out to find new deterioration indicators using chromatography analyses (HPIC, HPLC). In addition to standard parameters (i.e. purity, cane weight, pH, reducing sugars), oligosaccharides, polyols, organic acids, and amino acids were measured. Results highlighted that 1-kestose, proline and *cis/trans* aconitic acid ratio were closely linked to cut to crush delay (respectively $r^2$ = 0.98, 0.82 and 0.76). To a lesser extent citrate and amino acids (alanine, cysteine, isoleucine) were also correlated to cut to crush delay. These results were compared to mixed juice analysis to assess freshness of sugarcane delivered to the mills. According to Le Gol sugar mill mixed juice analysis, estimated freshness of delivered cane was variable. Purity, reducing sugars and Pol/sucrose highlighted a delay below four days after harvest. Aconitic ratio, proline and 1-kestose indicated a cut to crush delay between four and seven days.

*Keywords:* sugarcane, green cane, deterioration, sugar losses, kestose, proline, mixed juice

## *Biography: Arnaud Petit*

*Arnaud PETIT is a Research Technologist at Sugar Cane Research and Training Institute (CERF) in Reunion Island. He graduated from The National Institute of Applied Science of Toulouse. He worked on sweet maize variety for Bonduelle and on microbiological production of flavouring for Lesaffre before joining CERF on November 2006. He mainly works on analysis protocol setup in new CERF laboratory, sugar process (sugar losses, evaporation and crystallization) for Reunionese sugar mills and on microbiology for distilleries. He presents his first publication for the SASTA congress.*

# THE ENERGY AND ENVIRONMENTAL IMPACTS OF A COAL AND BAGASSE-FIRED POWER PLANT IN THE SUGAR INDUSTRY

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**Abstract**

This paper presents a thermodynamic model of a proposed firm power plant co-fired with bagasse and coal under South African conditions. It proposes the energy conversion for a 2.5 million tonnes of sugarcane per year sugar factory and demonstrates that a power plant of up to 120 MW can be supported by such a facility. Carbon emissions are quantified and compared to a 120 MW coal only power plant, to establish expected environmental benefits. It demonstrates the technical feasibility of power plant development in the South African sugar industry and contributes to informed decisions on partly renewable energy power plants.

*Keywords:* sugar firm power, power plant model, emissions

## *Biography: Charles Mbohwa*

*Charles Mbohwa is a Senior Lecturer in the Department of Quality and Operations Management at the University of Johannesburg. Previously he held a similar post at the Department of Mechanical Engineering at the University of Zimbabwe. He was a Fulbright Scholar visiting The Supply Chain and Logistics Institute at the School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta USA, to create a new masters course subject in Supply Chain Management and to research on the adaptation of electronic supply chain systems to less industrialized countries. Dr. Charles Mbohwa graduated with a B. Sc. Honours in Mechanical Engineering from the University of Zimbabwe in 1986 and then worked for 5 years as a mechanical engineer/ operations manager for the National Railways of Zimbabwe. He then completed a Masters in Operations Management and Manufacturing Systems from the University of Nottingham in 1991 after which he joined the University of Zimbabwe as a lecturer. He studied for his PhD at the Tokyo Metropolitan Institute of Technology in Japan from 2001 to 2004. His research activities are in logistics, supply chain management, quality, operations management, life cycle assessment and bio-energy/fuel feasibility. He has supervised several masters students and is currently supervising three masters and one PhD student. He has published 3 book chapters and more than 12 refereed journal papers and more than 50 refereed and non-refereed conference papers.*

# THE POTENTIAL OF BIOTECHNOLOGY IN THE SUGARCANE INDUSTRY: ARE YOU READY FOR THE NEXT EVOLUTION?

NEL S

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**Abstract**

Sustainability of the sugarcane industry relies heavily on the realisation that sugar, molasses and bagasse can no longer be considered as the final products of a sugar factory. Innovation through biotechnology has the potential to provide a sustainable, competitive edge to the value addition of sugarcane products and processes. Biotechnology can be defined as a combination of technologies which use biological systems, living organisms or derivatives thereof to produce or modify products or processes for specific use. Recent advances in genomics, proteomics and bioinformatics provide access to an enormous information base for facilitating the choice of suitable microorganisms and enzymes for bioconversions. This can shift the resource base for chemical production from fossil feedstocks to renewable raw materials and provides exciting possibilities for the use of industrial biotechnology-based process tools in the sugar industry. This paper explains the fundamentals of biotechnology and highlights the need to introduce these new technologies in a mature industry, for the sake of sustainability.

*Keywords:* biotechnology, sugarcane, sustainability, value-added products

## *Biography: Sanet Nel*

*I have obtained the following degrees from the University of the Free State:*

- *BSc (Biochemistry & Microbiology) (cum laude)*
- *BSc Hons. (Biochemistry – protein chemistry) (cum laude)*
- *MSc (Biochemistry – molecular biology) (cum laude)*

*After my post-graduate studies and a stint as bioanalyst at an international clinical research organisation, I joined the SMRI New Products Division as researcher in 2008. I am a biotechnology enthusiast with a passion for research, both fundamental and applied. My position at the SMRI calls for the promotion and execution of innovative research on possible approaches to add value to the sugar industry, and with this paper I tried to illustrate the vital role which biotechnology could play in the sustainability of this industry.*

# NEW APPROACH TO SHREDDER DRIVES DRIVEN BY ELECTRIC MOTORS

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**Abstract**

In the 1970s the sugar industry began moving away from steam turbine driven shredders in favour of electric motor drives. Due to the high inertias of the shredders, long starting times and high starting torque requirements, the preferred electric motor drives have been slip ring motors with liquid starters.

With the demand for higher Preparation Indices the shredder motor powers gradually increased. These ever-larger motors together with the power swings generally associated with shredders began to impact negatively on the sugar mill power houses and had the potential to cause loss of synchronism of the TAs and factory blackouts.

The accepted solution was to engineer an increase in the rotor resistance and thus motor slip in order to relieve the stress on the power supply of the large power swings. Increasing motor slip is easily carried out with slip ring motors and external wire wound resistances left in the rotor circuit during normal running. This solution has been the standard adopted in virtually all new southern African mills from then to the present day.

Pressure is being brought to bear by the large motor manufacturers in that slip ring motors and liquid starter applications are falling out of favour and being replaced with reliable, medium voltage, variable speed drives connected to robust, simple and low maintenance squirrel cage motors.

The sugar industry needs to keep up with this technology and take advantage of less expensive, more reliable shredder drive designs.

*Keywords:* sugarcane, factory process, shredders, shredder drives, electric motors

## *Biography: Dave Hall*

*Dave Hall is an electrical engineer at Bosch Projects, a multidisciplinary consulting firm. He received his degree from Natal University in 1970 and worked in the sugar industry for 12 years and the water industry with Umgeni Water for 17 years before taking early retirement at the end of 2003. He joined Bosch Projects in 2004 as head of the electrical department for 4 years before becoming an associate consulting engineer in the same firm.*

# MAXIMISING PROCESS PERFORMANCE IN A SUGAR FACTORY: ISSUES OF DESIGN AND MAINTENANCE

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**Abstract**

There are always strong incentives for Process Management to achieve high levels of technical performance in a sugar factory. This is particularly so in the South African sugar industry where the 'Division of Proceeds' system accentuates these incentives. The primary route to achieving good technical performance is usually close control of process operations, guided by detailed measures of factory performance.

A critical area that often does not get sufficient attention is that of equipment and process design coupled with the need for proper maintenance. There are many constraints (e.g. financial, mechanical, space and construction) as well as a lack of skill and/or technical knowledge which can contribute to placing limits on the performance that is possible from a particular factory. Identifying and correcting issues of design and maintenance that adversely affect process performance usually requires close attention to detail combined with sufficient technical knowledge. This paper attempts to provide a framework to assist in the process of identifying and correcting issues that affect sucrose loss in final molasses. This is done through a set of simple guidelines that are explained by using anecdotes from the combined experience of the authors to illustrate the type of problems that can be encountered and corrected.

*Keywords*: TPD, process performance, design, maintenance, principles

## *Biography: Muzi Ninela*

*Muzi Ninela is a Production Manager at the Tongaat Hulett's Amatikulu mill. He graduated with a Bachelor of Technology degree in Chemical Engineering from Mangosuthu Technikon and conducted his in-service training in SASOL Secunda. He has for the past 13 years worked in various roles in processing within the Sugar Industry. Muzi has authored and co-authored two published SASTA papers.*

# COMING SOON TO A FACTORY NEAR YOU – THE NEW TONGAAT HULETT CONTINUOUS PAN

SCHORN PM, SMITH L, PEACOCK SD, LOVE DJ and MUZZELL DJ

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**Abstract**

A new design continuous vacuum pan has been developed by Tongaat Hulett, and has been installed at their Xinavane factory in Moçambique. The pan is unlike any previous continuous pan design in that it is of a circular (round) construction with two internal floating calandrias stacked one above the other in a common vapour space. Although the calandrias share this common vapour space, each can be boiled independently of the other. This allows for 'on the run' boiling-out and cleaning of the pan, thus alleviating an inherent problem of high grade (A-massecuite) continuous pans which require regular shut down and boiling-out to remove encrustation above the boiling surface and/or in the tubes.

The design of the pan is such that it is possible to convert an existing batch pan into a continuous vessel or to install a continuous pan on the footprint of an existing batch pan.

This paper describes the design of the pan and lists its advantages and reasons for the development of the design.

*Keywords:* factory process, continuous pan, circular pan, crystallisation, pan boiling, vacuum pan

## *Biography: Paul Schorn*

*Paul Schorn is the Technology Group Leader in the Tongaat Hulett Technology and Engineering Group (TEG). He worked in the Malelane (TSB), Simunye (RSSC) and Darnall (Tongaat Hulett) factories before joining TEG. He has authored / co-authored 12 previous SASTA, one ISSCT and three SIT papers. He has served on the SASTA Council for the past five years.*

# THE IMPLEMENTATION OF SOUTH AFRICAN SUGAR TECHNOLOGY: THE WORLD'S LARGEST SUGARCANE DIFFUSERS

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**Abstract**

Cane diffusion gained popularity in South Africa in the 1960s and 1970s using European technology. Local research and developments led to the development of locally designed diffusers and to the South African industry achieving the highest extraction rates in the world. The largest diffusers in the South African industry were installed at Felixton 2 in 1984, being 12 metres wide and rated (conservatively) at 350 tch. Since then, no significant advances in diffuser technology were made until Bosch Projects introduced the 'Chainless Diffuser' concept in 2006.

Of the nine Chainless Diffusers to be installed in Brazil between 2008 and 2010, two are similar in size to those at Felixton and six are larger. The first of the 12 metre diffusers (at UNP and rated at 500 tch) was commissioned in September 2008. The diffusers at Brenco, Cosan Jatai and Meridiano are 15 metres in width, are rated for 98% extraction at 625 tch and are the largest cane diffusers in the world. The diffusers in Cosan and Meridiano will ultimately process 875 tch.

The success of the Chainless Diffuser in Brazil is evidence that South African sugar technology and engineering is still relevant and continues to play a leading role, even in the most competitive sector of a fast-changing world industry. In response to the demands of the market, Bosch Projects is about to initiate a design for diffusers that are 20 metres wide.

*Keywords:* diffusers, extraction, Brazil, technology, chainless

## *Biography: Bruce Moor*

*Bruce Moor is self employed as a Sugar Consultant. The majority of his consulting is for Bosch Projects. He graduated from the University of Natal with a BSc (Mech Eng) cum laude in 1961. He then proceeded to Cambridge University on an Elsie Ballot scholarship, where he obtained an MA (economics). He is a registered Professional Engineer He was employed for 34 years with Tongaat Sugar and Tongaat-Hulett Sugar, including technical service as Pupil Engineer, Chief Engineer, Factory Manager and Technical Director. He took early retirement in 1998 to establish his sugar consultancy and has consulted to sugar factories in over 20 countries. He has been involved with numerous successful sugar equipment designs and innovations. These include the Tongaat Shredder, the Tongaat-Hulett and Bosch continuous pans, sieve-plate scrubbers and various diffuser, process and boiler improvements. Some of these received SA Sugar Technologists Association and NPI awards and two have been internationally patented. He has presented more than 30 technical papers to ISSCT, SASTA, British SST and Philsutech. He has supplied articles for the International Sugar Journal, Zuckerindustrie and the South African Sugar Journal and contributed two Chapters for Prof. Rein's new Cane Sugar Engineering handbook. Other technical appointments include:*

- *Board of Sugar Milling Research Institute (15 years)*
- *Council of SA Sugar Technologists Association (14 years)*
- *Committee of SA Sugar Association Industrial Training Centre (16 years)*
- *External Examiner, University of Natal BSc (Mech Eng) examinations*
- *Council of Natal Technikon*

# A JUST-IN-TIME APPROACH TO REFINING

RAMBAKUS Z and MOODLEY M

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**Abstract**

The Tongaat-Hulett Sugar Refinery (Hulref) receives very high pol (VHP) sugar from the Hulett mills situated along the north coast of KwaZulu-Natal during the crushing season, and from the South African Sugar Terminal (SAST) during the off-crop. The sugar is stored in one of three warehouses with a total capacity of 80 000 tons. On 9 May 2008, a fire totally destroyed two of the stores and partially ruined the third one. All the essential sugar handling equipment such as conveyors, walkways, blending and storage facilities and auxiliary equipment were destroyed. The operational recovery period, which spanned three weeks, involved making the area safe for work and reinstating essential equipment required for receiving sugar directly into the melting process. The refinery resumed production on 28 May 2008 with the VHP intake as a fresh 'Just-In-Time' (JIT) raw sugar feeding system, entailing the conveying of VHP sugar directly into production. This paper covers the fundamental principles of the JIT system, innovative techniques employed across a variety of challenges, the internal refinery control philosophy, its advantages and disadvantages, the empowerment of staff and key production techniques employed to sustain refinery operations at a steady rate.

*Keywords:* just- in-time, JIT, melt rate, VHP, delivery rate, time efficiency

## *Biography: Zyven Rambakus*

*Zyven Rambakus graduated with a B-tech degree in chemical engineering at the Durban University of Technology in 2004. He joined Toyota Manufacturing Plant as an engineering trainee in the Paint Plant where production management skills such as Toyota Production System, Kaizen, Quality circles where developed. Zyven joined Tongaat Huletts in 2006 as a Chemical Engineering trainee and is currently working as a Process Engineer at the Huletts Refinery.*

# LABORATORY INFORMATION MANAGEMENT SYSTEMS IN THE SOUTHERN AFRICAN SUGAR INDUSTRY

MUZONDO B

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**Abstract**

The sugar factory laboratory has over the years evolved into the centre of all factory throughput, quality, and efficiency measurement and reporting procedures. The basis for the gathering and processing of results and information, and subsequent formatting into efficient reporting processes is the Laboratory Information Management System (LIMS). Initially designed to cater for laboratory testing and calculations only, the LIMS has developed into a more encompassing system that can potentially cover all operations in the wider factory environment without being limited by location.

This paper considers recent trends in sugar factory information management with specific reference to key functionalities and capabilities essential to a LIMS that is fit for function and to the benefit of both growers and millers. As the performance of a computerised system depends on key inputs, typical configurations of the data capture environment in a modern factory are considered. Current capabilities with regards to network configuration that best suit the sugar manufacturing environment are also covered.

*Keywords:* computer, software, data, laboratory, factory, reporting

## *Biography: Baldwin Muzondo*

*Baldwin Muzondo holds a BSc (HONS) degree from the University of Zimbabwe and is a Sugar Technologist with the Adapt IT group.*

*Muzondo likens his "training" to his actual work experience and this includes his role as a Production Manager at Tongaat-Hulett in Zimbabwe which entailed responsibility for sugar manufacture and its related processes for the organization, amongst other tasks.*

*With 12 years of experience under his belt, Muzondo joined Adapt IT in 2008 providing the industrial expertise required to make the company's products the best in the sugar business. His role also includes scoping, designing and implementation of IT solutions for sugar manufacturers.*

POSTER SUMMARY

# SEPARATION, IDENTIFICATION AND CHARACTERISATION OF EXTRACTIVES FROM SUGARCANE (*SACHARRUM OFFICINARUM*) LEAF

WALFORD S[1], EGLI S[1,2] and MARTINCIGH B[2]

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**Abstract**

The separation, identification and characterisation of the extractives from green and brown leaves of sugarcane plant (*Sacharrum officinarum*) are described. Green leaves were extracted by boiling in water, sonicating in a 1:1(v/v) methanol:water solution and 1:1(v/v) acetone:water solution and by the soxhlet technique. Dried leaves were extracted by sonication in a 1:1(v/v) methanol:water solution. Flavonoids and phenolic compounds in the green and dried leaf extracts were analysed, identified and characterised by use of Ultraviolet spectrophotometry and High Pressure Liquid Chromatography with photodiode array detection. The efficiency of the extraction methods were compared to previously reported values. The soxhlet technique gave the highest extraction of flavonoids and phenolic compounds.

*Keywords:* sugarcane extractives, green leaves, dried leaves, analysis, chemical characterisation

## *Biography: Stephen Walford*

*Stephen Walford is the head of the New Products research group at the Sugar Milling Research Institute. He obtained his degrees in Chemistry from the University of Natal and has been employed at the SMRI for a total of more than 17 years. He has presented at SASTA on numerous occasions and also at many international chromatographic conferences. Stephen is currently co-supervising an MSc graduate and Honours project – both in collaboration with the University of KwaZulu-Natal.*

POSTER SUMMARY

# PREPARATION OF THREE NOVEL IONIC LIQUIDS FOR THE DISSOLUTION OF CELLULOSE

DU CLOU H[1,2], WALFORD S[1] and MARTINCIGH B[2]

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**Abstract**

The full potential of sugarcane bagasse has not been fully exploited, with the main usage in South Africa being for providing energy in sugar mill operations, and portions being utilised for paper products, animal feed and furfural production. The dissolution and subsequent reactions of cellulose from sugarcane bagasse is a possible future application of ionic liquids (ILs), which are more environmentally-friendly solvents that can also be used as reaction media. Such use of ILs is aimed at the production of value-added products from the abundant bagasse substrate. This work describes the synthesis of a starting compound (1-allyl-3-methylimidazolium bromide) and subsequent preparation and characterisation of three novel organic ILs (1-allyl-3-methylimidazolium lactate, 1-allyl-3-methylimidazolium acetate and 1-allyl-3-methylimidazolium salicylate) because of their potential for cellulose dissolution. Preliminary tests showed that, although the ILs are able to dissolve cellulose, the presence of water limited cellulose dissolution.

*Keywords:* ionic liquid, cellulose, synthesis, analysis, bagasse, byproducts

## *Biography: Heidi du Clou*

*Heidi du Clou is an Assistant Researcher at the Sugar Milling Research Institute (SMRI) and a Master of Science student in the School of Chemistry at the University of KwaZulu-Natal (UKZN) (Westville Campus) in Durban. She completed her Bachelor of Science (BSc) in Chemistry Cum Laude and BSc Chemistry (Honours) at the same university and received recognition as being both the Best Student in the School of Chemistry in 2007, and the Best Honours Student in 2008. It is through the collaboration between SMRI and UKZN that she was able to undertake and complete her Honours research project titled "Synthesis, characterisation and application of 1-allyl-3-methylimidazolium bromide and three novel organic ionic liquids for the dissolution of cellulose", obtaining a Certificate of Merit for her achievement therein. Following her successes she was invited to join the SMRI to further her studies and potential career as a researcher in the sugar industry.*

POSTER SUMMARY

# ASSESSING THE PROCESSABILITY OF SUGARCANE VARIETIES

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**Abstract**

The Sugar Milling Research Institute (SMRI) is developing methods to characterise the processability of sugarcane, particularly pre-release varieties from the South African Sugarcane Research Institute's (SASRI) breeding programme. The pith/fibre ratio and colour are presently used to characterise the processability of sugarcane; however, further parameters are required to obtain a better understanding of how a particular variety would behave during processing, particularly in the front end of the factory. A number of methods have been investigated; these include the use of a stereomicroscope to identify pith and fibre, an impact test method and a percolation test method. Each method is described and test results obtained on selected varieties are given. The suitability and feasibility of each of the different methods is discussed.

*Keywords:* pith/fibre, sugarcane, varieties, impact, percolation

## *Biography: Bryan Barker*

*Bryan Barker is a Researcher in the process-engineering department at the Sugar Milling Research Institute. He has a National Diploma in Chemical Engineering and is studying towards his BSc in Chemistry at UNISA. He has been at the SMRI for fourteen years and it that time has been involved in research across all areas of sugar processing. He has presented ten times at SASTA.*

# PAYLOAD DISTRIBUTION IN THE LIGHT OF THE SUGAR INDUSTRY'S DECISION TO SELF-REGULATE

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**Abstract**

Over the past two years the sugar industry has been actively pursuing a system of self-regulation in addressing the issue of vehicle overloading. Although it is encouraging to see continuous improvement in this area, there have been concerns about the impact of self-regulation on underloads, and therefore the average payloads. Many of the individual mill areas felt that self-regulation was having a negative impact on payloads and therefore the profitability of the supply chain, and they felt that this was undesirable in an environment already under economic pressure. An extensive exercise to quantify payload distribution was therefore undertaken using the SLIP database, to assess whether the process of self-regulation was indeed having a negative effect on underloading. The results from this exercise were in contrast to what the industry had assumed. The predicted pattern of payload distribution, i.e. an increase in underloading and reduced average payload did not materialise. The results showed instead that the industry as a whole had become more aware of the need to load effectively and were achieving more accurate payloads. Although this exercise did not solve the problem of under loading, it did highlight the fact that there were other issues that were affecting payload, such as poor vehicle choice, cane variety and loading management.

*Keywords:* payload distribution, underloading, overloading, SLIP, self-regulation, profit

## *Biography: Ryan Giles*

*Ryan is a Bio resources Engineer and senior manager at Crickmay & Associates in Pietermaritzburg. He has more than 5 years experience and specialises in bulk supply chain efficiency improvement and the introduction of standards through the use of business analysis, benchmarking and various leading edge technology introductions.*
*He works predominantly within the sugar industry and his roles include project management of the FREDD, SLIP, RTMS Sugar Projects, project consulting, systems design, systems integration, and whole product lifecycle management predominantly in South African and Swaziland. More recently he has developed relations with the Australian and Brazilian bulk industries exporting locally developed technology and systems to those bulk industries.*
*Based on the successes in sugar in the last year has expanded his focus to include the South African coal industry (ESKOM) and is responsible for the logistics operational systems designs in one of the largest road logistics projects ever commissioned.*

# A STUDY OF SUGAR INDUSTRY VEHICLE CONFIGURATIONS AND THE IMPACT OF RISKS AND OPPORTUNITIES ON HAULAGE COSTS

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**Abstract**

The sugar industry is made up of numerous hauliers using a wide variety of different tractor and truck configurations, many of which have outdated technology. Some of the reasons for this are differing business principles and historical tendencies. However, continuing in these practices may result in economic losses for those role players. It is therefore important that the cost of haulage associated with using different vehicle configurations is understood.

Together with rising input costs, current global economic situation, pending Consignee/ Consignor and 'Haulage Tractor' legislation, role players involved in the haulage of sugarcane need to be aware of the different vehicle configurations and the opportunities and risks that they face by using them.

This paper is a desktop study using TransSolve to demonstrate and compare the haulage costs of different vehicle configurations and combinations and the risks involved, such as the effect on changing parameters. However, numerous opportunities also exist, such as innovations to reduce tare and thereby increase payload on the haulage cost. The information obtained from this study can be used in the future to help role players decide on the vehicle configuration which would best suit their needs.

*Keywords:* sugarcane, vehicle configuration, haulage, risks, opportunities, haulage legislation

## *Biography: Ryan Giles*

*Ryan is a Bio resources Engineer and senior manager at Crickmay & Associates in Pietermaritzburg. He has more than 5 years experience and specialises in bulk supply chain efficiency improvement and the introduction of standards through the use of business analysis, benchmarking and various leading edge technology introductions. He works predominantly within the sugar industry and his roles include project management of the FREDD, SLIP, RTMS Sugar Projects, project consulting, systems design, systems integration, and whole product lifecycle management predominantly in South African and Swaziland. More recently he has developed relations with the Australian and Brazilian bulk industries exporting locally developed technology and systems to those bulk industries. Based on the successes in sugar in the last year has expanded his focus to include the South African coal industry (ESKOM) and is responsible for the logistics operational systems designs in one of the largest road logistics projects ever commissioned.*

# PERFORMANCE-BASED ANALYSIS OF CURRENT SOUTH AFRICAN SEMI-TRAILER DESIGNS

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**Abstract**

In South Africa, heavy vehicles are currently designed according to stringent prescriptive standards designed and enforced by the national Department of Transport (DoT); these standards are regulated in terms of mass, dimensions and configurations. The current prescriptive standards leave little room for innovative designs.

Performance Based Standards (PBS) for heavy vehicles have been developed and implemented in Australia, Canada and New Zealand since the mid-1980s. This is an alternate regulatory system designed to improve the dynamic stability and performance of heavy vehicles. PBS regulates the performance of a vehicle rather than limiting it with regard to size and mass, thus creating more flexibility for innovative designs, increased productivity and improved safety.

This paper presents the analysis and evaluation results of five current South African semi-trailer combination vehicles assessed in accordance with the PBS approach.

*Keywords:* heavy vehicle dynamics, performance based standards, dynamic stability, tractor semi-trailers, directional response, static rollover threshold

## *Biography: Rhys Thorogood*

*Rhys Thorogood has a BSc qualification in Mechanical Engineering from the University of Kwa Zulu Natal, and is in the process of completing his MSc in vehicle dynamics analysis with the use of Performance Based Standards. This research is done in collaboration with the Council of Scientific and Industrial Research (CSIR) built environment division, Department of Transport (Dot), and the Eastern Centre of Transport Development (ECoTD).*

# VEHICLE SCHEDULING PROJECT SUCCESS AT SOUTH AFRICAN AND SWAZILAND SUGAR MILLS

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## Abstract

Typified by the South African sugar industry, current sugarcane transport and indeed also loading and supply systems have been identified as very inefficient and costly components of the sugar logistics chain. These systems have become significantly overcapitalised, fragmented and relatively poorly managed and coordinated, which has resulted in significant under utilisation of equipment for growers, transporters and the miller. This has contributed to role-player antagonism, distrust and unnecessarily high costs for all three role-players.

It was proposed that at a mill a single control centre should schedule all the vehicles and also coordinate supply and loading operations to improve efficiency and reduce inbound supply chain costs. As a component of the SLIP programme, FREDD, a vehicle dispatching/ scheduling programme developed in New South Wales, Australia, has been introduced into four Mills in SA and Swaziland, which has resulted in significant improvements in efficiency.

This paper will discuss the above mentioned projects' objectives to (1) customise FREDD for South African mills, (2) reduce vehicle delays by as much as 67%, thereby reducing the number of vehicles in the fleet and maximising vehicle utilisation, (3) reduce the occurrence and duration of mill no-cane stops by as much as 50% and (4) demonstrate how the central measurement and management strategy exposes areas of weakness and opportunity. It will discuss the success of the project and also highlight further opportunities for technology use within the sugarcane supply chain and a number of spin-offs in terms of improving the general supply chain management.
*Keywords:* FREDD, SLIP, supply chain improvement, vehicle scheduling, sugarcane transport

### *Biography: Ryan Giles*

*Ryan is a Bio resources Engineer and senior manager at Crickmay & Associates in Pietermaritzburg. He has more than 5 years experience and specialises in bulk supply chain efficiency improvement and the introduction of standards through the use of business analysis, benchmarking and various leading edge technology introductions. He works predominantly within the sugar industry and his roles include project management of the FREDD, SLIP, RTMS Sugar Projects, project consulting, systems design, systems integration, and whole product lifecycle management predominantly in South African and Swaziland. More recently he has developed relations with the Australian and Brazilian bulk industries exporting locally developed technology and systems to those bulk industries. Based on the successes in sugar in the last year has expanded his focus to include the South African coal industry (ESKOM) and is responsible for the logistics operational systems designs in one of the largest road logistics projects ever commissioned.*

# CHOICES AND COMBINATIONS OF QUALITY, HACCP AND SAFETY STANDARDS IN THE FOOD MANUFACTURING SECTOR

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## Abstract

The International Standards Organisation (ISO) 9001 standard facilitates the implementation of a quality management system which in its early infancy was the only standard available to food manufacturers for standardisation purposes. With the introduction of Hazard Analysis Critical Control Point (HACCP) systems and more recently the promotion of ISO 22000 which are more appropriate for food manufacturers has created some anxiety as to what standards to implement. Some ISO 9001 food manufacturing organisations are considering implementing ISO 22000 food standard as a replacement for ISO 9001, some are just adding SANS 10330, a HACCP standard, whilst some want to implement ISO 22000 as an additional standard. This paper reports on an investigation of the choice of standards that management prefers. The study consists of comparative analyses of the standards, an empirical determination of management's preferred choices of standards or combinations of standards and the study of the implementation of ISO 22000 at the Mhlume Sugar Factory in Swaziland (Royal Swazi Sugar Corporation). The findings shows that an ISO 9001 certified organisation can add SANS 10330 and be equivalent to ISO 22000 depending on customer and market requirements. It is also shown that management have the least preference for ISO 9001 only, and prefer both ISO 9001 and ISO 22000 certificates. The greatest preference was for an integrated ISO 9001 and ISO 22000 system. The implementation at Mhlume shows that the ISO 9001 system and be combined with the ISO 22000 system. The benefit of this contribution is to inform management of the similarities and differences between quality, HACCP and food safety systems and the possibility of combining them.

*Keywords:* ISO 9001, food safety, ISO 22000, food quality, HACCP, SANS 10330

***Biography: Roy Ramphal***

*Roy Ramphal was once employed in the sugar industry with C.G.Smith Group and Hulett Sugar group. The various positions entailed process management as well as development of related sugar products.He has presented papers to SASTA in the past. He was also employed in the business world with Hewlett Aluminum before joining academia. Roy is presently employed as a senior lecturer at the University of Johannesburg and has just completed a business related doctoral study. He is one of the major advisors on Operations Management and Quality related curriculums in many universities. Roy is currently the National President of the South African Society for Quality (SASQ), and Chairman of the board of SAATCA, has been recently appointed to serve on the Editorial Board of the Management Today magazine, as an advisory panel member for Marcus Evans as well as a board member of the Services Seta Quality Council. He is a contributor to the various revisions of ISO 9000 standards. He has presented and published many research papers as well as a co-author of two books in operations Management.*

***Biography: Sindisiwe Simelane***

*Sindisiwe Simelane is an Area Production Manager for the Front-end (Cane and Mills) at the Royal Swazi Sugar Corporation (RSSC), Mhlume Factory. She undertook this position in 2008 having been the Area production Manager for the Refinery where her responsibilities included production, conditioning and packaging of white sugar as well as being the Food Safety Team Leader. As the Food Safety Team Leader, she has been instrumental in the implementation of ISO 22000 at the Mhlume Factory. Within a year, under her leadership, the company received certification against the standard. Sindisiwe holds a BSc in Home Economics from the University of Swaziland and an MSc in Food Science from Michigan State University. She has experience in alcohol production, fruit processing, managing quality systems and product development.*

# MINIMISING SUCROSE LOSS IN FINAL MOLASSES: THE THREE LAWS OF MOLASSES LOSS

LOVE DJ and MUZZELL DJ

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**Abstract**

Maximising sucrose recovery can also be viewed as minimising sucrose losses. From this perspective, since sucrose loss in final molasses is normally the largest component of the total sucrose loss, minimising sucrose loss in final molasses is vital to maximising sucrose recovery. A set of 'Three Laws of Molasses Loss' is proposed as a basis for guiding actions necessary to minimise the loss of sucrose in final molasses. The rationale behind each of the laws is described, along with how they relate to good operational practices. The three laws are also used as an aid to interpreting standard factory performance figures.

## *Biography: David Love*

*Dr David Love is a Chemical Engineer working for the Technology and Engineering Group of Tongaat Hulett Sugar. He has worked in the South African sugar industry for just over 30 years. His experience has covered; research & development, process design, process equipment design, factory operations and technical consulting. Dr Love has published papers at both SASTA and ISSCT congresses on topics from diffusion to pan boiling.*

# OPTIMISING IMBIBITION IN A SUGAR MILL WITH COGENERATION

PEACOCK SD and COLE MA

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**Abstract**

Design of raw sugar factories has traditionally focused on achieving a balance between the energy demand of the factory and the energy contained in the available fuel supply (i.e. bagasse). This has been particularly true in South Africa, where historically low prices have discouraged any investment for the purposes of exporting electrical energy to the national grid. This approach to factory design yields factories with a relatively low capital cost, but often with reasonably poor levels of energy efficiency. However, the current drive towards cogeneration has changed industry thinking in this regard.

Standard sugar industry practice aims at maximising the recovery of sucrose from cane by maximising the amount of imbibition water that is applied to the extraction plant, while remaining within the constraints of the bagasse supply. This is a sensible approach for a factory producing only one valuable product. However, this optimisation method is no longer valid for a cogeneration factory producing a product mix which includes both raw sugar and electrical power. While sugar recovery is maximised by increasing the rate of imbibition, this reduces the potential for electrical power export. The current study demonstrates techniques that can be used to determine the economic optimum for a typical South African raw sugar mill, based on detailed modelling of the extraction plant (e.g. a diffuser) and the energy balance of the factory. The best financial outcome for the mill occurs at an imbibition rate lower than that conventionally applied in the local industry.

*Keywords:* imbibition, extraction, cogeneration, electricity, energy, optimisation

## *Biography: Steve Peacock*

*Steve Peacock is a chemical engineer in the Technology and Engineering Group of Tongaat Hulett Sugar. His work focuses on mathematical modelling and the process design of factory modifications and expansions. He has authored or co-authored 19 SASTA papers, all of which have been verbose and incomprehensible.*

# THE KVP REFRACTOMETER – A SOUTH AFRICAN DESIGN

COUPAR KE

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**Abstract**

In consultation with several key stakeholders within the South African sugar industry, including AutoLab, the Cane Testing Service and the Sugar Milling Research Institute, LASEC SA facilitated the development of the J157-KVP, a flow-through vertical prism refractometer manufactured by Rudolph Research Analytical (RRA). Meeting the industry's requirements for electronic temperature control, small-volume flow-through sampling and accurate reproducible readings with the ability to connect to LIMS, the KVP refractometer is the culmination of years of industry knowledge and experience. Pour-through refractometers offer the key benefit that inter-sample flushing forms an integral part of the sample loading process, thereby reducing measurement cycle times and increasing sample throughput. While a horizontal pour-through design was already available from RRA, it was through discussions with the local sugar industry that development began on a vertical prism design. The KVP vertical prism design refractometer allows suspended solids, which are often present in cane juice samples, to fall past the measurement prism, rather that settling onto it. The small funnel volume allows increased sample flushes, while the integrated overflow funnel reduces spillage. The J157-KVP was designed in collaboration with local experts to meet the needs of the South African sugar industry.

*Keywords:* refractometer, vertical prism, pour-through, brix, temperature control

## *Biography: Kylie Coupar*

*After completion of her Bachelor of Science Honours Degree at the University of Cape Town, Kylie left academia to join LASEC SA. As suppliers of laboratory and scientific equipment, LASEC SA provided her with the opportunity to use her science background in a commercial field, and she grew within the company to assume the role of Product Specialist and later Product Manager. Recently appointed to the position of Divisional Manager for Instrumentation, Kylie retains her portfolio as Product Manager for Rudolph Research Analytical products, and as such has been directly involved in the implementation of Rudolph equipment into the South African sugar industry.*

# ON-LINE SUGAR ANALYSIS: THE SOLUTION FOR COST REDUCTIONS

GAILLAC B and TRINTIGNAC C

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**Abstract**

Process optimisation is a substantial element for factories wishing to distinctly reduce production costs and energy consumption. Larger variations in the process are expensive to correct and may lead to a quality outside specifications.

*The Colobserver®: More than a simple colorimeter*
By capturing and analysing in real-time the image of the sugar, the Colobserver offers a new approach and new abilities to sugar on-line colour measurement. The great advantage of the Colobserver is the timely reception of accurate data which makes it easier to act rapidly on the factory process and avoid potentially expensive errors. On wet sugar, the control of batch centrifugals is optimised in identifying the whiteness of the sugar coming out of each machine and the average of the strike. On dry sugar, quality is optimised in managing the blend of the different sugar qualities coming out of each silo. The Colobserver controls the entire width of the conveyor, displays the sugar image in real time and detects brown sugar lumps. With an automatic storage of images from production issues, it allows reliable tracking of the complete production. The Colobserver is the latest technology to replace the old generation of colorimeters.

*The Part'Sizer®: On-line particle size measurement*
Based on the same measuring principle as the laboratory, the Part'Sizer is a fully automatic system from the sampling to the particle size measurement. On line quality control allows the detection in real time of off-spec product. The Part'Sizer® is the solution to increase quality and decrease production costs.

*Keywords:* on-line colour measurement, brown lumps detection, process optimisation, cost saving solution, quality improvement, on-line particle size measurement

## *Biography: Coraline Trintignac*

*Coraline Trintignac is the Export Sales Manager of the Colour Dpt in ITECA Company.*
*After a diploma of Mechanical Engineering from the National Institute of Sciences in Lyon, France, she received a 12-months post graduate degree in Franco-Latino-Americano Management from the Institute of the Enterprise Administration in 2004.The same year, she began to work in DALKIA in Mexico, the European leader in Energy Services. Two years spent in this company and an internship of 6 months in Embraer, one of the largest aircraft manufacturers in the world gave her a good knowledge of high technology and adaptability to multicultural environments. By the way, she speaks fluently both Spanish and Portuguese. In 2006, she returned to France and began to work in ITECA, in the Colour Dpt specialized in on-line colour measurement and on-line particle size analysis. She travelled the world to promote our new range of particle size analyzers and on-line colorimeters based on digital technology and able to store and analyses images of the checked products.Thanks to her cooperation ITECA has recently sold new Colobservers CL 150 in sugar companies in Brazil, Morocco and Philippines and benefits from a new reference in bulk industry in Spain with the Part'Sizer.*

# ENERGY SAVINGS USING PLATE TECHNOLOGY IN SUGAR PRODUCTION

LJUNGQVIST A

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**Abstract**

This presentation will, among other things, explain how a cane sugar producer saved 50% on live steam consumption in raw juice heating by replacing 15 shell and tubes heaters with six WideGap plate heat exchangers. Energy savings are getting higher and higher on the agenda for sugar producers. Sugar production is a very heat intensive process but, due to the residual bagasse, cane sugar mills are more than self-sufficient in fuel for their own production needs. Historically, there has not been much incentive to save energy in sugar production but, as co-generation of electricity is becoming more and more common, energy savings are now definitely of high priority. The more live steam you can save, the more electricity you can produce. In a sugar mill, there are many lower grade heat sources that are often not regarded as valuable sources of energy. Condensate, pan vapour and vapour from the later effects of the evaporation station are some examples of such heat sources and, by shifting heat sources towards the lower grade ones, more live steam is saved for electricity production.

The key to success is to use heat exchanging equipment which allows a close temperature approach. This is much more easily achieved using plate technology compared to shell and tubes. Low pressure vapour is, for example, conveniently handled in the Alfa Laval double sided WideGap plate heat exchanger, where you have the fibrous raw juice on one side and the vapour on the other. When condensate is used, and for other duties where there are liquids on both sides, plate technology is well known to be more efficient than shell and tubes. In addition to the thermal advantages, plate technology offers very compact solutions that are easy to maintain and clean, and it is also very easy to increase the capacity by just adding plates.

*Keywords:* energy saving, plate technology, WideGap, pan vapour, condensate

## *Biography: Anna Ljungqvist*

*Anna Ljungqvist is the Alfa Laval Marketing Manager for sugar applications and is based at the Alfa Laval head office in Lund, Sweden. She received her MSc in Chemical Engineering at the Royal Institute of Technology in Stockholm, Sweden, in 1994. After 13 years in the chemical industry, she joined Alfa Laval in 2007 when she took her current position.*

# OPTIMISATION OF SUGAR FILTRATION WITH AN INNOVATIVE FILTER-AID

SAI H

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Filtration is one of the most important phases in cane sugar factories. The principle of filtration is to block the solid particles by a porous filtering obstacle. Good filtration should allow not only better quality of sugar but, more importantly, reduce the cost of production. In traditional filtration, due to the pressure during the feeding of the filter, solid particles can lose their shape and create a reduction in porosity and consequent blockage of the filter. By extending the filtration cycle, it is possible to reduce the number of filtrations per year and consequently the cost through a reduction in the number of filtration cycles, decreased perlite consumption, and decreased water and energy consumption.

Pre-coating is the most important stage which ensures the optimisation of the filtration cycle length as well as the sugar quality. Success is based on a perfect homogenisation on the sheets or on the metallic plates of the filter. It allows the filter cake to reinforce its sieve and depth power, avoiding immediate sealing.

A complex of fibres (celluloses and cotton) and perlites create an optimum particle size distribution and permeability. Cellulose which has been specially treated is the most important component in pre-coat adsorption; in fact the cellulose is responsible for electro-kinetic potential. Cotton has a support function: the fibres form a network which offers physical resistance to pre-coats. Perlite allows a proportional increase of the retention power of solids.

Fibroxcel® is characterised by different properties:
- Particle Structures
- Rigid particle filter cake
- Homogeneity in filter cake
- Wetness
- Resistance to fast and hard pressure
- Cleaning the cake at the end of filtration.

The objective of this presentation will be to show with relevant figures and diagrams, the impact of an innovative filter-aid on improvement of filtration and comparison with traditional filtration.

## *Biography: Hadi SAI*

*Hadi SAI is Export Manager of AEB-SPINDAL Group in France. He studied Biology at the University of Bordeaux I in France, Degree in Business administration (Chamber of Commerce and industry in Paris and Sensory analysis and oenological tasting training at the oenological University of Bordeaux II. In 1999 he joined AEB Group "International Group specialised in bio-technology production for the food and beverage industry" as Technical-Sales Manager for Beverage Division. He Planned and conducted scientific and technical seminars for Beverages in various countries. His technical knowledge in filtration and clarification has been supplemented by various interventions in the major groups in the field of beverages. Since 2003, he has been Export Manager in AEB Group.*

# MICROWAVE TECHNOLOGY: THE MOST RELIABLE AND COST EFFECTIVE METHOD OF MEASURING BRIX IN THE SUGAR FACTORY

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**Abstract**

Microwave density measurement is a new concept for the local sugar industry. However, microwave measurement is fast becoming the principal technology that is being used to measure and control brix directly in the pipeline between evaporators, as well as batch and continuous pans.

Although the technology has been available for the past 15 years, the sugar industry in South Africa is only now seeing the cost advantages. Over a period of 48 months, during which equipment tests and performance trials were carried out, the equipment has shown acceptance and all installed units in service have proved very successful.

This presentation will discuss measurement successes within Africa and the rest of the world, and the technical aspects and requirements of the microwave principles used in the making of sugar.

*Keywords:* brix measurement, batch pan, continuous pan, evaporator, melters

**Biography: Dudley James**

*Dudley James served an apprenticeship and qualified as a Fitter and Turner working for Benoni Engineering in the early 1970s, and with further technical studies obtained a Mechanical Technician's Certificate in 1975. Following a period of employment at Sulzer Bros. South Africa, in the design drawing office, Dudley joined Festo South Africa and was instrumental in establishing the Vereeniging Festo branch office.*

*An opportunity arose during which a family business, the J6 Engineering Co, was established. J6 Engineering is a manufacturer of sawmill machinery located in White River in what is now Mpumalanga province. A decision was made to create a distributorship for Festo pneumatic equipment and products in the area and, as a result, Brenley Engineering Sales cc came into being in 1990. Brenley Engineering operates as a one-man business and serves Eastern Mpumalanga and Swaziland.*

*By 1995, Brenley Engineering was well established and recognised as the sole distributor for Festo in the region. The servicing of local sugar and paper and pulp mills resulted in a sugar mill approaching Brenley Engineering for information regarding proMtec. A distributorship for proMtec was negotiated and started.*

# BUILDING ETHANOL PLANTS FOR AFRICA

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**Abstract**

The impact of bio fuels on the economic development of developing economies is increasingly becoming an area of interest particularly in sub-Saharan African countries where cost of production results in quite competitive prices for cane, a factor which could in turn help to keep the cost of producing ethanol at economical levels. Molasses is available in most of the countries in excess which is used mostly for export and local feed use. Sub-Saharan Africa has good potential for agriculture as it has availability of unused agriculture land. Sugar economy is well developed in the region with good sugar and alcohol trade practices. These economies present significant opportunities as they have sugar deficit which will promote greater cane acreage with unwinding of more agriculture land area. Africa enjoys many trade agreements, including ACP Protocol Preferential trade agreement and recent Economic Partnership agreement (EPA) with European Union (EU).

However, building an ethanol plant in Africa would involve customizing the plant to local conditions. It is essential when entrepreneurs or investors are planning their projects that they evaluate these factors critically and take a decision. Decisions involve feedstock choices, energy sources, water conservation and most important wastewater utilization.

Countries should also examine how they can address the commodity cycle. Currently sugar prices are at a peak. There will be another cycle wherein sugar prices could fall. This is when a well planned ethanol plant can play a role. Multiple feedstock to de-risk the commodity cycle is an imperative. Energy integration is yet another way forward. Where biomethanation has been used, we can look for additional options like vinasse boiler which will also provide generation of steam and power.
*Keywords:* Bio fuels, Sub Saharan Africa, Molasses, Agriculture, Trade, Energy Integration, Wastewater Treatment, biomethanation, vinasse boiler

## *Biography: Abhay Chaudhari*

*Abhay Chaudhari is a Mechanical Engineer from the Leading Engineering College in India. Mr. Chaudhari is the Executive Vice President of PRAJ INDUSTRIES LIMITED, world's leading Alcohol technology company. He has over 25 years of experience in ethanol and brewery plant engineering. He has provided end-to-end solutions encompassing range of technologies and systems for Fermentation, Distillation, Dehydration, Evaporation, Effluent Treatment. As Executive Vice President, Abhay Chaudhari heads the Strategic Business Unit for India and Sub-Saharan Africa. He has presented many papers in seminars in India and abroad on varied subjects. He has been closely associated with the sugar and distillery industry.*

# THE SMRI: 60 YEARS OF INNOVATION AND SUPPORT

DEWAR J[1]

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**Abstract**

The Sugar Milling Research Institute was founded in 1949 as *"the focal body to deal with all sugar milling problems, both fundamental and practical"* (Minutes of the first Associate Members Meeting). Originally funded by the SA Miller's Association and the CSIR, the SMRI is now funded by the South African Sugar Millers Association Limited (SASMAL) and from income it receives largely from its Full and Affiliate members for training, consulting and analytical services. In the 60 year period since its inception, the SMRI has played a pivotal role in advancing sugarcane processing technology including developing many significant methods of sugar analysis and has become the central repository for milling information. Over the years, it has trained a large number of the industry's sugar technologists and many of the past and current leaders in the industry have, at some stage, worked at the Institute.

This paper outlines some of the history of the SMRI, detailing the major developments and successes of the Institute, indicates how changes have been effected to continue being relevant in a changing environment, and shows how the current strategy and offerings ensure continued success into the future.

*Keywords:* eg. SMRI, sugarcane, processing, research, strategy, innovation

## *Biography: Dr Janice Dewar*

Janice is the Chief Executive Officer of the SMRI. She has a PhD in Biological Sciences and before joining the SMRI at the end of 2003, she spent 14 years with the Council for Scientific and industrial (CSIR) based in Pretoria. There she spent 10 years building up and managing a technical research group that consulted to the malting and brewing industry. Thereafter, she moved into Strategic Management of Innovation and was responsible for setting up the CSIR's Minimum Acceptable Standards for Intellectual Property management and exploitation. Since joining the SMRI, Janice has placed a lot of emphasis on interacting with the sugar milling industry to gain a better understanding of where the industry sees itself going in the medium to longer term. This has resulted in the SMRI developing a new research strategy which is aligned with the strategic objectives of the industry and focused towards assisting the industry to be profitable and sustainable into the future. Janice is passionate about the role that technology can play in improving the economy of South Africa and the quality of life of its citizens.

# ENHANCING SUPPORT MEASURES TO SMALL SCALE GROWERS AND NEW FREEHOLD GROWERS IN THE SOUTH AFRICAN SUGAR INDUSTRY

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**Abstract**

The South African sugar industry is a significant contributor to the local economy and is committed to supporting Land Reform and Broad Based Black Economic Empowerment. The industry has made steady progress with transformation of commercially owned land since 1994, and, at the end of the 2006/07 season, black owners controlled 15% of the freehold area. Including the cane grown in communal authority areas, 30% of the total industry area was owned/operated by black growers at this time. With the large number of new entrants into the industry came the challenge of empowering the new growers to operate sustainable cane farm businesses. Yield trends of the new freehold growers and small scale growers highlight the need to enhance support measures available to these growers. Further complicating the matter is the emergence of community ownership arrangements arising from the various settlement models used for land restitution. The paper analyses current support services and highlights requirements for improved service delivery to entrant growers and small scale growers. The identified areas for small scale grower support include: input procurement and distribution to communal areas, development of viable commercial contracting enterprises in these areas, and access to credit from agricultural development institutions. Support for new freehold growers needs to focus on improving business understanding with the aim of improving long term planning, productivity, competitiveness, benchmarking and leadership.

## *Biography: Kathy Hurly*

*Kathy started off her working career at the University of Natal first as a student completing her BSc (1981), HDE(1982), BSc Hons (1983) and MSc (1985) and a PhD (1991) and later as a lecturer. Her MSc studies focussed on the seed dormancy and seedling establishment of Rooibos tea and her PhD investigated the role of carbohydrate metabolism in the rubber biosynthetic pathway of guayule. Guayule is a small rubber bush that the then government wanted to grow as a natural source of rubber providing a natural source of rubber for the country in the face of apartheid sanctions. She started working in the sugar industry in 1995, first at SASRI, as the Scientific Liaison Officer and then the Extension Manager. While at SASRI she was part of the management team. She joined CANEGROWERS in 2006 as the Regional Services Director.*

# A SURVEY OF SMALL-SCALE SUGARCANE FARMERS IN SOUTH AFRICA AND MAURITIUS: INTRODUCING PROJECT METHODOLOGY, INVESTIGATING NEW TECHNOLOGY AND PRESENTING THE DATA

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**Abstract**

This paper outlines the procedure followed, technology used and preliminary results derived from an extensive and comprehensive survey of small-scale sugarcane farmers conducted in Mauritius and South Africa. Mauritius and South Africa were concerned about the yield gap between small and large-scale farmers as well as their international non competitiveness within the diminishing preferential markets and rapidly increasing costs of production. A further concern was the apparent lack of adoption of improved technology and practices recommended by the research institutes. This paper reports on some of the preliminary findings of the survey carried out in South Africa. Methodology and appropriate innovative technology was identified to undertake such a complex task capturing data relating to social information, agronomic practices, skills and knowledge. Data was collected, captured and made available for further analysis. More than 900 farmers in South Africa (SA) and 800 in Mauritius (MU) were surveyed using the 'logitech smart pen' technology.

Gaps in knowledge and skills as well as possible areas for further research needs for small-scale farmers were identified. This project has produced extensive data on an important industry client group that will better inform decision-makers on points which were previously largely assumed. It has also firmly asserted the South African Sugarcane Research Institute (SASRI) and the Mauritian Sugar Industry Research Institute (MSIRI) as leaders in this largely unexplored and novel area of extension empathy.

This project was made possible through a European Union (EU) competitive grant fund to conduct agricultural research that would benefit the small-scale farmers of the Southern African Development Community (SADC) region.

*Keywords:* survey, small-scale, research, sugarcane, extension, technology

## *Biography: Martin Eweg*

*Martin attained a Diploma in Agriculture from Cedara College in 1974 and managed a number of private mixed farming units to gain valuable experience eventually being stationed in Zululand as a senior estate superintendant for a timber company. In 1983 he joined SASA as a farm manager for the Experiment station, relocating to Mount Edgecombe Durban and in 1991 transferred to the Extension department returning to a station in Zululand as Extension officer for the Zululand Central region. Martin was promoted to Principal extension specialist for SASRI in 2000 to manage the small-scale grower extension initiative and transferred back to Mt Edgecombe. Martin has a number of reviewed papers presented at international forums and is working towards an MSc in extension methodology, having a strong engagement both nationally and internationally in the Agricultural Extension Education fraternity serving on the national board of the South African Society for Agricultural Extension.*

# FACTORS AFFECTING MORTGAGE LOAN REPAYMENT BY NEW FREEHOLD GROWERS IN KWAZULU-NATAL

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**Abstract**

The average financial performance of emerging commercial farmers (now called New Freehold Growers or NFGs) in the South African Sugar Industry was below that of large-scale commercial farmers during 1997-2007. Given that this trend raises concerns about the long-term viability of NFGs, this paper identifies factors that distinguish between successful, less successful and unsuccessful NFGs using a stratified random sample of 96 NFGs in KwaZulu-Natal (KZN) surveyed during July-November 2008. These NFGs were classified according to whether their mortgage loans were current (successful), in arrears (less successful) or in the process of legal action (unsuccessful). Student *t-tests* indicate that in terms of common differences, successful NFGs had *statistically significantly* larger farms (average annual gross farm income over two times greater than less successful, and over three times greater than unsuccessful, NFGs), were more solvent (average debt:asset ratio of 0.31 versus 0.61 and 0.95 for less successful and unsuccessful NFGs, respectively) and annually replanted more of their sugarcane area (mean of 7.15% compared to 3.39% and 0.76% for the other two groups, respectively). Unsuccessful NFGs also had less personal contact with some industry role players. These results suggest that (1) policy makers can promote the viability of NFGs by facilitating the transfer of adequate size farms (proxied by annual gross income); and (2) potential NFGs need to manage leverage levels and implement replanting schedules in line with industry norms. New sugarcane farmers are also encouraged to build relationships with industry role players to obtain key industry information and to learn from their financial and production experience.

*Keywords:* sugarcane, mortgage loan repayment, emerging farmers, farm size, solvency, management

## *Biography: Warren Floyd*

*Mr Warren Floyd is a postgraduate student in the Discipline of Agricultural Economics, School of Agricultural Sciences and Agribusiness, University of KwaZulu-Natal. Mr Floyd completed his BSc Agric at the same institution in 2006, and is currently doing his MSc Agric degree in Agricultural Economics, researching the factors contributing towards the success/failure of New Freehold Growers within the South African sugar industry.*

# SEZELA GROWER UNIFICATION PROVIDES A FOUNDATION FOR SUSTAINABLE CANE COMMUNITIES

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**Abstract**

Local Grower structures and associated leadership hold the *key* to unlocking sustainable cane communities. The Sezela cane supply area has moved from a 'very separate mis-aligned member structure' to an integrated, focused grower organisation over an 18-month time period. This paper will provide a 'road map' for unification, identify obstacles that were encountered en route and provide three case studies illustrating how unification provided the foundation and vehicle to implement the new vision. This resulted in a cohesive, better organised Local Grower structure with collective muscle, which in turn enhanced the bargaining power in local Miller Grower negotiations. This new momentum translated into innovative solutions in the arena of Small Scale Grower sustainability, Land Reform and Transport Logistics.

An unintended outcome of unification was the creation of a self-perpetuating momentum which resulted in support from a range of external parties. Local area challenges are ongoing, and future strategies will be discussed.

*Keywords:* grower unification, institutional structures, land reform, small scale growers, sustainability

## *Biography: William Gillham*

*Mr. William Gillham is the General Manager of Sezela Cane Growers Association (SCGA). He also fulfils the role of the CaneGrowers grower affairs representative in the region, providing liaison with the Local Grower Council (LGC).*
*He obtained a Diploma in Agriculture at Cedara College and has worked in the sugar industry for the past 18 years gaining experience in a wide variety of agronomic spheres and has performed many administrative functions for growers and industry structures at a local level. These functions include the management of the previous Alexandra Group, management of the Sezela Transplant Nursery, Mill Group Board and the Sezela Pest, Disease and Local Variety Control Committee of which he is currently Chairman.*
*Mr. Gillham is a grower delivering his cane to Sezela mill. This is Mr. Gillham's first publication.*

SHORT COMMUNICATION

# INTEGRATING SMALLHOLDER GROWERS INTO COMPETITIVE SUGARCANE PRODUCTION

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**Abstract**

The Government of Swaziland has made a significant investment in irrigation infrastructure development to encourage smallholder farmers to engage in commercial farming and increase productivity for poverty alleviation. An example is the Maguga Dam Project, a collaboration between Swaziland and the Government of the Republic of South Africa, which supports the development of about 6 000 hectares of land under the Komati Downstream Development Project (KDDP). A further example is the development of infrastructure for the Lower Usuthu Irrigation Project (LUSIP) in the southern lowveld of the country, which has recently been completed to cover 11 500 hectares under irrigation.

Sugarcane farming is one of the most strategic crop options for the smallholder growers, given the success of the industry and the confidence of the agriculture credit service providers in the industry. Currently, 7 000 hectares of the total 57 000 hectares under cane are farmed by smallholder associations, with land areas ranging up to 50 hectares per association.

However, the inept performance of the existing sugarcane smallholders under the KDDP has required a re-examination of the operation and efficiency of these associations. A key challenge is the unsustainably high level of debt owed to local financial institutions, which may be the result a combination of factors including smallholder management practices, the constitution of the farmer associations, the rapidly increasing cost of production inputs and a suppressed sugar price.

Analysis indicates that under optimal management conditions smallholder cane growing can provide significant returns that can contribute to improved livelihoods for the communities and enhance the competitiveness of the industry by increasing throughput. To achieve this, a Model has been developed to improve the viability of these growers, using lessons learnt from the KDDP and integrating industry practices to enhance the commercial content of the growers' operations. New entrant growers, particularly from the LUSIP, and the existing growers will be the beneficiaries.

The concept of this Model is to rationalise technical and governance issues to optimise industry production and the transition of the grower entities to mainstream commercial operations. A group of schemes within the same proximity will pool their resources to hire a professional farm manager, who will work closely with the sugar mills and the financiers to enhance productivity and minimise production costs. This will entail establishing a strong alliance between the grower, the miller and the financier, the creation of a Ratoon Management Fund (RMF) and the support of a Central Procurement System through the mills. The financiers are optimistic about this Model. This short communication presents the proposed Model and gives perspective on opportunities for future customised financing options. The Model ensures development of sustainable business entities with lasting benefits for growers, millers and financiers.

## *Biography: Sibusiso Malaza*

*Mr Sibusiso Malaza is an Agronomist with GFA Consulting Group a consulting company based in Germany, currently co-ordinating the implementation of the National Adaptation Strategy in response to the EU sugar reforms. He received training in Swaziland and South Africa in the field of Agriculture, Land and Water Management and Sugarcane Husbandry and worked for Ubombo Sugar Limited as a crop production manager for 13 years. Mr Malaza then joined the Technical Services Department of the Swaziland Sugar Association where he provided technical advice to sugarcane growers in Swaziland before joining GFA Consulting group where his knowledge of smallholder growers is being exploited for the successful implementation of the EU assistance to smallholder growers for adaptation to the EU sugar reforms.*

POSTER SUMMARY

# AN INVESTIGATION OF IPM PRACTICES FOR PEST CONTROL IN SUGARCANE

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**Abstract**

Integrated Pest Management (IPM) covers a wide range of control methods available to growers to mitigate the impact of pests on yields and quality. However, some control methods are not suitable for emerging farmers, an increasingly important sector of the industry. This study, comprising six stages, addresses the current status of IPM in the South African sugar industry and highlights gaps that might warrant future research. First, a list of industry pests was compiled. This included five weed categories, 11 arthropod, 11 pathogen, and three nematode species. Current control methods were then identified. This list included 15 agronomic, three biological and four chemical control methods, together with three regulatory approaches. The applicability of these practices was tabulated for each of 30 pests, and their suitability for adoption by emerging farmers identified. The results were analysed and summarised to identify trends. Agronomic methods were shown to be the most widely applicable for pest control in sugarcane. While regulatory and biological control options were applicable to all farmers, some methods in the agronomic and chemical control categories were not suitable for emerging farmers. The reasons for this were mainly cost-related, e.g. application of agrochemicals. Research gaps were identified, and eight pests were regarded as potential bio-security risks requiring future research efforts. Nine potential pest control methods were identified that may add value to further enhance existing IPM strategies in sugarcane. As the final stage of this study, IPM was demonstrated on a whole-farm scale.

*Keywords:* sugarcane, IPM, pest control, emerging farmers

## *Biography: Peta Campbell*

*Dr Peta Campbell is a senior researcher at the South African Sugarcane Research Institute (SASRI). She received her PhD from the University of KwaZulu-Natal, Pietermaritzburg in 1991, after studying the reproductive potential of a major forestry weed. Prior to this appointment, she worked for 20 years at the Plant Protection search Institute (Agricultural Research Council) as an agricultural researcher and project leader. Current research focus involves developing integrated control strategies for creeping grasses and improving minimum tillage recommendations. She is the author of 18 peer-reviewed publications, around 40 popular publications, and is a fellow of the South African Weed Science Society.*

POSTER SUMMARY

# DEMONSTRATION PLOTS DOUBLE AS SEEDCANE NURSERIES FOR SMALL SCALE GROWERS IN THE NOODSBERG AREA

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**Abstract**

Many small-scale sugarcane growers fail to prosper due to poor production practices, lack of resources, a shortage of technology and information, ageing ratoons and lack of access to low cost, disease-free seedcane. For these and other reasons, progress is slow and they remain trapped in economically non-viable activities, while they remain highly vulnerable to risk and suffer severe or on many occasions total economic losses. In the Noodsberg Mill supply area in the KZN Midlands, it was noticeable that a lack of access to information had hindered economic returns for small-scale growers in the area. Limited access to finance for suitable seedcane has become important because spatial expansion in the area has increased and has resulted in inappropriate cane from neighbouring fields being used as seedcane. Demonstration plots were introduced as sites for training and technology transfer while demonstrating the potential of the area to produce cane and evaluating varieties under local conditions. Small growers were reluctant to replant due to the expense of purchasing and transporting seedcane. Since the introduction of demonstration plots as seedcane nurseries, one new variety, N37, has been widely accepted. Demonstration plots have served as a technical training facility with numerous on-site training days held and attended by local growers. The relationship between local growers and technicians has been strengthened. Demonstration plots are of significant value in motivating small-scale growers to adopt better farming practices and offer greater access to cheaper disease-free seedcane. The demonstration plots also act as a catalyst for development and potentially higher economic returns, resulting in sustainable and improved livelihoods.

*Keywords:* sugarcane, demonstration plots, disease free seedcane, improved small grower viability

## *Biography: William Gillespie*

*William Gillespie is an Extension Specialist for the Sugarcane Research Institute. He is involved in technology transfer to the Small-scale growers in the southern areas of KwaZulu Natal. He obtained a Diploma in agriculture from Cedara College and has experience in the fields of soil surveying, farm planning and farm management within the sugar industry.*

POSTER SUMMARY

# TECHNOLOGY TRANSFER AMONG SMALL-SCALE SUGARCANE FARMERS IN SOUTH AFRICA

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## Abstract

Between 2006 and 2008, the extension program in the Umbumbulu District of KwaZulu-Natal has been comprehensively planned and meticulously implemented according to sound technology transfer principles. Theoretical messages disseminated during formal presentations were reinforced with practical lessons at demonstration plots of sugarcane. Small-scale sugarcane farmers usually evaluate a technology and determine its economic benefits before adoption. Perceptions by the people involved, and findings from farmer questionnaire surveys, have indicated a high level of knowledge acquisition with the concomitant reasonable levels of awareness on the topics of correct harvest age, varieties and fertilisers, and the need to replant. In contrast, information about the symptoms caused by diseases in sugarcane, and the importance of taking soil samples before planting, require further attention.

*Keywords:* sugarcane, extension, technology transfer, small-scale growers

## *Biography: William Gillespie*

*William Gillespie is an Extension Specialist for the Sugarcane Research Institute. He is involved in technology transfer to the Small-scale growers in the southern areas of KwaZulu Natal. He obtained a Diploma in agriculture from Cedara College and has experience in the fields of soil surveying, farm planning and farm management within the sugar industry.*

POSTER SUMMARY

# PURSUING HERBICIDE TOLERANCE IN SUGARCANE: SCREENING GERMPLASM AND INDUCTION THROUGH MUTAGENESIS

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**Abstract**

Herbicide tolerance is highly desirable in commercial sugarcane. This study explores two strategies for the production of sugarcane tolerant to imazapyr, *viz*. (i) screening populations from breeding crosses for naturally occurring tolerant genotypes, and (ii) producing tolerant genotypes through *in vitro* cell mutagenesis. In the first, over 11 000 seedlings were sprayed with 0.1-1.5 L/ha Arsenal (250 g/L active ingredient - imazapyr), after which 1.25 L/ha Arsenal was selected to test 12 000 seedlings. The second approach exploited the regeneration of herbicide tolerant plants through induced somaclonal variation. Somatic embryogenesis calli of N12 were screened for somaclonal variant tolerance to imazapyr, which may have resulted from 2,4-dichlorophenoxyacetic acid (2,4-D) in the culture medium. In addition, embryogenic calli were exposed to the mutagen ethyl methanesulfonate (EMS; 8 - 96.6 mM for 4 hours). Ongoing work includes regenerating potentially tolerant cells into plants on selection medium (0.042 µM and 0.08 µM imazapyr) after exposure to EMS (8 mM and 16 mM). The surviving plants will be acclimatised in the greenhouse and sprayed with Arsenal to confirm tolerance.

*Keywords:* sugarcane, herbicide tolerance, imazapyr, chemical mutagen, ethyl methanesulfonate, somaclonal variation

## *Biography: Aimee Koch*

*Aimee Koch obtained her BSc and BSc (Hons) (summa cum laude) from the School of Biological and Conservation Science (UKZN), majoring in Plant Biotechnology and Plant Physiology. She started her MSc at SASRI in 2008, where her research is currently being conducted, and is registered with UKZN. In 2009 she was awarded a DAAD scholarship for her final year of masters.*

POSTER SUMMARY

# TOWARDS DEVELOPING A MODIFIED DELTA TRAP TO MONITOR *ELDANA SACCHARINA* (LEPIDOPTERA: PYRALIDAE)

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**Abstract**

*Eldana saccharina* Walker (Lepidoptera: Pyralidae) moths can be monitored in sugarcane using a modified Robinson light trap but there are several shortcomings associated with this particular technique. Amongst these are the necessity for a power source and the non-selectivity of the catch. There is ongoing research at SASRI towards developing a pheromone trap for this major pest. In field trials the standard white or yellow Delta™ insect trap was recently tested with and without crude pheromone lures made from excised abdomens of laboratory bred *E. saccharina* males. In addition, because it has been known by entomologists for many years that catch in light traps are considerably higher near the period of new moon than near full moon, the performance of white and yellow standard traps and specially modified white and yellow reflective traps, was tested in relation to lunar periodicity. Delta traps would be suitable to use in sugarcane. Specific features rendering this trap particularly suitable include: readily available commercially (www.insectscience.co.za); small and portable (110 x 200 x 280 mm); made from coryx (plastic) which is durable and resistant to the vagaries of the weather; a wire attachment on the top allows the trap to be set at canopy height, and a sticky liner within the trap retains the catch for easy counting.

*Keywords:* sugarcane, *Eldana saccharina*, Pyralidae, monitoring, Delta traps, pheromones

## *Biography: Mike Way*

*Mike Way is an entomologist in the Crop Biology Resource Centre (CBRU) at the South African Sugarcane Research Institute (SASRI). His research focuses on monitoring techniques, biology and ecology of arthropod pests in sugarcane agroecosystems. He has been involved with researching: (1) monitoring, yield loss, pest status, and factors influencing African borer (*Eldana saccharina*) (2) distribution, abundance and white grub (Scarabaeioidae) species assemblages in sugarcane (3) distribution, status, yield loss, seasonal and temporal population patterns, natural enemies, effect of planting dates on sugarcane thrips (*Fulmekiola serrata*), cataloguing thysanopteran species and arthropod communities in sugarcane leaf spindles in southern African sugarcane. He is a member of the Entomological Society of Southern Africa.*

POSTER SUMMARY

# SASRI'S MONITOR FARM: PUTTING THEORY INTO PRACTICE

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**Abstract**

The pressure on sugarcane farmers to improve their efficiency and sustainability is continuously mounting. At the same time however, there appears to be a delay in the adoption of SASRI research outcomes by growers. An explanation of this paradox is that much of this research has been mono-disciplinary and conducted at field trial level, removed from the context of everyday farming. The Monitor Farm Project responds to this problem by applying a multi-disciplinary, participatory approach to farming systems level research and technology transfer. In this project, a large team of research and extension specialists work together with sugarcane growers to integrate state-of-the-art best management practices (BMPs) into a practical system on a whole-farm scale. Specific objectives of the project are to benchmark the current agronomic and economic status of the monitor farms (including financial planning, crop husbandry, harvesting and pest and disease management); determine and implement specific BMPs for each farm; and improve BMP adoption by showcasing the outcomes, resulting in more sustainable sugarcane farming throughout the sugar industry. Participating growers needed to be innovative and open to change, whilst their farms needed to provide challenges typical of their wards, to be addressed in the project. A Memorandum of Understanding was signed with each grower, allowing access to farm records, and agreeing that suitable changes would be discussed and implemented whenever these appeared to be practical and economically attractive within their systems. This poster describes the current state of implementation of the rainfed Monitor Farm in Upper Tongaat, and some of the challenges faced and lessons learned so far.

*Keywords:* monitor farm, technology transfer, integrated system, multi-disciplinary approach, participatory approach, best management practices

## Biography: Dirk McElligott

*Dirk McElligott is an Extension Specialist for the South African Sugarcane Research Institute and has been based on the South Coast for the past 10 years, prior to which he worked for Kynoch Fertilisers as an Agronomist. He holds a B.Agric Management Degree from the University of Natal, a National Diploma in Agricultural Resources Utilisation from Pretoria Technikon and a Diploma in Marketing Management from the Institute of Marketing Management.*

POSTER SUMMARY

# ATMOSPHERIC NITROGEN DEPOSITION: WHAT DOES IT TELL YOU?

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**Abstract**

The negative impacts that the seepage of nitrogen into natural ecosystems has on the environment, are well known. Nitrogen from the atmosphere is a significant contributor of N to the environment; it can be transported over long distances and puts pressure on ecosystems. Amounts of 15 to 20 kg N/ha/annum have been established as critical values for shifting natural ecosystems (Bobbink and Roelofs, 1995). Measurements in South Africa are still rare. In Mount Edgecombe, measurements of the bulk deposition were first taken in 2007/08. This poster will provide an introduction to forms of atmospheric deposition, as well as the results of the Mount Edgecombe measurements.

*Keywords:* nitrogen, environment, atmospheric nitrogen deposition, sources

## *Biography: Annett Weigel*

*Dr Annett Weigel is a German soil scientist who is working at present in SASRI's crop nutrition and soils department. She made her PhD in agronomy at the Martin-Luther University in Halle, former East Germany, in 1992. After her graduation she worked for the Environmental Research Centre Leipzig-Halle, dealing with Soil Organic Matter, its role for soil fertility and its interaction with the nitrogen cycle. From 1998 to 2006 she was working for the Saxony-Anhalt Environmental Protection Agency in the Department Soil protection and waste management with primary focus on implementing the new German soil protection law. During her time at SASRI she is working on projects dealing with sensitive methods for detection of management caused short term changes of carbon in soils.*

POSTER SUMMARY

# SMALL SCALE GROWER PROJECTS IN THE SEZELA AREA

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**Abstract**

The South African Cane Growers' Association (CANEGROWERS) undertakes an annual cost survey of SSGs which gathers production cost information for a sample of SSGs in each mill area. From the 2006/07 survey, it was discovered that the Sezela sample produced a higher average yield than samples taken from other areas, as well as the average yield for the Sezela mill area. In addition, the Sezela mill average SSG yield is above that of the overall dryland SSG average. This poster summary attempts to discover the reasons for these high yields.

*Keywords:* small scale growers, Sezela, yields, farming practices, costs, productivity, cost survey, contractor

## *Biography: Minette Landman*

*Minette Landman is the Statistical Analyst at CANEGROWERS. She has been working in the Economics Research Department since 2006 and has an Honours degree in BCom Information Systems.*

POSTER SUMMARY

# ADAPTABILITY OF TEN SUGARCANE VARIETIES AT KIKONENI, MSAMBWENI DISTRICT, KENYA

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**Abstract**

Best-yielding sugarcane varieties are identified by cultivating them in different environments. Adaptability trials of improved varieties have been done in the western part of Kenya. However, in the coastal region there have been no recent trials due to the collapse of Ramisi Sugar Company. An adaptability trial was conducted at Kikoneni in the Msambweni District. The objective was to evaluate the performance of sugarcane varieties to determine their adaptability to the area. The trial was established in a randomised complete block design with three replications. Agronomic parameters were collected and data analysed using analysis of variance. The results showed that four varieties (KEN 82-216, KEN 82-808, KEN 83-737 and Co421) yielded more than 100 tons cane/ha. The four varieties could be recommended for commercial production in the revamped Ramisi sugarcane growing area.

Keywords: sugarcane, varieties, adaptability, yield, Kikoneni, Kenya

## *Biography: Evans Ong'injo*

*Mr Evans Onyango Ong'injo is a Research Scientist at Kenya Sugar Research Foundation. He trained in Kenya in the field of agricultural sciences. He holds Master of Science in plant breeding from the University of Nairobi. Mr Ong'injo has worked in a number of projects related to; characterization, utilization and maintenance of germplasm as well as deep understanding of the role of genotype by environment interaction in the performance of varieties. He heads sugarcane breeding centre- Mtwapa as officer in-charge.*

## *Biography: Calleb Olweny*

*Mr. Calleb Olweny Ochia is a Research Scientist with Kenya Sugar Research Foundation in charge of Sugarcane variety testing across various agro ecological zones in Kenya. Mr. Ochia has a Master of Science Degree in Plant Breeding and Genetics from University of Nairobi. He is currently the Head of Biotechnology sub program of the Foundation. Mr. Ochia has contributed enormously towards variety development in Kenya. He has also published in international journal. Mr. Ochia presented two posters at SASTA congress held in 2008.*

# FOUR-YEAR PERFORMANCE EVALUATION OF SASRI SUGARCANE VARIETIES AT NCHALO SUGAR ESTATE, MALAWI

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**Abstract**

The advent of globalisation has added a new dimension to maintaining a competitive advantage in sugar production. Continuous improvement is the key to achieve efficient and cost effective sugar production. At Nchalo Sugar Estate the production team uses new sugarcane varieties from SASRI's Plant Breeding Programme to add value, increase the competitive advantage of its sugar production enterprise and ultimately improve returns on investment. Ten varieties were evaluated in a randomised block design from plant to third ratoon, harvested Early, Mid and Late season. The 10 varieties evaluated were N38, N35, N36, 87F2719, 90F613, 90F2765, 90F3125, 91F0820, 91F2765, 90F3125 and 91F1161. The control variety was N14.

Overall, the top ranking varieties for tons sucrose per hectare (TSH) were N14 (23.28), N38 (22.08) and N35 (22.07). The lowest levels of smut were recorded in 91F0820 (1.08%), N36 (1.1%) and 87F2719 (1.34%) while the control variety, N14, had a smut level of 2.61%. From these trial results, varieties N38 and N35 have been identified as the varieties of choice to replace N14, which has succumbed to smut pressure.

*Keywords:* adding value, competitive advantage, superior sugarcane varieties

## *Biography: Martin Isyagi*

*Mr Morut Martin Isyagi is Field Manager Technical for Illovo Sugar Malawi Nchalo Estate-Head of Agronomy Section. Previously employed by Cargill and Monsanto Malawi as Assistant Research Manager-Product development. His educational background; Bachelor of Science Agriculture-Crop Science ,Makerere University ,Kampala Uganda; Diploma in Financial Management from Association of Chartered Certified Accountants, England; Masters in Business Administration from the Eastern and Southern African Management Institute, Arusha Tanzania. He has authored 3 SASTA papers won the 2002 Cecil Renaud award.*

SHORT COMMUNICATION

# RAPID BULKING AND TESTING OF COLD TOLERANT VARIETIES IMPORTED FROM LOUISIANA

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**Abstract**

In sugarcane producing regions of the Midlands of KwaZulu-Natal province in South Africa, frost occurs frequently during winter in low-lying areas (frost pockets). Frosted sugarcane often has to be harvested when the stalks are immature and sucrose content and cane yield are low. Early harvesting is common practice in the Midlands to avoid the detrimental after-effects of frost damage, which include quality deterioration. Where frost pockets occur, there is great demand for frost tolerant sugarcane varieties to improve profitability. In Louisiana, USA, sugarcane is harvested young due to cold winter conditions. Two fast-maturing Louisiana varieties (LCP 85-384 and HOCP 96-540) and two South African Midlands varieties (N21 and N36) were evaluated for frost tolerance. All varieties were bulked-up using the NovaCane® tissue culture protocol. A field trial was established during October 2007 in a typical valley-bottom frost pocket at New Hanover in the Midlands North area. The Performance Index ($PI_{ABS}$), a sensitive indicator of photosynthetic electron transport efficiency, was derived from chlorophyll *a* fluorescence measurements performed on leaves of the varieties before and after frost events. Varieties N21 and HOCP 96-540 responded the most severely to frost, with $PI_{ABS}$ values reduced by up to 50% compared to N36 and LCP 85-384. Subsequent analysis revealed that N36 and LCP 85-384 were capable of cold acclimation following the first frost event, allowing maintenance of photosynthesis for longer. This led to substantially higher stalk sucrose accumulation capacity that resulted in up to 30% higher sucrose yields (t/ha) in these two varieties than in N21.

*Keywords:* NovaCane®, tissue culture, sugarcane, varieties, frost, cold tolerance, chlorophyll *a* fluorescence

## *Biography: Riekert van Heerden*

*Dr Riekert van Heerden is a Scientist at the South African Sugarcane Research Institute. He holds a Ph.D. in Plant Physiology from North-West University, South Africa. Dr van Heerden is a National Research Foundation (NRF)-rated scientist and has authored/co-authored 22 publications in accredited international journals and 75 oral or poster papers at local and international conferences. He has supervised/co-supervised 9 MSc and 1 PhD students. He currently serves on the editorial boards of Plant Growth Regulation and South African Journal of Botany and regularly performs peer review duties for more than 20 scientific journals.*

SHORT COMMUNICATION

# GENE DISCOVERY: APPROACHES, DEVELOPMENTS AND APPLICATIONS TO SUGARCANE IMPROVEMENT

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**Abstract**

Knowledge of the identity of genes participating in the delivery of important traits or displaying tissue- or organ-specific expression is advantageous in the development of rational molecular breeding strategies. Over the past 15 years, the South African Sugarcane Research Institute (SASRI) has enjoyed considerable success in the discovery of such genes, which have been used within marker-assisted breeding and genetic engineering strategies. For example, identified genes have facilitated the development of genetic markers depicting resistance or susceptibility to the stalk borer, *Eldana saccharina*, as well as in the modification of the activity of enzymes involved in sucrose metabolism. Over the years, several technologies have been used at SASRI for gene discovery, including Expressed Sequence Tag Analysis, cDNA Differential Display, Suppression Subtractive Hybridisation and Affymetrix® Sugarcane Genome GeneChip analysis. While the application of these technologies has been successful, the recent advent of the next-generation DNA sequencing and gene expression analysis technologies and the release of the *Sorghum* genome sequence herald a new era for gene discovery in sugarcane; one which presents SASRI scientists with new challenges and opportunities. Presented here is an overview of gene discovery strategies employed at SASRI and the impact that they have had on sugarcane improvement research. Also described is the manner in which recent technological and bioinformatical advances are being embraced within this area of research.

*Keywords*: gene isolation, gene expression, transgenesis, DNA markers, molecular breeding

***Biography: Derek Watt***

*Dr Derek Watt is a Senior Scientist in Biotechnology and Manager of the Variety Improvement Programme at the South African Sugarcane Research Institute. He also holds the position of Honorary Senior Lecturer in the School of Biological and Conservation Sciences at the Westville Campus of the University of KwaZulu-Natal. He received his education at the universities of the Witwatersrand and Natal in the fields of botany and plant physiology and worked in university teaching and research for eight years before joining SASRI in 1998. Dr Watt has authored/co-authored 18 research publications in international journals and has supervised/co-supervised 8 MSc and 2 PhD students. He is a member of the Molecular Biology Section Committee in the Agricultural Commission of the International Society for Sugar Cane Technologists.*

SHORT COMMUNICATION

# COMPARATIVE BIOLOGY AND EFFECTS OF CROSSBREEDING *PAREUCHAETES INSULATA* (LEPIDOPTERA: ARCTIIDAE), A BIOLOGICAL CONTROL AGENT OF *CHROMOLAENA ODORATA* (ASTERACEAE)

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**Abstract**

Although populations of *Pareuchaetes insulata* imported from the USA (Florida) and Jamaica were released separately at several sites each in South Africa, only one Florida and no Jamaica sites were definitely established. It is likely that insects from the established Florida site interbred with insects from the Jamaica population released at nearby sites. This study was aimed at determining possible reasons for the establishment difference between the two populations and to assess outcomes of crossbreeding where sites overlapped. Trials comprised crossbreeding and backcrossing of a Florida population from the only established site in South Africa and a laboratory reared Jamaica population. Population fitness was determined by measuring adult fecundity, egg viability, larval sizes and development and survival rates of the different life stages. Trials were repeated over two successive years. The Florida population was superior to the Jamaica population in most measured parameters, particularly in the second year, and hybridisation reduced the fitness of the Florida population. It is not known whether these differences in fitness were intrinsic to the populations, were laboratory artifacts or were in response to feeding on South African *C. odorata*. The lower fitness of the Jamaica population may have reduced its likelihood of establishing successfully, and reduced the fitness of the established Florida population where they came into contact. These results caution that different populations of a biocontrol agent should be kept separate in culture, and that the possible consequences of mixing genotypes should be investigated before field releases are made.

*Keywords: Pareuchaetes insulata*, population fitness, hybridisation, backcrossing, biological control, *Chromolaena odorata*

## *Biography: Nontembeko Dube*

*Miss Nontembeko Dube is a postgraduate student under the Professional Development Programme of the Plant Protection Research Institute (Agricultural Research Council). Her research background includes the biological control of invasive alien plants and in 2009 she was awarded a Master of Science degree in entomology from the University of KwaZulu-Natal. The title of her thesis was "Investigation of the biology and cross-breeding of populations of Pareuchaetes insulata (Lepidoptera: Arctiidae) and the implications for the biological control of Chromolaena odorata (Asteraceae) in South Africa".*

SHORT COMMUNICATION

# PROGRESS IN THE USE OF INSECTICIDES FOR THE CONTROL OF THE SUGARCANE THRIPS *FULMEKIOLA SERRATA* (KOBUS) (THYSANOPTERA: THRIPIDAE) IN SOUTH AFRICA

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**Abstract**

Field trials examined the efficacy of insecticides against *Fulmekiola serrata* (Kobus) (Thysanoptera: Thripidae). Their aim was to determine the possible effect of timing insecticide applications on thrips numbers and crop yield, in relation to the December/January thrips population peak. Products selected for testing were the nematicides oxamyl and aldicarb as well as the insecticides imidacloprid and chlorphenapyr. A commercial formulation of a thrips-specific strain of *Beauveria bassiana* was also tested.

During the first trial in 2006-2007, it was evident that plant crops were more severely affected by *F. serrata* than ratoons. Accordingly, a later trial included planting date as a treatment with crops planted monthly from September to December 2007. Frequency of application was also examined, with foliar treatments being applied at two and three weekly intervals at each planting date.

Results showed that treatments applied before the thrips peak significantly increased yield, increasing tons sucrose/ha by between 13% and 30%; nematicides and imidacloprid were the more effective products tested.

*Keywords:* sugarcane, *Fulmekiola serrata*, insecticides, nematicides, pest control

## *Biography: Graeme Leslie*

*Graeme Leslie is a Principal Scientist at SASRI. Over the past 30 years he has been involved in all aspects of Integrated Pest Management strategies against Eldana, whitegrubs, and most recently, sugarcane thrips. Current research focus is the economic use of insecticides for effective pest control.*
*He has authored or co-authored over 30 research papers on IPM related research as well as many posters and Conference abstracts for national and international research meetings.*

SHORT COMMUNICATION

# USING SPECTROSCOPIC DATA SETS TO PREDICT NUMBERS OF THRIPS (*FULMEKIOLA SERRATA*) IN SUGARCANE

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**Abstract**

Sugarcane thrips, *Fulmekiola serrata* (Kobus) (Thysanoptera: Thripidae), has recently been perceived as a constraint to southern African sugarcane production. Spectroscopic readings at leaf level in sugarcane variety N19 were recorded with the aim of predicting numbers of thrips (nymphs, adults and nymphs+adults) using partial least squares (PLS) regression. Correlations were high, *viz*. $R^2$=0.75 for predicting nymphs numbers, 0.72 for adults and 0.75 for nymphs+adults. Predictions were reliable for nymphs since root mean square error (RMSE) of prediction was 1.25 (47%). Higher RMSE values were obtained for adults (4.8; 66%) and combined life stages (6.2; 63%).

*Keywords:* sugarcane, thrips, *Fulmekiola serrata*, spectroscopy, partial least squares regression

## *Biography: Elfatih Abdel-Rahman*

*Mr. Elfatih Mohamed Abdel-Rahman is a lecturer at the Department of Agronomy, Faculty of Agriculture, University of Khartoum, Sudan. He received his BSc (hons) in Agronomy and MSc in Crop Production from the University of Khartoum in 1998 and 2003, respectively. Mr. Abdel-Rahman is currently in study leave to study for his PhD in Environmental Sciences. His PhD research project which is in conjunction between University of KwaZulu-Natal (UKZN) and South African Sugarcane Research Institute (SASRI) is focusing on the potential applications of remote sensing techniques in quantitative assessments of sugarcane growth, yield and factors of stress. Mr. Abdel-Rahman is a principal author of three peer reviewed journal papers and two conference proceedings.*

# INDICATORS OF SOIL HEALTH FOR USE IN THE SOUTH AFRICAN SUGAR INDUSTRY: A WORK IN PROGRESS

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**Abstract**

Sugarcane growers acknowledge the importance of the soil's contribution to optimal yields. However, a question frequently asked is: which of the parameters have to be taken into account to assess the condition of a soil? The objective of this paper is to compile a list of parameters that can be easily measured in the laboratory, and from which the condition of a soil can be gauged to suggest a system of interpretation. Soil samples were collected from 28 cane fields comprising three different land uses, i.e. cane fields burnt at harvest, cane fields that were trashed at harvest and undisturbed virgin areas. All soil samples were analysed for their chemical (pH, total N, P, K, Ca and Mg), physical (texture, dispersion and aggregate stability) and biological (soil carbon, microbial biomass, basal respiration and nematodes) properties. These are all routinely assayed in the SASRI laboratories. The clay contents for the burnt and trashed cane fields were similar, and they significantly differed to that found in the virgin sites. However, this variation in clay content was overshadowed by organic carbon, which had a greater effect on all soil properties. All indicators were then linked to threshold values so that laboratory results could be meaningfully interpreted. Although most threshold values were taken from the literature, those for biological soil properties were developed from work done in the South African sugar industry. A format was subsequently developed to present the soil health ratings with comments to clients. Most of the parameters considered were able to reflect differences between land uses, which could be explained by soil carbon content differences.

*Keywords:* biological, chemical, nematodes, paired sites, physical, sugarcane, soil health index

## *Biography: Rianto van Antwerpen*

*Dr Rianto van Antwerpen is a Research Scientist at the South African Sugarcane Research Institute (SASRI). He received training at the University of the Free State to qualify as a soil physicist. He worked at the University of the Free State, National Institute for Tobacco & Cotton and currently at SASRI. At all these institutes he worked with a long list of crops and soils and is currently applying his expertise to develop mechanisms to guard against the degradation of agricultural soils.*

SHORT COMMUNICATION

# BURNING, TRASHING AND FERTILISATION: EFFECTS ON CARBON POOL PROPORTIONS?

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**Abstract**

It is widely known that land management practices affect soil organic matter (SOM) levels, and thus the different carbon pool proportions. However, the degree to which each pool is affected is uncertain. Understanding the effect of burning, trashing and fertilisation on SOM levels and subsequently the labile and non-labile proportions of the sugar industry's soils is vital because the different carbon portions perform different functions. Labile carbon is accepted as the main contributor of available nutrients (from organic matter) for plant growth and microbial activity, whereas non-labile carbon is more important as a structural component of the soil. The objective of this work was to explore the effects of burning, trashing and fertilisation on total and labile carbon in soils. Soil samples were collected for four different treatments from the BT1 trial at Mount Edgecombe, South Africa: (i) burnt, no tops, no fertiliser ($Bt_0F_0$), (ii) burnt, no tops, with fertiliser ($Bt_0F$), (iii) trashed, no fertiliser ($TF_0$) and (iv) trashed, with fertiliser (TF). Each of the samples was analysed for labile and total carbon. Results showed that the addition of organic amendments (trash and/or tops, after harvest), in combination with the use of fertilisers, led to the greatest increase in SOM. The addition of organic amendments alone proved to be valuable for increasing the labile carbon content of the soil, while fertilisation tended to increase the labile carbon pool by encouraging a more extensive root system.

*Keywords:* sugarcane, carbon pools, labile carbon, microbial biomass, trashing, burning, fertiliser

## *Biography: Tarryn Eustice*

*Tarryn Eustice is an assistant research officer in soils at SASRI. She completed both degree and master's degree, in Soil Science, at the Stellenbosch University. This is the second year that she has worked for SASRI, but her first SASTA presentation.*

# GREEN MANURE FALLOW DURATION: DOES IT MATTER?

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**Abstract**

Green manures are commonly used in the South African sugarcane industry to improve soil health and break the pest and disease cycle. Fallow periods typically range from three to twelve months, and growers often enquire as to the optimal green manure fallow duration. To answer this question, three different green manure crops – black oats (*Avena strigosa*), sunn hemp (*Crotalaria juncea*) and a mixture of white oats (*Avena sativa*) and cowpeas (*Vigna unguiculata*) – were planted on the KwaZulu-Natal south coast. Halfway through the trial, the blacks oats and sunn hemp were replaced with Rhodes grass (*Chloris gayana*) and velvet beans (*Mucuna deeringiana*), respectively. Sugarcane was grown continuously on the control plots. Green manures were grown for three, six, twelve or 18 months. Planting dates were staggered so that all fallows ended simultaneously. There were few noticeable differences in soil chemistry when fallows were grown for three months. However, there were significant differences in soil chemistry (increases in pH, P, Ca and OM% and decreases in K) when green manures were grown for six months or longer. All three crop regimes significantly reduced numbers of the plant parasitic nematode, *Pratylenchus*, by 80-94%, when grown for 18 months. *Helicotylenchus*, a mitigating nematode species, as well as beneficial free-living nematodes, were increased by 150% by the sunn hemp/velvet bean (12 month) treatment. The effect on soil characteristics from the green manure fallow was still evident after 12 months of sugarcane growth. Based on the soil results, green manure fallow duration should be at least six months. A fallow of up to 18 months is beneficial, though growers need to take the economic consequences of an extended fallow into consideration.

*Keywords:* fallow duration, green manure, nematodes, soil chemistry, soil health, sugarcane

## *Biography: Ruth Rhodes*

*Ruth Rhodes has been a soil scientist at the South African Sugarcane Research Institute since 2004. She completed her BSc. Agric. at the University of Natal, Pietermaritzburg, and her MSc (Conservation Biology) at UCT in 2001. After an adventure teaching English to Taiwanese schoolchildren, Ruth worked as a laboratory analyst at UKZN before joining SASRI. Ruth's primary field of research is green manures and their many benefits; she has recently begun to work on crop nutrition. Ruth serves on the SASTA Council and Congress Organising Committee.*

# ASSESSMENT OF DAMAGE DUE TO *ELDANA SACCHARINA* WALKER (LEPIDOPTERA: PYRALIDAE) IN SUGARCANE

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**Abstract**

The sugarcane stalk borer *Eldana saccharina* is the most injurious pest in the Zimbabwe sugar industry. With its increasing establishment and population build-up in the fields it was found necessary to conduct investigations into assessing current damage patterns and possible host plant mechanisms to add on to current management practices. The study was therefore aimed at variation in damage among sugarcane varieties and investigating morphological and biochemical traits associated with damage at the Zimbabwe Sugar Association Experiment Station. Rind total phenolics, condensed tannins, cane juice quality, root primordia diameter, primordia counts and pith expression were investigated for their association to damage. Damage was found to be highest in varieties ZN1L, ZN4 and ZN2E while varieties CP72-2086 and N14 had the least damage. Percentage Tunnel length bored ranged between 1.9-19.6%, % Stalk length red 4.6-33.4% and % Internodes bored between 6.9-32.2%. Of all the stalk characteristics assessed only cane juice purity was found to have a significant negative association with all damage parameters. ERC % cane was found to be associated only with % Internodes bored ($r$=-0.571, $p$<0.01) and not with % Stalk length red and % Tunnel length bored. Morphological traits assessed in this study also did not have a significant association with damage.

*Keywords:* sugarcane, *Eldana saccharina*, host plant resistance, damage, biochemistry, morphology

## *Biography: Audrey Mabveni*

*Dr. Audrey Mabveni is a Senior Entomologist at the Zimbabwe Sugar Association Experiment Station. She received her training in Zimbabwe, USA and Kenya in the fields of Biological Sciences (Botany & Zoology), Nematology and Entomology. She worked in university teaching and research for 15 years before joining ZSAES in 2004. Dr. Mabveni has authored and co-authored 6 research publications in international journals, authored a module for distance learning (Entomology: Agriculture Management) and has supervised 6 MSc and 3 PhD graduates. She is an external examiner in Agricultural and Biological Sciences for 2 universities.*

# DETECTION OF SUGARCANE AFRICAN STALK BORER *ELDANA SACCHARINA* WALKER (LEPIDOPTERA: PYRALIDAE) USING HYPERSPECTRAL REMOTE SENSING (SPECTRORADIOMETRY)

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**Abstract**

The South African sugar industry is one of the world's leading sugarcane producers. The stalk borer *Eldana saccharina* has for many years been the most destructive pest in the South African sugar industry and is the most important factor limiting sugarcane productivity. The pest has been monitored using a traditional visual approach whereby a representative sample of stalks is taken from a field and split longitudinally to assess damage and count the number of *E. saccharina.* This approach is time-consuming, labour intensive and sometimes biased as, in some instances, only easily accessible areas are surveyed. To investigate a more economical but equally sensitive survey methodology, this paper aims at determining the potential use of hyperspectral remote sensing (spectroradiometry) for identifying sugarcane infested by *E. saccharina*. A hand-held ASD (Field Spec® 3) spectroradiometer was used to take leaf spectral measurements of sugarcane plants from a potted-plant trial taking place under shade house conditions. In this trial, nitrogen and silicon fertiliser applications as well as varieties used were known. In addition, watering regimes and artificial infestation of *E. saccharina* were carefully controlled. Results illustrated that severe *E. saccharina* infestation increased reflectance throughout the whole spectrum range (400-2500 nm). *E. saccharina* stalk damage was also linearly related to modified normalized difference vegetation index (mNDVI) using $R_{2025}$ and $R_{2200}$ ($R^2$=0.69). It was concluded that hyperspectral data has a potential for use in monitoring *E. saccharina* in sugarcane rapidly and non-destructively under controlled conditions. A follow-up study is recommended in field conditions and using airborne and/or spaceborne hyperspectral sensors.

*Keywords*: hyperspectral remote sensing, spectroradiometry, *E. saccharina*, nitrogen, silicon, sugarcane variety, leaf reflectance

## *Biography: Tholang Mokhele*

*Tholang Mokhele was born in 1982, in Berea, Lesotho. He completed his first degree in B.Sc. Agriculture at the National University of Lesotho (NUL) in May 2005. He worked as a teacher at Morapeli High School (Maseru, Lesotho) from July 2005 till Jan 2006, when he decided to leave the country to read for postgraduate studies at the University of KwaZulu-Natal, South Africa. He changed his career and studied B.Sc Honours in Environmental Science. He is a member of the Golden Key International Honour Society. He has just finished his MSc (Cum Laude). He is interested in GIS, climate change and global warming; hence he is currently working on a possible PhD based on these.*

# PROGRESS OF THE AREA-WIDE INTEGRATED PEST MANAGEMENT PLAN FOR *ELDANA SACCHARINA* WALKER (LEPIDOPTERA: PYRALIDAE) IN THE MIDLANDS NORTH REGION OF KWAZULU-NATAL

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**Abstract**

In 2005, 14 farms in the Midlands North Extension Region were reported with *Eldana saccharina* Walker (Lepidoptera: Pyralidae). Currently, a further 29 farms in this region are known to have this pest in their sugarcane. It is thus firmly entrenched in the Midlands North Region (MNR), and is spreading. This 207% increase in known localities over three years in this region is disturbing, and highlights the urgent need for growers to implement the IPM plan presented in 2005, on an area wide basis. This paper demonstrates the increased occurrence and spread of *E. saccharina* in ecozones 1-6, 8, 10 and 11 since 2005.

Using already known ecological data on *E. saccharina*, soil characteristics and climatic forecasts, it is evident that ecozone 7 is the next likely area to suffer an increase in *E. saccharina* numbers, should growers continue with the slow implementation of the Integrated Pest Management (IPM) plan and the Environmental Management System (EMS), which are aimed at minimising the threat of *E. saccharina* in their areas.

*Keywords: Eldana saccharina*, Integrated Pest Management, environmental management, climate change, soils, incursions

## *Biography: Tom Webster*

*Tom Webster is the Midlands North Pest, Disease and Variety Control Officer for the Noodsberg, Union Co-op and Small Scale Growers in Kwa Zulu-Natal. He took up this position in September 2000. His work is on the practical side where information is gathered from sugar cane surveys on pest, disease and sugar cane varieties for the region. He also works very closely with SASRI research teams on Integrated Pest Management(IPM) trials. This is now his 2nd co-authored paper on the progress made in his region in its area wide implementation of IPM.*

SHORT COMMUNICATION

# BIOLOGICAL AND HABITAT INTERVENTIONS FOR INTEGRATED PEST MANAGEMENT SYSTEMS

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**Abstract**

Conventional Integrated Pest Management (IPM) systems control pests through informed use of cultural and biological control and host plant resistance characteristics to minimise pesticide interventions. Successful IPM is based on a thorough knowledge of the target pest's life cycle, and its ecological and behavioural interactions with its environment and natural controlling factors. A number of new interventions can be added to the IPM arsenal. These include habitat management, which increases the efficacy of conservation, inoculative and augmentative biological control; use of plant and insect pathogens and symbionts on target pest populations to make potential host plants more or less suitable for colonisation; and the impact of these on adult fertility and offspring sex ratios makes their exploitation, in combination with interventions such as Sterile Insect Technology (SIT), a real and practical possibility.

Modern IPM is not only about insect/plant interactions, but about holistic agro-ecosytem interactions, in which knowledge about plants, pathogens, endophytes, symbionts and insects are combined to provide crop protection in an area-wide, environmentally friendly manner.

The full chapter on which this short communication is based is now published (Conlong and Rutherford, 2009).

*Keywords:* habitat management, Sterile Insect Technology, endophytes, *Wolbachia*, host plant resistance, cultural controls

## *Biography: Des Conlong*

*Dr Des Conlong is a senior researcher in the Crop Biology Resource Centre of SASRI. He holds Honorary Professor and senior lecturer posts in the Department of Conservation Ecology and Entomology at Stellenbosch University and School of Biological and Conservation Sciences at University of KwaZulu-Natal (UKZN) respectively, and has an NRF rating. His MSc encompasses large mammal /grassland ecology. His PhD is in host plant /host insect/parasitoid ecology. His primary research focus is based on Integrated Pest Management which covers conservation biological control, habitat management, plant and arthropod ecological and biological studies and sterile insect and insect rearing technology in an integrated way to minimise pest (both insect and plant) incursions. He is the author and co-author of 33 papers published in SASTA proceedings since 1984, and 24 peer reviewed international journal publications. In addition, he has also contributed chapters to four internationally reviewed books, and supervised eight MSc and three PhD graduates. He has been a member of SASTA since 1981.*

SHORT COMMUNICATION

# A CHECKLIST OF PHYTOPHAGOUS INSECTS OF SUGARCANE IN ETHIOPIAN ESTATES

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## Abstract

Surveys of the insect fauna in Ethiopian sugarcane estates were carried out between 2003 and 2007. Species belonging to the orders Coleoptera, Lepidoptera, Hemiptera, Isoptera and Orthoptera were recovered. In addition to this being the first survey of its kind in Ethiopian sugarcane, providing the first inventory of possible phytophagous insects, a number of new associations of insects species with sugarcane in Africa were discovered. In particular, *Busseola* sp. and *Chilo partellus* were found in high numbers.

This paper lists the phytophagous insects in Ethiopian sugarcane estates and discusses the attention each species received in the estates.

*Key words:* Ethiopia, phytophagous insects, sugarcane, check list

## *Biography: Yoseph Assefa*

*Dr Yoseph Assefa is a lecturer in Department of Crop Sciences and Production, Botswana College of Agriculture (BCA), Botswana. He received his PhD from University of KwaZulu-Natal in the field of Entomology and conducted his Post Doctorial research in Ecology and molecular biology of cereal stem borers in University of North-West South Africa for a year before joining University of Zululand, South Africa in April 2008 and then to BCA in September 2008. Dr Assefa has authored several research publications in national and international journals and has supervised/co-supervised 2 MSc graduates.*

# *IDENTIFICATION KEY TO SCARABAEID BEETLE LARVAE ATTACKING SUGARCANE IN SOUTH AFRICA USING DNA BARCODING AND INTEGRATIVE TAXONOMY*

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## Abstract

Scarabaeid pests in South Africa and especially KwaZulu-Natal are characterised by a very long larval life cycle and short pupal and adult periods. However, it has nearly always been the adults of the species that have been identified, with very little attention paid to larval identification. This is unfortunate, as it is mainly the larval stage that is found to be associated with crop damage. Inadequate keys for the taxonomy of larvae of these groups, as well as the lack of taxonomists working on these groups have been identified as constraints. Using mitochondrial DNA data variation in the base pair sequence of the mitochondrial cytochrome c oxidase sub unit I (*cox 1*) gene, sequences of *cox 1* from scarabaeid larvae collected from sugarcane fields were compared with sequences from scarabaeid adults of known species in order to identify the species attacking sugarcane. The major groupings delimited specimens belonging to the subfamilies Dynastinae, Melolonthinae and Rutelinae. Mitochondrial DNA (mtDNA) of larval specimens was linked with mtDNA of identified adult specimens through phylogenetic analysis. This allowed the identification of those larvae through morphological characteristics unique to certain species. Keys were produced during this study which will allow workers to identify larvae, in many cases to species. Obtaining species identifications for larvae will allow the application of species-specific control measures and also will facilitate analysis of interactions among species. These taxonomic advances are a start to the improvement of knowledge of the species composition of scarabaeid larvae in sugarcane fields, thus making management and biological control of these pests a greater possibility.

*Keywords:* DNA barcoding, identification key, integrative taxonomy, Scarabaeidae, sugarcane

## *Biography: Gudrun Dittrich-Schröder*

*Gudrun Dittrich-Schröder is currently in progress with her PhD at the Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria. Her study will focus on the Eulophid, Leptocybe invasa (Hymenoptera: Eulophidae). Gudrun studied at the University of KwaZulu-Natal, Pietermaritzburg. She has conducted research in collaboration with the South African Sugarcane Research Institute (SASRI), Mount Edgecombe, Durban on Scarabaeids as well as a potential biocontrol agent of the stalk borer, Eldana saccharina. Gudrun's masters focused on identifying Scarabaeid larvae problematic in sugarcane by using molecular techniques to link unidentified larvae to identified beetles. Subsequently a field key and electronic key, using Lucid 3.4 software, were developed to allow identification of larvae in sugarcane fields.*

# EFFECTS OF VARIETY, HARVEST AGE AND ELDANA ON COASTAL SUGARCANE PRODUCTION IN SOUTH AFRICA

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**Abstract**

Information on varietal adaptability to different harvest ages along the coastal belt of KwaZulu-Natal province, South Africa, is currently limiting. The objective of this study was to identify commercial and recently released varieties adapted to different cutting cycles along the coastal region of the South African sugar industry, and to evaluate the effects of *Eldana saccharina* Walker (Lepidoptera: Pyralidae) damage on productivity. The suitability of biplot analysis (a graphical representation of two-way data) for the interpretation of variety x cutting cycle data was also investigated. Two field trials (12 and 18-month harvest), consisting of the same set of 10 varieties were established alongside each other in randomised complete block designs with five replications each, and harvested for six (12-month) and three (18-month) seasons respectively. Tons cane/ha (TCANE), estimated recoverable crystal (ERC%), tons ERC/ha (TERC) and % internodes damaged (%ID) by *E. saccharina* were determined at each harvest. A restricted maximum likelihood (REML) analysis was conducted, and diagnostic biplots were produced using Genstat statistical software. Highly significant ($p<0.001$) variety x trial interactions were observed for TCANE and TERC. Lower TERC in the 18-month trial was associated with higher *E. saccharina* damage, while varieties N39 and N41 were identified as alternatives to current commercial varieties on the 12-month cycle. Significant variety x ratoon interactions revealed three distinct patterns of ratooning with N27, N39, and N41. Diagnostic biplots allowed quicker interpretation of variety x cutting cycle data and corresponded to variety rankings generated from REML analysis. Higher yields associated with aging cane along the coast can only be achieved through appropriate variety choice, and continued variety x cutting cycle evaluations using the biplot technique will be investigated further.

*Keywords:* sugarcane, biplot, cutting cycle, *Eldana saccharina*, ratooning, variety

## *Biography: Sanesh Ramburan*

*Sanesh Ramburan currently holds the position of Scientist (Varieties) at the South African Sugarcane Research Institute. His research focuses on variety evaluation by conducting multi-environment trials throughout the sugar industry, characterising varietal responses to environmental conditions and management practices. He was previously employed as a Researcher by the Agricultural Research Council – Small Grain Institute, where his work focused on cultivar evaluation and plant growth regulator responses. He is the author of several peer-reviewed scientific articles and popular publications, and holds an MSc.(Agric) from the University of Kwa-Zulu Natal.*

SHORT COMMUNICATION

# PEAK TILLER POPULATION: RESEARCH SHEDS NEW LIGHT ON THIS PHENOMENON

SMIT MA

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**Abstract**

Sugarcane stools typically produce more tillers than mature in both plant and ratoon crops. The maximum number of tillers (TPeak) can vary considerably and its significance and the underlying mechanisms are not well understood. The objective of this study was to investigate the effect of planting density, soil fertility and trash cover on TPeak and its relationship with fractional interception of photosynthetic active radiation (FIpar). FIpar is an important indicator of dry matter accumulation and is used in crop modelling.

Across trials, TPeak was not a function of thermal time. TPeak occurred sooner in treatments with higher tiller density per metre of row length and was closely associated with intra-row FIpar (FIintra). In unfertilised plots, tiller senescence was initiated at FIpar ratios as low as 0.6. Results indicate that FIpar by itself is not sufficient as a proxy for intercepted photosynthetic active radiation or of source becoming limited. Leaf chlorophyll content related to FI at the time of TPeak, and may explain the reason for the low FI max and inability of some treatments to attain higher TPeak or FI values. New knowledge gained from the reported results will enable improved management practices, and prediction of TPeak and dry matter accumulation in sugarcane.

*Keywords*: tiller population, radiation interception, soil fertility, trash cover, water stress

## *Biography: Michiel Smit*

*Dr Michiel Smit has been agronomist, programme leader and assistant director with the ARC Grain Crops Institute, Potchefstroom prior to his appointment at South African Sugarcane Research Institute in 2001. He did his undergraduate studies at the University of the Freestate and received a PhD in Crop physiology from Purdue University, USA in 1986. He acted as chairman of the South African Sugar Industry Agronomy Association for the period 2003-2006 and as President of the South African Society of Crop Production in 2006. Dr Smit has supervised/co-supervised 15 MSc and 1 PhD graduate studies.*

SHORT COMMUNICATION

# PHYTOMER LEVEL SOURCE-SINK MODEL OF BIOMASS PRODUCTION AND PARTITIONING IN SUGARCANE

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**Abstract**

A framework for above-ground biomass partitioning between competing sinks is proposed where partitioning depends on temperature, water status, the physiological age of the leaf and associated internode (phytomer), and on the structural demands imposed by the phenological development of leaves and tillers. This hypothesis was tested by comparing simulations from a model with observations from two glasshouse experiments. In these experiments, net photosynthesis, expansive growth, biomass production (at a plant level) and partitioning (at plant and internode levels) were measured for four genetically diverse sugarcane clones grown in two water and two temperature regimes. Although whole plant assimilation was simulated accurately for most treatments, the model did not provide for the observed clonal differences in response to low temperature. Whole plant partitioning response to water stress and temperature was simulated well when simulated assimilation was forced to measured values. Internode profiles of stalk fibre and sugar storage were adequately mimicked with functions that accounted for growth and development at internode level. A useful platform has been created for testing theories of genetic and environmental control of assimilate production and partitioning at whole plant and phytomer level.

*Keywords:* biomass, expansive growth, internode, model, sink, source, sugar, temperature, water

## *Biography: Abraham Singels*

*Dr. Abraham Singels is an research agronomist with the South African Sugarcane Research Institute and has honorary appointments at the University of Pretoria (extraordinary Professor) and the University of Kwazulu-Natal (Honorary Research Fellow). He obtained a Ph.D. in Agrometerology from the University of the Free State in 1991, where he also worked as researcher and lecturer for 10 years. His interests are crop response to climate, crop modelling and decision support systems for crop production.*

SHORT COMMUNICATION

# INTEGRATING CROP MODELLING AND GENOMICS TO ACCELERATE PLANT IMPROVEMENT: PRELIMINARY ASSESSMENT OF PROGRESS FROM A PILOT STUDY IN SUGARCANE

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**Abstract**

Crop yield is a complex trait governed by dynamic interactions between plant and environment. Integrating crop modelling and genomic technologies provides an opportunity to gain a better understanding of the underlying physiological mechanisms and genetic basis of these interactions and has the potential to enhance plant improvement. This communication reviews progress in an exploratory project to integrate genomics and crop modelling in sugarcane.

Stalk and leaf elongation rate per unit thermal time, fully expanded leaf area, and photochemical light use efficiency were measured in two experiments for 80 clones of a mapping population. These genetically determined traits were chosen because they are important in determining resource capture and yield formation, and are relatively easily measured.

The suitability of crop models for simulating simple trait effects on crop performance is assessed. The heritability of traits and their association with molecular markers are reported. The reliability of regression equations to predict trait values from marker data is assessed.

*Keywords:* molecular marker, stalk elongation, crop model, genomics, traits, light use efficiency

## *Biography: Abraham Singels*

*Dr. Abraham Singels is an research agronomist with the South African Sugarcane Research Institute and has honorary appointments at the University of Pretoria (extraordinary Professor) and the University of Kwazulu-Natal (Honorary Research Fellow). He obtained a Ph.D. in Agrometerology from the University of the Free State in 1991, where he also worked as researcher and lecturer for 10 years. His interests are crop response to climate, crop modelling and decision support systems for crop production.*

SHORT COMMUNICATION

# IRRIGATED SUGARCANE PRODUCTION FUNCTIONS

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**Abstract**

With the ongoing implementation of the 1998 National Water Act in South Africa, irrigation water requirements of sugarcane are coming under increasing scrutiny. To provide some perspective to the many questions being posed, irrigated sugarcane production functions are presented in this paper. The production functions are unique in that they show not only the response of sugarcane to various levels of irrigation water applied, but include the impacts of irrigation systems that are either well or poorly maintained as indicated by the irrigation distribution uniformity. It was shown that poor irrigation distribution uniformities cannot be corrected by simply increasing the amount of water applied. Thus, the typical practice of increasing irrigation water application amount to account for low irrigation uniformities in net to gross irrigation water requirement calculations, can lead to substantial wastage. The impacts of reduced irrigation water allocations on crop yields should not be generalised, even for a specific location. For the case studies reported, near maximum crop yields in Komatipoort required at least 1 150 mm of irrigation water on shallow, 0.6 m deep sandy clay loam soils compared with only 900 mm on 1.2 m deep sandy clay loam soils.

*Keywords:* irrigated sugarcane, crop yields, deficit irrigation, distribution uniformity

## *Biography: Neil Lecler*

*Neil Lecler is a Senior Research Engineer at the South African Sugarcane Research Institute and an Honorary Associate Professor at University of KwaZulu-Natal. His PhD was on the development and application of tools and methods to assess the performance of irrigation and water management systems. He has worked in the former Bophuthatswana, at the University of Natal (now University of KwaZulu-Natal) and for the Zimbabwe Sugar Association Experiment Station. He frequently serves on a number of Water Research Commission reference groups and review panels, is on the Committee of the KwaZulu-Natal branch of the South African Irrigation Institute, and is the SASA representative on the South African National Committee on Irrigation and Drainage. Much of his recent research effort has been aimed at supporting more effective water use at both field and catchment scales.*

SHORT COMMUNICATION

# A CONTINUOUS SOIL WATER POTENTIAL MEASUREMENT SYSTEM FOR IRRIGATION SCHEDULING ASSESSMENT

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**Abstract**

In this study, the application of a relatively inexpensive continuous soil water monitoring system to assess crop model predictions of under- or over-irrigation was investigated. Three Watermark soil water potential sensors and a soil temperature sensor were linked with a relatively inexpensive 'Hobo' data-logger capable of recording hourly measurements. These measurement systems were installed in four sugarcane fields with the Watermark sensors at three depths: 15, 30 and 60-80 cm, dependent on site conditions. In-field data were recorded from August 2007 to July 2008, a period covering the sugarcane growing season. Continuous monitoring of the soil water potential provided strong evidence in support of other studies that the fields were under-irrigated. At one site, the crop experienced water stress for as much as 50% of the critical summer growth period. Early in the season, when sugarcane water requirements are relatively low, soil water potential was less than 50 kPa, indicating adequate water for almost 100% of the early growth period. Monitoring systems such as the one described, can add value in providing information to inform irrigation management decisions and contribute to optimising the use of water for crop production to the benefit of individual farmers and the wider community.

*Keywords:* soil moisture monitoring, soil water potential, Watermark sensors, irrigation assessment, sugarcane

## *Biography: Ashiel Jumman*

*Ashiel Jumman qualified with a BSc. Agricultural Engineering Degree from the School of Bioresources Engineering and Environmental Hydrology at the University of KwaZulu Natal in 2005. He went on to work as an Agricultural Engineer for the Provincial Department of Agriculture for two years before registering as a full time MSc student with the University of KwaZulu Natal. As an MSc student funded by the South African Sugarcane Research Institute (SASRI), under the supervision of Dr. Neil Lecler (SASRI) and Dr. Aiden Senzanje (UKZN), Ashiel has co-authored a paper at the South African Sugarcane Technologists Association (SASTA) conference in July 2008 and presented a second paper at the SANCID symposium in November 2008.*

SHORT COMMUNICATION

# ECONOMIC ANALYSIS OF HARVESTING BURNT VERSUS GREEN CANE UNDER IRRIGATED CONDITIONS

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**Abstract**

The costs and benefits of having a green cane trash blanket (GCTB) under irrigated conditions are investigated in this paper. For the case studies reported, the direct cost savings in water, energy, herbicides and fertiliser, were offset by an average increase in harvesting and haulage costs of 22% under a GCTB system. Although per hectare partial margins for both systems were similar, a GCTB farming system could allow a relatively larger area of cane to be irrigated for a given amount of irrigation water and this should result in increased overall returns. For example, in Pongola it was shown that the same amount of water used to irrigate an area of burnt N14 could be used to irrigate a 33% larger area where a GCTB system was used. The opportunity cost of water in the above example was R3 544/ha converted to a GCTB system. For sectors of the industry which may face significant reductions in irrigation water allocations, the option to try and maintain production and supply of cane to Sugar Mills through conversion to a GCTB farming system should be considered. If a GCTB system is considered unfeasible due to harvesting constraints, early morning or 'cold' burns should be adopted. The larger amount of trash and tops which remain relative to a 'hot' burn should then be scattered to cover the soil surface and the fields watered as if they were fully trashed.

*Keywords:* green cane trash blanket, burnt sugarcane, irrigated sugarcane, economic analysis

## *Biography: Neil Lecler*

*Neil Lecler is a Senior Research Engineer at the South African Sugarcane Research Institute and an Honorary Associate Professor at University of KwaZulu-Natal. His PhD was on the development and application of tools and methods to assess the performance of irrigation and water management systems. He has worked in the former Bophuthatswana, at the University of Natal (now University of KwaZulu-Natal) and for the Zimbabwe Sugar Association Experiment Station. He frequently serves on a number of Water Research Commission reference groups and review panels, is on the Committee of the KwaZulu-Natal branch of the South African Irrigation Institute, and is the SASA representative on the South African National Committee on Irrigation and Drainage. Much of his recent research effort has been aimed at supporting more effective water use at both field and catchment scales.*

# NEMATODE ABUNDANCE AND DIVERSITY IN TWO SUGARCANE FIELDS AT SECTION 10, HIPPO VALLEY ESTATES

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**Abstract**

There has been a decline in sugarcane yields in fields 1051 and 1053 at Hippo Valley Estates section 10, from an average of 116 t/ha in 1999 to 84 t/ha in 2007. Several factors have contributed to this decline, among which may be plant parasitic nematodes. The aim of this study was to identify plant parasitic nematodes associated with sugarcane in fields 1051 and 1053. Samples of soil and sugarcane roots were collected from the two fields. Samples were collected from areas with stunted cane and areas that had healthy cane. Soils were collected from the cane root zone and from areas 0.75 metres away from the cane row. Nematodes were extracted from soil and root samples using the Baermann technique. Nematodes were identified to genus level and the number of nematodes per 100 grams of soil and one gram of root material were determined. Seventeen genera of ectoparasitic and endoparasitic plant nematodes were identified from soils and sugarcane roots. Most nematodes were identified in soils collected from sugarcane root zones. Soils collected from root zones of stunted cane had significantly more nematodes compared to soils from root zones of healthy cane. *Scutellonema* sp., *Pratylenchus* sp. and *Tylenchorhynchus* sp. were present in >90% of the soil samples collected from sugarcane root zones. *Scutellonema* sp. and *Criconemella* sp. were identified in >90% soil samples collected from 0.75 metres from the cane row. *Rotylenchulus* sp., *Pratylenchus* sp. and *Meloidogyne* sp. were collected from sugarcane roots. These results are discussed in relation to the potential of plant parasitic nematodes in reducing sugarcane yields.

*Keywords*: plant parasitic nematodes, sugarcane, abundance, diversity

## *Biography: Audrey Mutambara-Mabveni*

*Dr. Audrey Mabveni is a Senior Entomologist at the Zimbabwe Sugar Association Experiment Station. She received her training in Zimbabwe, USA and Kenya in the fields of Biological Sciences (Botany & Zoology), Nematology and Entomology. She worked in university teaching and research for 15 years before joining ZSAES in 2004. Dr. Mabveni has authored and co-authored 6 research publications in international journals, authored a module for distance learning (Entomology: Agriculture Management) and has supervised 6 MSc and 3 PhD graduates. She is an external examiner in Agricultural and Biological Sciences for 2 universities.*

SHORT COMMUNICATION

# ENTOMOPATHOGENIC NEMATODES IN SUGARCANE IN SOUTH AFRICA

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## Abstract

Entomopathogenic nematodes (EPNs) and their symbiotic bacteria have been the focus of research for many years due to the possibility of their use as biocontrol agents. In the South African sugarcane industry, their use against the main insect pest, the stalk borer *Eldana saccharina*, was documented in the 1980s. This study re-investigates the use of EPNs for their effect against *E. saccharina* and other pests of sugarcane, including thrips *(Fulmekiola serrata)* and white grubs (Coleoptera: Scarabaeidae). EPNs were isolated from soils under sugarcane cultivation from 10 locations in KwaZulu-Natal. These were subsequently cultured *in vivo* on *E. saccharina* larvae and then identified as being either *Heterorhabditis* or *Steinernema* using PCR-based molecular methods. Results showed of the 10 isolates, five were *Heterorhabditis* and five were *Steinernema* species. Two *Steinernema* isolates (EST3D and GING13G) were used to conduct pathogenicity tests and thereafter in pot and field trials. Results of the pathogenicity tests showed that 100% mortality was achieved with both isolates within 48 hours. The isolates were then used at a high rate (2000 IJs/$m^2$) and a low rate (1000 IJs/$m^2$) in a field trial to determine their efficacy against thrips. Results from the first sampling, three weeks after application, showed that isolate EST3D at the high rate resulted in significantly less thrips in sugarcane leaves. A pot trial was also conducted using white grubs identified as *Hypopholis* sp. Susceptibility of the white grub to the infective juveniles was seen when application involved the addition of an insecticide containing the active ingredient, imidacloprid.

*Keywords:* entomopathogenic nematodes, bio-control, sugarcane, pathogenicity

## *Biography: Uvendri Pillay*

Uvendri Pillay is an Assistant Research Officer in the Nematology department at the South African Sugarcane Research Institute. She holds a BSc Degree in Biological Sciences from the University of KwaZulu-Natal and has previously been involved in projects pertaining to parasitology and biocontrol.

SHORT COMMUNICATION

# DEPOSITION OF SILICON IN LEAVES OF SUGARCANE (*SACCHARUM* SPP. HYBRIDS) AND ITS EFFECT ON THE SEVERITY OF BROWN RUST CAUSED BY *PUCCINIA MELANOCEPHALA*

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Sugarcane is considered to be a silicon (Si) accumulator, and extensive research has been conducted on the role of Si nutrition in this crop. This study focused on the uptake and deposition of Si in the leaves of sugarcane plants and the associated effect on the severity of brown rust. Two trials were conducted, each consisting of varying treatments of potassium silicate ($K_2SiO_3$), applied weekly. For the disease severity trial, an additional treatment of Calmasil® was applied. Si uptake and deposition increased significantly with an increase in Si added. Using X-ray mapping, it was found that significantly more Si was deposited in the lower epidermis than in the upper epidermis and mesophyll. Disease severity was significantly reduced in plants treated with Si at 2000 mg/L. These results suggest that Si nutrition may play an important role in the management of brown rust.

*Keywords:* sugarcane, brown rust, silicon, Si, deposition, plant resistance

## *Biography: Prabashnie Ramouthar (nee Naidoo)*

*Prabashnie Naidoo is currently employed by the South African Sugarcane Research Institute as an Assistant Research Officer in Nematology while completing her MSc in Plant Pathology. She has covered a variety of topics during her postgraduate studies viz. the use of bacteriophages to control bacterial diseases in her honours year to a number of studies on sugarcane rust during the course of her Masters degree (epidemiology, effects of nutrition on rust, electron microscopy, molecular identification of resistance genes). She is very interested in the molecular approach to traditional Plant Pathology. This is her maiden SASTA presentation.*

SHORT COMMUNICATION

# APHID POPULATION DYNAMICS IN THE NORTHERN IRRIGATED REGIONS OF THE SOUTH AFRICAN SUGARCANE INDUSTRY AND ITS INFLUENCE ON THE SPREAD OF *SUGARCANE MOSAIC VIRUS* AND *SUGARCANE YELLOW LEAF VIRUS*

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**Abstract**

Aphid populations were monitored in plots of sugarcane planted at monthly intervals near Komatipoort and Pongola. The incidence of *Sugarcane mosaic virus* (SCMV) and *Sugarcane yellow leaf virus* (SCYLV) within the plots was also recorded. Aphids were trapped at both sites throughout the year. More aphids were trapped at Pongola where populations were highest from November through February, while populations peaked in February at Komatipoort. *Melanaphis sacchari*, a vector of SCYLV but not of SCMV, was the most common aphid species identified at Pongola. SCYLV infection was extensive at this site. *Hysteroneura* and *Rhopalosiphum* species were more common than *M. sacchari* at Komatipoort where the incidence of SCMV was higher than at Pongola. *H. setariae* and *R. maidis* are known to be efficient vectors of SCMV. These findings indicate that it is possible to limit but not prevent the spread of SCMV at Komatipoort by avoiding the planting of susceptible varieties between November and the end of January. Field data collected since 2000 show mosaic incidence to be highest in December/January planted plots. SCYLV incidence was high in plots planted from August to February in Pongola and increased substantially at Komatipoort after one harvest. Planting time would appear to be less effective in limiting the spread of this disease.

*Keywords:* aphids, *Sugarcane mosaic virus* (SCMV), *Sugarcane yellow leaf virus* (SCYLV), disease transmission

## *Biography: Sharon McFarlane*

*Sharon McFarlane is a Plant Pathologist at SASRI. She joined the research institute in 1989 after completing her BSc Honours in Microbiology at the University of Natal, Pietermaritzburg. She later received a Masters degree from the School of Life and Environmental Sciences, University of Natal, Durban. Her key focus is disease management but she is also involved in research on microbe-insect interactions.*