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### OPENING SESSION (Chair: Gavin Smith)

- **Public Private Partnerships in Science and Technology - The role of sugar industry**
  - Dr Phil Mjwara (Guest Speaker)
  - Page 8

- **Review of South African sugarcane production in the 2012/2013 season from an agricultural perspective**
  - Singels A, Schoeman J, Leslie GW, McFarlane SA, Sithole P and Miles N
  - Page 9

- **Eighty-eighth annual review of the milling season in southern Africa (2012-2013)**
  - Smith GT, Davis SB, Madho S and Achary M
  - Page 10

### PLENARY SESSION TWO (Chair: Kerry Redshaw)

- **Intercropping in sugarcane: a practice worth pursuing?**
  - Ramouthar PV, Rhodes R, Wetgreen T, Pillay U, Jones MR, van Antwerpen R and Berry SD
  - Page 11

- **Investigation into the high ash content of molasses at Nakambala, Zambia**
  - Munsamy SS
  - Page 12

- **Service and innovation: The SASRI R&D value chain**
  - Watt DA, Binedell ML and Maher GW
  - Page 13

- **A heuristic towards driving improvements in an agri-industrial sugarcane system**
  - Bezuidenhout CN, Bodhanya S, Hildbrand S and Lyne PWL
  - Page 14

- **Miller-grower fragmentation: A core challenge in South African sugarcane production and supply systems**
  - Hildbrand S, Bezuidenhout CN, Bodhanya S, Hurly KM and Grantham EO
  - Page 15

- The use of aerial drone data in sugarcane farming
  - Pons D and Pons J (demonstration poster)
  - Page 16

### PLENARY SESSION THREE – NIRS (Chair: Stuart Rutherford)

- **NIR - A technique that has come to stay**
  - Stephen Walford (guest speaker)
  - Page 17

- **Near infrared reflectance (NIR) spectroscopy as a high-throughput screening tool for pest and disease resistance in a sugarcane breeding programme**
  - Sabatier DR, Moon CM, Mhora TT, Rutherford RS and Laing MD
  - Page 18

- **Near infrared reflectance (NIR) spectroscopy - behind the scenes**
  - Moon CM, Mhora TT, Rutherford RS, Sabatier RD and Laing MD
  - Page 19

- **Infrared reflectance spectroscopy for the rapid measurement of agronomically important soil properties**
  - Mathadeen P, Miles N and Manson AD
  - Page 20

- The practical application of near infrared spectroscopy (NIRS) to predict quality of solid sugar
  - Nadasen T and Naicker K
  - Page 21

### Agriculture Session 1 - Crop Nutrition and Agronomy (Chair: Sanesh Ramburan)

- **Crop nutrition and soil textural effects on eldana damage in sugarcane**
  - Rhodes R, Miles N and Keeping MG
  - Page 22

- **Isidulis: pointers to yield potential on sandy soils?**
  - Miles N, Rhodes R, van Antwerpen R and Ramouthar PV
  - Page 23

- **Towards a more accurate prediction of nitrogen reserves in the soil for crop growth**
  - Weigel A and Miles N
  - Page 24

- **Prediction of phosphorus availability and fixation in soils of the Southern African sugar industry**
  - Miles N, Elephant D and Mathadeen P
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- **Effect of row spacing on seedcane yield and yield components in Western Kenya**
  - Omoro G, Auma E0 and Muasya RM
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- **Chemical ripener responses in irrigated sugarcane varieties at Pongola (South Africa)**
  - Mbatha TP and van Heerden PDR
  - Page 27

- **Resource use efficiency and drought sensitivity of sugarcane for bioenergy production compared to other crops: preliminary findings**
  - Olivier F, Singels A and Eksteen A
  - Page 28
Agriculture Session 2 - Water (Chair: Ashiel Jumman)

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Agriculture Session 3 - Technological Advancements (Chair: Ruth Rhodes)

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AGRIC POSTERS ON DISPLAY ALL CONGRESS and AUTHORS PRESENT AT THEIR POSTER ON WED 7 AUGUST from 16:30 - 17:30

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### SASTA Awards 1962-2012

#### SASTA Gold Medalists

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#### Talbot-Crosbie and Kynoch/Triomf Prizewinners 1962-2012

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**ANNUAL CECIL RENAUD AWARDS 1977-2012**
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South African Sugar Technologists’ Association
2013 Congress - Abstract Book
GUEST SPEAKER ADDRESS

PUBLIC PRIVATE PARTNERSHIPS IN SCIENCE AND TECHNOLOGY – THE ROLE OF SUGAR INDUSTRY

DR PHIL MJWARA

Biography: Dr Phil Mjwara
Director General: Department of Science and Technology

Dr Phil Mjwara has served as the Director General of the Department of Science and Technology (DST) since April 2006. In this capacity he is responsible for all policy development in the science and technology sector in South Africa. His responsibilities further include the management of South African science and technology official development assistance and the driving of the implementation of South Africa’s National Research and Development Strategy and the management of South Africa’s new DST 10 Year Innovation Plan.

Prior to his appointment at DST, Dr Mjwara was the Group Executive: Research and Development; Strategic Human Capital Development at the Council for Scientific and Industrial Research (CSIR). At the CSIR, he was responsible for assisting the CSIR in its efforts of strengthening its Science base including Human Capital Development. In 2001, Dr Mjwara joined the National Laser Centre (NLC) as its head, where he has been instrumental in growing the centre’s activities since its inception and in creating a network of centres in Africa, i.e. African Laser Centre (ALC).

He has also held positions at the then Department of Arts, Culture, Science and Technology; as Director of Technology; at the University of Pretoria as professor of S&T policy and at the Universities of the Witwatersrand, South Africa and Fort Hare as a physics lecturer. He has been involved in a discipline of Management of Technological Innovation as well as in processes for policy formulation. He has led a team that conducted the South African Technology Foresight project. He has published and presented numerous papers on physics, technology analysis and foresighting related topics.

Dr Mjwara has served on various advisory councils and review boards. He also serves on the Council of the University of Johannesburg. He is the co-chair of the Group on Earth Observation based in Geneva.
REVIEW OF SOUTH AFRICAN SUGARCANE PRODUCTION IN THE 2012/2013 SEASON FROM AN AGRICULTURAL PERSPECTIVE

SINGELS A¹, SCHOEMAN J², LESLIE GW¹, McFARLANE SA¹,
SITHOLE P¹ AND MILES N¹

¹South African Sugarcane Research Institute, P/Bag X02, Mount Edgecombe, 4300, South Africa
²South African Cane Growers’ Association, Flanders Drive, Mount Edgecombe, 4300, South Africa

abraham.singels@sugar.org.za

Abstract

The objective of this study was to analyse South African sugarcane production in the 2012/13 season and relate the key performance indicators of cane yield and cane quality to the main production factors. This could provide useful information for identifying research and management priorities for more efficient production of high quality sugarcane in South Africa.

The industry average cane yield was 65.5 t/ha, very similar to that achieved in 2011/12 and to the 5-year mean value. Cane yields were mostly driven by climate (erratic rainfall) and water availability, although the study suggests that yields could have been below par for Komati (irrigation inefficiencies on small-scale farms, high smut levels), Umfolozi, Felixton (high Eldana levels), and Amatikulu (high Eldana levels). Subsoil acidity has been identified as a major limiting factor in most regions, and requires urgent measures to mitigate its impacts on crop growth.

Generally, cane quality was better than the very poor levels of 2011/12, but was below the 5-year mean. The dry winter promoted good cane quality for the first half of the milling season; however, wet weather in the late season, combined with industrial strike action, caused a sharp drop in cane quality and limited the amount of cane that could be crushed in 2012.

Farm profitability of sugarcane production has declined from 2011/12 due to higher than inflation-based production cost increases. The expected increases in labour costs from 2013 onwards do not bode well for sugarcane farmers, and drastic measures will have to be taken to limit increases in production costs to remain viable and internationally competitive.

The review highlighted the potential benefits of accurate forecasts of future wet weather that could disrupt harvesting operations, as well as the need for more accurate estimates of area harvested.

Keywords: cane yield, cane quality, diseases, economics, modelling, sugarcane, pests, production

Biography: Abraham Singels

Dr. Abraham Singels is a Principal Agronomist at the South African Sugarcane Research Institute (joined in 1997), a fellow of the SA Society of Crop Production and holds honorary appointments at the Department of Plant Production at University of Pretoria and the School of Agriculture, Earth Environmental Sciences at the University of Kwazulu-Natal. He obtained a Ph.D. in Agrometerology from the University of the Orange Free State, where he also worked as researcher and lecturer for 15 years. His interests are crop response to climate, crop modelling and crop decision support systems including those for irrigation scheduling.
REFEREED PAPER

EIGHTY-EIGHTH ANNUAL REVIEW OF THE MILLING SEASON IN SOUTHERN AFRICA (2012-2013)

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Abstract

Performance, throughput and other relevant aspects of the sugar industries in southern Africa for the 2012/13 milling season are presented and discussed. Data from sugar mills in South Africa, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe are included. In South Africa, Umzimkulu Mill reopened after being closed for the entire 2011/12 crushing season, with the cane being diverted to Sezela Mill. The 2012/13 season in South Africa was better than the poor 2011/12 season in terms of tons cane harvested. Cane quality also improved from the previous season, with the exception of ash, which increased slightly. The Overall Time Efficiency improved, despite a higher Lost Time % Available, as a result of a marked decrease in no-cane stops. Recoveries improved from 2011/12, with the overall recovery moving off the lowest value recorded for more than ten years. Decreased losses to bagasse and molasses, as well as a constant Undetermined Loss, resulted in a higher Boiling House Recovery and Overall Recovery.

Regarding the Sugar Milling Research Institute NPC Affiliate member mills in neighbouring countries, recoveries were similar to 2011/12, while most also had improved time efficiencies.

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

Biography: Gavin Smith

Gavin Smith is Industry Support Manager at the Sugar Milling Research Institute in Durban. He received his Chemical Engineering degree from the University of Natal in Durban in 1983. His work history includes the nuclear energy field, before moving into the sugar industry in 1987. He worked for Tongaat-Hulett Sugar and Illovo Sugar, including the downstream alcohols plant where he managed both the distillery and pharmaceutical plants. After a brief stint in project management, still mainly involved in the sugar industry, he moved to the SMRI to help manage the research programme. He now heads the Industry Support Division where he is responsible for training, consulting and the factory performance figures of the SMRI’s Member and Affiliate Member mills.

Gavin has been a member of SASTA since 1990, has been on the SASTA Council for 5 years and President for the past 3 years.
INTERCROPPING IN SUGARCANE: A PRACTICE WORTH PURSUING?

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Abstract

The South African sugar industry recommends green manuring as a best management practice, but it can only be practised once every crop cycle (every 8-10 years). Intercropping was therefore investigated as a potential means of exploiting the benefits of green manuring over the entire sugarcane crop life. The objectives of this study were to determine the effects of intercropping on cane yield, and to investigate the possibility of reducing inorganic nitrogen (N) inputs in the presence of a leguminous intercrop. Four trials, with soybean, cowpea and/or lupin intercrops, were conducted at sites in Paddock, Nkwaleni and Pongola. In total, nine crops were harvested from four trials. Different rates (0, 33, 67 and 100%) of the recommended N were applied to the cane. In seven of the nine crops harvested (78%), no significant yield differences existed between cane-only controls and cane grown with intercrops. The crop response to N was generally poor, with significant yield differences between the 0% and 100% N cane-only controls observed in only 44% of the crops harvested. Analyses of the results show that in most cases where a response to nitrogen was seen, a significant reduction in yield was noted due to intercropping. Economic analysis of one trial showed that growing a sugarcane monocrop made more economic sense than intercropping. Practical and management considerations involved with intercropping must also be taken into account when intercropping.

Keywords: economics, inorganic nitrogen, intercrop, legume, management, yield

Biography: Ruth Rhodes

Ruth Rhodes received her BSc.Agric. at the University of Natal, Pietermaritzburg, and completed her MSc. in Conservation Biology at the University of Cape Town. She currently works at SASRI as a Soil Scientist, conducting research into green manures and crop nutrition.
INVESTIGATION INTO THE HIGH ASH CONTENT IN MOLASSES AT NAKAMBALA, ZAMBIA

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Abstract

The sucrose loss in molasses as a percentage of sucrose in cane ranges between 7-13% in the southern African sugar industry and is the highest of all the processing losses. It is well known in sugar technology that the mass of molasses is a function of the mass of non-sucrose in the cane juice and the sucrose content of the molasses is a function of the type of non-sucrose in the cane juice.

At Nakambala sugar factory in Zambia, about 30% of the molasses non-sucrose is made up of ash. The ash content of Nakambala molasses is on the high side compared to other factories in the southern African sugar industry. Detailed analyses of the molasses showed that potassium was the biggest contributor to the high ash content. Since potassium is not added in the sugar manufacturing process, the investigation turned to agricultural practices on the estate. Soil analyses showed that the soil was rich in potassium and this was confirmed by cane leaf analyses. Since potassium is an expensive component of fertiliser the reduction in potassium application will result in cost savings. Potassium in cane is also expressed as non-sucrose in cane and this affects the cane quality and the ERC% cane.

Keywords: ash in molasses, potassium in molasses, cane leaf analysis, soil analysis, effect of non-sucrose on molasses exhaustion, effect of ash on ERC

Biography: Stanley Munsamy

Stanley Munsamy was the Operations Director of Zambia Sugar Plc from April 2009 to January 2013 based at Nakambala in the Southern Province of the Republic of Zambia. Zambia Sugar is a subsidiary of the Illovo Group. The operations included 17 000 hectares of irrigated cane and a large sugar manufacturing plant. He held a number of senior positions in the Illovo Group before moving to Zambia. He studied sugar technology and sugar cane husbandry at M L Sultan Technikon now part of Durban University of Technology. He was past President of SASTA and a SASTA Council member for many years. He authored and co-authored a large number of SASTA papers. He is currently Group Head of Sugar Technology in the Illovo Group.
SERVICE AND INNOVATION: THE SASRI R&D VALUE CHAIN

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Abstract

As primary provider of agro-technical expertise to the South African sugar industry, the South African Sugarcane Research Institute (SASRI) delivers diverse research and development (R&D) outcomes to the industry, including: (a) pertinent and robust agricultural solutions, products and services; (b) novel and improved in-house technologies to enhance the scope and quality of service provision; and (c) innovations to support industry strategic initiatives, particularly those pertaining to sustainability. Consequently, SASRI maintains a differentiated project portfolio, of which relevance, balance and rigour are routinely monitored quality indicators. Over several years, SASRI has developed and refined processes to enhance the quality and scope of service delivery, central to which have been: (a) full alignment of the R&D programme with industry research, development and extension structures and requirements; (b) complete integration of internal R&D, knowledge management and extension functions; (c) embedded quality assurance and benchmarking mechanisms; (d) development of industry mandated R&D key performance areas and related performance indicators; and (e) establishment of research collaborations and formalisation of partnerships to enhance capacity and delivery in areas of strategic importance to the industry. These developments and refinements are located within the context of the institute’s vision of being the recognised global leader in innovative sugarcane research at the forefront of a thriving industry. The objective of this paper is two-fold, viz. (i) to review the advances that have been made towards optimising service delivery and innovation across the SASRI R&D value chain; and (ii) to discuss emerging challenges regarding the advancement of technology adoption and service delivery to meet a diversity of grower needs.

Keywords: research and development, knowledge management, extension, technology transfer and adoption, grower demographics

Biography: Derek Watt

Derek is a plant physiologist who, before assuming the position of SASRI Research Manager in 2011, served as Manager of the Variety Improvement Programme and Senior Scientist in biotechnology. His early career was as an academic, having held positions in education and botany at the University of Durban-Westville between 1992 and 1998.
A HEURISTIC TOWARDS DRIVING IMPROVEMENTS IN AN AGRI-INDUSTRIAL SUGARCANE SYSTEM

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Abstract

This short paper reports on a wide range of inter-disciplinary research findings after studying the integrated sugarcane production and processing systems at four mills. A heuristic was developed to detect problems and instigate change in a sugarcane supply chain. The heuristic requires an initial state of mind which draws strongly from complexity. This is followed by an inquiry. Theme networks, an analysis of veto powers and the Viable Systems Model (VSM) displayed promising strengths to surface issues during the inquiry. Thereafter, specific issues, such as stockpiling, harvesting, logistics, cane quality and grower-miller interaction, were identified and further investigated. Although attempts were made to address some of the issues, the researchers could not instigate change and some reasons for this shortcoming are given.

Keywords: supply chain, mill area, diagnostics, heuristic, Soft Systems Methodology

Biography: Carel Bezuidenhout

Carel Bezuidenhout is a systems analyst and fills a sugar industry funded associate professorship in the School of Engineering at the University of KwaZulu-Natal (South Africa). He holds a BSc in Computer Science and Statistics, a Masters degree in Engineering and a PhD in sugarcane production forecasting. His primary research interest is the sugarcane supply chain, which involves a continuum of harvesting, transport, milling and many other economic and soft issues.
MILLER-GROWER FRAGMENTATION:
A CORE CHALLENGE IN THE SOUTH AFRICAN SUGARCANE
PRODUCTION AND SUPPLY SYSTEMS

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Abstract

From a systems thinking perspective, this paper reviews the collaboration regime of the South African sugar industry. It is based on the outcome of seven case studies, the comprehensive analysis of two milling areas and the deep knowledge of experienced industry stakeholders. Because miller-grower fragmentation surfaced as a main challenge, the paper aims at providing a holistic understanding of this phenomenon. It outlines the impacts of the fragmentation and its causes, which comprise hard, soft and structural issues. However, in contrast to other studies, it places a particular focus on soft issues.

Keywords: sugarcane supply chain, systems methodologies, miller-grower fragmentation, soft issues, holistic approach

Biography: Sandra Hildbrand

Sandra Hildbrand holds a BSc in Agricultural Science (Animal Science) and an MSc in Agribusiness (Hohenheim University, Germany). She worked for one year on the topic of wastewater re-use in agriculture in Lesotho and South Africa for the BORDA NGO. She is currently finalizing her PhD at the Graduate School of Business and Leadership (UKZN), and as part of an interdisciplinary project has applied systems methodologies in milling areas to explore and address management challenges.
POSTER SUMMARY

USE OF AERIAL DRONE DATA IN SUGARCANE FARMING

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Abstract

Land-based data collection has recently been augmented by web-based satellite and high altitude satellite imagery available on Google Earth. However, zooming in to see details gives disappointing results, especially when high definition research information is required. Traditional aerial photography can be used to enhance the satellite imagery; however, this is expensive and may not supply the required data.

Recent technological advances have allowed civilian aerial drones to be mounted with a camera or data collection device and have used them to gather data in specific areas. The research has required specialised equipment and skills for building, maintaining and flying of the drones, as well as the manipulation and presentation of the data for farm use.

After a year of experimentation, the optimal flying photographic platform was developed and it was found that the best configuration was a tricopter fitted with computer controlled gyro, accelerometer, barometer and GPS sensors for stabilised flight, under the command of a skilled radio control pilot. The multiple cameras mounted on the drone record different types of images, depending on the application. The drone data is combined with Google Earth imagery and land-based images to form an effective management tool for sugarcane farmers.

There is a demand for low altitude data, and the proliferation of civilian aerial drones will make collection of the data widespread. This data is used to evaluate agronomic conditions in sugarcane fields.

Keywords: aerial photography, drone, quadcopter, tricopter, data

Biography: Dave Pons

Dave Pons was a commercial sugarcane farmer on the North coast harvesting 45 000 tons per annum. He also lectures agriculture at Mangosuthu University of Technology. He saw the need for an aerial tool to monitor farming operations and together with brother Jasper Pons have used aerial drones to gather data.
NIR – A TECHNIQUE THAT HAS COME TO STAY

STEPHEN WALFORD

Biography: Stephen Walford
Analytical Quality & Development Manager,
Sugar Milling Research Institute NPC, South Africa

Stephen manages the Analytical Quality & Development group at the Sugar Milling Research Institute (SMRI). He is the nominated representative for the SMRI ISO17025 quality system and responsible for the management and on-going development of the system, including the necessary research and development of new and alternate analysis techniques. It is in this role that he is responsible for the development of appropriate NIR methods for use in the mill laboratories. He is excited about the potential of NIR as a technique to help in both current applications and future research for the sustainable development of the local sugar industry. His presentation “NIR - A technique that has come to stay” will give a brief history and introduction to the technique, discuss the advantages and disadvantages, present examples that highlight the benefits of the technique and instrumentation used and conclude with a discussion on current and potential applications within the sugar industry. Stephen has a research interest in analytical techniques and instrumentation, is the chairman of the South African National Committee for ICUMSA and presented at both local and international conferences.
SHORT NON-REFEREED PAPER

NEAR-INFRARED REFLECTANCE (NIR) SPECTROSCOPY AS A HIGH-THROUGHPUT SCREENING TOOL FOR PEST AND DISEASE RESISTANCE IN A SUGARCANE BREEDING PROGRAMME

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Abstract

Pests and diseases cause major production and economic losses in sugarcane cropping systems. The most effective form of long-term protection is through the use of resistant varieties. However, phenotyping sugarcane genotypes for pest and disease resistance is difficult and costly. Near-infrared reflectance (NIR) spectroscopy was investigated for its potential to predict the constitutive components of resistance to pests and diseases in germplasm in the South African sugarcane breeding programme. Two hundred and twenty-two genotypes were scanned over the 1100-2300 nm wavelength range using a fiber-optic probe. Partial least square (PLS) regressions were applied to bud, internode and leaf spectra that were pretreated (second derivative) and scatter-corrected (SNV and de-trending). Calibration models resulting from the correlations between NIR measurements and existing ratings gave coefficients of determination for calibration ($R^2_c$, the closer to one the better) and standard errors of prediction by leverage correction (SEP, the lower the better) of 0.72 (SEP 1.19) for the African stalk borer (Eldana saccharina), 0.62 (SEP 1.50) for smut (Sporisorium scitamineum), 0.62 (SEP 1.07) for sugarcane thrips (Fulmekiola serrata) and 0.67 (SEP 1.02) for brown rust (Puccinia melanocephala) ratings respectively. Performance of the calibration models in prediction are encouraging and demonstrate the potential of NIR spectroscopy as a high-throughput screening method to evaluate sugarcane genotypes for resistance to pests and diseases. We believe that NIR spectroscopy can be used as an additional screening method, in the early selection stages of the breeding programme, which should increase the proportion of resistant genotypes carried forward to later selection stages.

Keywords: African stalk borer (Eldana saccharina), smut (Sporisorium scitamineum), brown rust (Puccinia melanocephala), sugarcane thrips (Fulmekiola serrata), constitutive resistance.

Biography: Damien Sabatier

Dr Sabatier completed his M.Sc. on plant protection and production at the University of Avignon, after which he studied in Paris at the Agronomy National Institute of Paris-Grignon. He then went to La Reunion Island and did his PhD on agronomy and modelling in le CIRAD where he spent 3 years at the research station of St Denis. During his PhD he developed some skills in near infrared reflectance (NIR) spectroscopy and build models to quickly predict chemical composition of sugarcane fibre in order to investigate the effect of agro-climatic factors on sugarcane biomass partitioning. Damien is now doing his first year of Post-Doc at SASRI under the supervision of Dr Stuart Rutherford. The aim of his current project is to use NIR spectroscopy as a screening tool for pests and diseases resistance in sugarcane genotypes.
Near-infrared reflectance spectroscopy (NIRS) can provide rapid, non-destructive and quantitative analyses of most organic constituents found in plant tissues. Near-infrared radiation (750-2500 nm) is absorbed mainly by C-H, N-H and O-H bonds that are the primary constituents of organic compounds. The chemical constituents of a particular plant tissue or biochemical compound determine the nature and number of bonds present, and consequently, the wavelengths and amount of light that is absorbed, as a unique spectral pattern or fingerprint. Consequently, NIRS generates complex spectra which can only be interpreted through the use of chemometric models. Spectral features are combined with reliable compositional or functional analyses of the material (‘wet chemistry’) in a predictive statistical model. This calibration model is then used to predict the composition of new or unknown samples that are part of the same population. Samples falling outside the population can be analysed by traditional means and iteratively included in an expanded calibration model. NIRS can be used to analyse specific elements (e.g. N as protein), well-defined compounds (e.g. starch), or more complex, poorly defined attributes (e.g. animal food intake or pest and disease resistance). In these cases, the NIR reflectance must be of an important but unidentified biochemical constituent of resistance, quantitatively correlated with resistance expression. Both constitutive and induced resistance can be screened, before or after induction of a resistance reaction, respectively. This poster illustrates the processes currently being applied in the development of rapid, non-destructive, on-site NIRS screening techniques for rating the resistance of sugarcane clones to pests and diseases. Upon implementation, these techniques will allow the screening of larger plant populations at earlier stages within the plant breeding selection programme, resulting in cost savings, productivity benefits and increased numbers of resistant clones progressing to later selection stages.

Keywords: NIRS screening, spectra, chemometric, calibration, sugarcane, pests, diseases, resistance

Biography: Cindy Moon

Cindy is in her second year of Masters at SASRI, for which her project title is “Rapid means of screening for resistance to pests in a sugarcane plant breeding selection programme”. The project involves screening of genotypes using Near infrared spectroscopy which is an accurate, rapid, and non-destructive technique. Prior to doing her Masters at SASRI, she studied at the University of KwaZulu-Natal majoring in a BSc (Honours) in Plant Breeding.
INFRARED REFLECTANCE SPECTROSCOPY FOR THE RAPID MEASUREMENT OF AGRONOMICALLY IMPORTANT SOIL PROPERTIES

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Abstract

Infrared spectroscopy is a non-destructive, rapid technique which is being used increasingly in the analysis of a range of soil chemical and physical properties. The investigation reported in this short paper made use of a diffuse reflectance spectrometer with a spectral range of 375-7500/cm (this includes the mid-infrared as well as part of the near-infrared range of wavelengths). Data for topsoil samples collected from 127 fields located throughout the South African sugar industry were used to develop calibrations for exchangeable Ca and Mg, clay, total cations, organic C, ammonium-oxalate extractable Al, Si (CaCl2), total N, pH (CaCl2), P sorption and nitric-acid extractable K. An independent sample set was used for validation purposes. Ammonium-oxalate Al (range error ratio (RER)=19.14) and exchangeable Mg (ratio to performance of inter-quartile range, RPIQ,=2.77, r=0.92) had notably outstanding practical utilities. Clay, organic carbon, exchangeable Ca and total cations had great potential to be used on a practical scale (RER>11; RPIQCV range: 4.13-2.65). Si (CaCl2) and pH (CaCl2) had moderate predictability (RER<9). Further work needs to be conducted for P sorption (RPIQCV=0.84), nitric-acid K (RER=3.59) and total N (RPIQP=0.50) as these calibrations had limited practical significance.

Keywords: diffuse reflectance, mid-infrared, near-infrared, PLS regression, soil analysis

Biography: Prilene Mathadeen

Prilene Mathadeen obtained her BSc. Applied Chemistry degree from the University of KwaZulu-Natal and she currently holds a BSc. (Honours) Formulation Science degree from the Nelson Mandela Metropolitan University. Prilene was employed in 2010 by the South African Sugarcane Research Institute (SASRI) as a research intern in analytical chemistry, working with Dr N. Miles and Dr R.S. Rutherford. In 2012, Prilene was promoted to the position of Soils Laboratory Technician at SASRI, whereby her work involved the development of infrared spectroscopic methods for rapid measurement of soil chemical and physical properties. Prilene is currently employed at the AECI – Nulandis as a formulation chemist.
PRACTICAL APPLICATION OF NEAR-INFRARED SPECTROSCOPY TO PREDICT QUALITY OF SOLID SUGAR

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Abstract

Near-infrared spectroscopy (NIRS) is a fast, efficient and easy method that has enabled Sezela mill to test every consignment of sugar prior to leaving the site during the 2012/13 season. This has ensured customer satisfaction, savings on costs of rejection, and improved supplier credibility, which was encouraging in a season with large variations in weather conditions, cane quality and customer demands.

Conventional analytical methods for pol, moisture, colour, starch and dextran are time consuming and laborious, and make it impractical to test every consignment of sugar. The use of the NIR Fourier Transform Bruker multi-purpose analyser (MPA) therefore becomes attractive as it can read quality parameters of solid sugar in less than one minute.

This paper discusses the practical application of the MPA instrument on very high pol (VHP) solid sugar and presents the comparative analytical data for both conventional and NIRS methods.

Keywords: NIRS, sugar, pol, moisture, colour, starch, dextran

Biography: Tony Nadasen

Tony is currently employed by Illovo Sugar SA as Production Manager. He has a total of 35 years experience in the sugar industry. He was initially trained as a Sugar Technologist by the SMRI and completed the Diploma in Sugar Technology. His first position was with Tongaat Sugar and then he joined Illovo Sugar. Tony has presented a number of SASTA papers and chaired a session at the 2012 SASTA congress. Tony qualified with a B Tech in Chemical Engineering and a Diploma in Sugar Technology.
CROP NUTRITION AND SOIL TEXTURAL EFFECTS ON ELDANA DAMAGE IN SUGARCANE

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Abstract

The stalk borer Eldana saccharina Walker (Lepidoptera: Pyralidae) (eldana) causes substantial economic losses in the South African sugar industry. Reliable information is required regarding possible roles of crop nutrition and soil properties on eldana damage levels. The objective of this study was to make use of field trial data to elucidate the effects of macronutrients and soil properties on eldana damage. Data from 16 harvested crops in ten N response trials – with N rates varying from zero to well in excess of crop requirements for optimum growth – revealed only three instances where eldana damage increased with increasing N application rate. In field trials (two sites) where Si was included as a treatment, eldana damage decreased with Si application in one out of the four crops. A survey carried out in the North Coast and Midlands South regions, with soils varying extensively in clay and organic matter contents, revealed that eldana damage increased markedly with decreasing clay and organic matter levels, as reflected by volume weight measurements ($R^2=0.76$, $n=23$). This relationship has not previously been reported. These findings indicate that: (1) crops growing on sandy, lower organic matter soils are more likely to suffer high levels of eldana damage than those with a lower volume weight; (2) the current practice of curtailing N application rates in an effort to reduce eldana damage inevitably results in yield reductions and appears unwarranted on soils with low (<1.25 mg/L) volume weights; and (3) Si and K application (on deficient soils) was highlighted as a means of limiting eldana damage, and research on these and other nutrients’ effects on eldana should continue to receive priority.

Keywords: Eldana saccharina, nitrogen, potassium, silicon, soil texture, volume weight

Biography: Ruth Rhodes

Ruth Rhodes received her BSc.Agric. at the University of Natal, Pietermaritzburg, and completed her MSc. in Conservation Biology at the University of Cape Town. She currently works at SASRI as a Soil Scientist, conducting research into green manures and crop nutrition.
ISIDULIS: POINTERS TO YIELD POTENTIAL ON SANDY SOILS?

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Abstract

The low productivity of sugarcane on sandy soils (typically <15% clay) in the coastal areas and midlands of KwaZulu-Natal has received much research attention over the years. A common and striking feature of the crop on these soils is the presence of localised patches of markedly superior growth on the remnants of termitaria. In local vernacular, these patches are termed ‘isidulis’. Uncertainty exists regarding the factors responsible for the improved growth on isidulis. This paper deals with an investigation in which crop growth and soil factors relating to isidulis and their immediate surrounds were studied. The isidulis were located on the North Coast and in the Midlands South regions. Mean stalk height of the cane on the isidulis was 73% greater than that of the surrounds. Eldana saccharina (stalk borer) damage was low in all fields, with no consistent differences observed between the isidulis and surrounds. High populations of crop-damaging nematodes were present in most fields; however, once again consistent differences observed between the isidulis and their surrounds were not apparent. In terms of soil properties, samples taken incrementally to depths of 80 cm revealed that clay and carbon were generally higher under the isidulis; however, striking differences were apparent in exchangeable calcium and acid saturation values, with the isidulis having far more favourable levels of these parameters. In a secondary study in which isidulis on a localised area of high pH sands were investigated, differences in populations of harmful nematodes appeared to be the major factor involved in the variable growth. It is suggested that these findings are of value in terms of the identification of management practices for optimising yields on sandy soils.

Keywords: termitaria, isidulis, Eldana saccharina, nematodes, soil properties

Biography: Neil Miles

Neil Miles is a senior scientist with the South African Sugarcane Research Institute. His particular interests are plant nutrition and soil health. Prior to becoming involved with sugarcane some 5 years ago, he worked for the provincial Department of Agriculture, where he managed the fertilizer advisory service and conducted research into the nutritional requirements of intensive pastures for dairy production systems.
TOWARDS A MORE ACCURATE PREDICTION OF NITROGEN RESERVES IN THE SOIL FOR CROP GROWTH

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Abstract

The accurate quantification of potentially mineralisable N reserves in soils is of great importance in terms of the estimation of crop N requirements. For the past 20 or so years, the Fertiliser Advisory Service (FAS) at the South African Sugarcane Research Institute has made use of the ‘N category’ approach in predicting N release in soils. Nitrogen categories, as used by the FAS, are based on soil total organic matter and clay contents. To further improve the accuracy of FAS N recommendations, the effects of variations in the composition and stability of soil organic matter on N availability are under investigation. In this study, N release from 114 topsoil samples largely representative of soils of the South African sugar industry was investigated using laboratory incubations and chemical tests, with a view to effecting an improvement on the N category approach currently in use. Nitrogen release following 28 and 112 day aerobic incubations did not closely concur with predicted N release using FAS soil N categories. The correlations for N release of various chemical tests (7-day anaerobically mineralisable N, hot water extraction and hot 2 M KCl extraction, 3-day CO2 flush) with the 28 and 112 day aerobic incubation data were stronger (r values ranged from 0.57 to 0.84) than the correlations with N category (r range = 0.18 to 0.24). This paper discusses the potential value of these tests for routine soil testing in a high throughput laboratory.

Keywords: N management, potential N mineralisation, N tests, N category, soil organic matter, incubation studies

Biography: Annett Weigel

Dr Annett Weigel is a German soil scientist. She completed her PhD 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 in soil fertility and its interaction with the nitrogen cycle. Since 2007 she has been working at SASRI with focus on Carbon and Nitrogen dynamics of soils and improvement of Nitrogen use efficiency.
SHORT NON-REFEREED PAPER

PREDICTION OF PHOSPHORUS AVAILABILITY AND FIXATION IN SOILS OF THE SOUTHERN AFRICAN SUGAR INDUSTRY

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Abstract

Variations in soil properties across southern African sugar industries present particular challenges in terms of managing and estimating phosphorus (P) supplies to the crop. The Fertiliser Advisory Service (FAS) has traditionally made use of the Truog test for the estimation of plant available P supplies in soils, while P immobilisation (fixation) is determined by measuring the amount of added P desorbed by the Bray II solution. Concerns regarding the reliability of these acidic tests on higher pH soils led to alternate tests being evaluated. Phosphorus extracted with anion resin membrane strips was found to be closely related ($r^2=0.96$) to Truog-extractable P in soils with pH (CaCl$_2$) ≤5.0. However, at pH values of >5.0, the two tests were poorly related ($r^2=0.38$). This finding points to the Truog extraction being unreliable on higher pH soils due probably to the solubilisation of plant-unavailable calcium phosphates. Several P immobilisation indices were related to P sorption isotherm slopes for soils varying widely in texture and chemical properties. Ammonium oxalate extractable Al was found to be the best predictor of isotherm slope ($r^2=0.96$), while the Bache and Williams P sorption index also performed well ($r^2=0.91$). The Bray II-based index was not well related to isotherm slope ($r^2=-0.63$). Encouragingly, infrared spectroscopy was found to provide useful predictions of oxalate Al ($r^2=0.91$) and the Bache and Williams index ($r^2=0.78$), suggesting a role for MIR in predicting P immobilisation in the routine analysis of grower samples.

Keywords: phosphorus soil tests, resin P, Truog P, phosphorus sorption, mid-infrared spectroscopy

Biography: Neil Miles

Neil Miles is a senior scientist with the South African Sugarcane Research Institute. His particular interests are plant nutrition and soil health. Prior to becoming involved with sugarcane some 5 years ago, he worked for the provincial Department of Agriculture, where he managed the fertilizer advisory service and conducted research into the nutritional requirements of intensive pastures for dairy production systems.
SHORT NON-REFEREED PAPER

EFFECT OF ROW SPACING ON SEEDCANE YIELD AND YIELD COMPONENTS IN WESTERN KENYA

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Abstract

Sugarcane planted at wide row spacing grows slowly in the early stages, and this is detrimental to both the soil and the crop because the delayed closure of the crop canopy in wide rows hinders efficient use of light, water and nutrients. Two experiments were conducted at Kibos and Nasewa during 2002/03, with the objective of determining the effect of row spacing on seedcane yield and yield components of two varieties. The experiments were laid out as 2x4 factorials in randomised complete block designs, replicated three times each. Treatments were two cane varieties (KEN82-247 and N14) and four row spacings (120, 60, 50 and 40 cm). Three-budded cane setts were planted in plots measuring 72 m². Each plot had a length of 10 m and width of 7.2 m. Data on yield and yield components at 12 months after planting were determined. Analysis of variance for yield, stalk weight (t ch), stalk population/ha and setts/ha showed significant differences (P<0.05) between the row spacings. There were no significant interaction effects between variety and site for any of the yield components. The 120 cm spacing gave significantly lower yields (58 t ch) than the other three spacings, which gave similar yields (103, 103 and 104 t ch for the 60, 40 and 50 cm spacings, respectively). The results from the study show that any row spacing between 40 and 60 cm nearly doubled yields and can therefore be a better option for sugarcane growers to adopt for seedcane production. The 50 cm row spacing cannot be managed with current machinery, and will require modifications to be made to existing equipment.

Keywords: sugarcane, seedcane, row spacing, variety, effect, yield

Biography: George Omoto

Dr George Omoto is a Research Scientist (Crop Physiologist) in the Crop Development Department at Kenya Sugar Research Foundation. He obtained his BSc Hons in Agriculture at the University of Nairobi, and then his MSc in Agronomy and his PhD in Crop and Ecophysiology at Moi University. He also has a Kenya Advanced Certificate of Education (KACE). Dr Omoto has published 10 papers and has attended numerous conferences and training courses. His current research focuses on the effects of varying seed rates on sugarcane yield of new sugarcane varieties, and on the relationship between seedcane age variation, subsequent plant establishment and yield of early maturing sugarcane varieties.
CHEMICAL RIPENER RESPONSES IN IRRIGATED SUGARCANE VARIETIES AT PONGOLA (SOUTH AFRICA)

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Abstract

Increases in stalk sucrose content through chemical ripening depend on the chemical used, the sugarcane variety, and the environmental conditions. The objective of this study was to quantify the effects of Ethephon (Eth), Fusilade Forte (FF) and the combination treatment (Eth+FF) on cane quality and recoverable value (RV) yield in different irrigated varieties (N36, N49 and N53) and pre-release irrigated variety (01F1920) at Pongola (South Africa). The trial was a complete randomised design with each variety x treatment combination replicated six times. Eth and FF were applied at standard spray-to-harvest intervals and at rates of 1.5 and 0.2 L/ha respectively. Cane quality, stalk heights and population numbers were determined on five occasions between spraying and harvesting. Cane and RV yields were determined at harvest. The various ripener treatments induced statistically significant increases in cane quality (RV%) in N36 and 01F1920 with near significant increases in N49 and N53. Increases in cane quality ranged from 0.3 to 5.3 RV% units. There were no significant reductions in cane yield in any of the variety x treatment combinations. RV yield was significantly increased in all the varieties except N53. Increases in RV yield ranged from 0.5 to 5.7 tRV/ha, with the largest responses induced by the FF and Eth+FF treatments. Results clearly demonstrated that the large increases in RV%, in the presence of only modest reductions in cane yield, would make the use of chemical ripeners in these varieties under Pongola growing conditions highly profitable.

Keywords: cane quality, cane yield, chemical ripeners, Ethephon, Fusilade Forte, recoverable value

Biography: Thobile Mbatha

Thobile is an assistant research officer at SASRI in the agronomy department. Thobile is working with Dr Riekert van Heerden on SASRI’s long-term chemical ripening programme. She is currently both involved in the modelling and long-term ripener projects. Thobile has a Master’s degree in Agriculture (Crop Science) from the University of KwaZulu-Natal.
RESOURCE USE EFFICIENCY AND DROUGHT SENSITIVITY OF SUGARCANE FOR BIOENERGY PRODUCTION COMPARED TO OTHER CROPS: PRELIMINARY FINDINGS

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Abstract

Sugarcane is a strong candidate crop for bioenergy production, with potential for cultivation in new marginal areas. However, more information is needed on the productivity, resource use and drought sensitivity of different types of sugarcane. This short paper provides values of biomass and theoretical first and second generation ethanol yield, water use and radiation capture achieved by two conventional sugarcane genotypes (N19 and N31), a high fibre sugarcane hybrid and an Erianthus clone in a trial in Komatipoort. Their performance under well-watered and dry conditions was compared with that of Napier grass, forage sorghum and sugar beet.

Keywords: bioenergy production, water use efficiency, drought sensitivity, crop water use, ethanol, radiation use efficiency

Biography: Francois Olivier

Francois Olivier has been an irrigation scientist at SASRI since 2000 and is based at the Mpumalanga Research Station near Komatipoort. He received his MSc degree from the University of Pretoria in 1997 and is currently registered for a PhD at the University of KwaZulu-Natal. He specialises in soil-plant-atmosphere relationships and has a keen interest in agronomic aspects of water management.
SHORT NON-REFEREED PAPER

WATER USE AND YIELD OF TWO CONTRASTING SUGARCANE GENOTYPES IN RESPONSE TO DROUGHT STRESS

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Abstract

High biomass sugarcane (energy-cane) cultivars may be good candidates for bio-energy production in marginal areas. However, a better understanding is required of how much water would be used during cultivation and of their tolerance to drought. The aim of this study was to compare the drought response in terms of water use and yield of an energy-cane genotype (Saccharum species hybrid, genotype 04G0073) to that of a commercially grown sugarcane cultivar (Saccharum species hybrid, cultivar N19). Crop transpiration rate for well-watered treatments related well to grass reference evapotranspiration. Under well-watered and mild stress conditions, 04G0073 transpired at a higher rate than N19, due to a higher LAI and g. As drought stress intensified, N19 reduced transpiration rates sooner through early stomatal closure and at higher soil water contents than 04G0073. Instantaneous WUE was not different between control treatments, however 04G0073 showed a 21% increase in WUE under drought stress conditions. At final harvest, the well-watered 04G0073 produced 17% more biomass and used 4% more water than N19. However, drought stress caused a yield reduction of 46% in 04G0073 compared with 14% in N19.

Keywords: energy cane, drought stress, biomass, water use efficiency, transpiration

Biography: Alana Eksteen

Alana Eksteen is currently the Crop Physiologist in Agronomy at SASRI. She obtained her PhD from UKZN in 2012, which was based on a collaborative project between SAPPI and UKZN. Her research focus areas are physiological responses of sugarcane to ripening, flowering, and drought stress.
GROWTH AND YIELD OF A SUGARCANE PLANT CROP UNDER WATER STRESS IMPOSED THROUGH DEFICIT DRIP IRRIGATION

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Abstract

Little is known about the way sugarcane yield is affected by water stress during different phases of crop development. This information is necessary to optimise the allocation of limited water for irrigation. A drip irrigated field experiment of cultivar N49 (a plant crop) was conducted in Komatipoort. Treatments included maintaining available soil water (ASW) between 30 and 60% of capacity during the tillering phase (T), stalk elongation phase (SE) and through both (T+SE), while the ASW was maintained above 60% of capacity in the well-watered control (WW). The WW and T treatments received 1142 and 985 mm of irrigation, respectively, and experienced few days with stress (ASW <50%), while the soil water potential (SWP) fluctuated between -5 and -40 kPa. The SE (809 mm) and T+SE (633 mm) treatments received much less irrigation and went through 62 and 86 days of stress, respectively, while SWP fluctuated between -10 and -90 kPa. Average cane yield at the final harvest (11 months) of the unstressed treatments was 124 t/ha. Water stress during the stalk elongation phase reduced cane yield by 6 t ha\(^{-1}\) and 11 t ha\(^{-1}\) in the SE and T+SE treatments, respectively. Results showed that the small reduction was due to resurgence in stalk elongation rates after a wetting event. The compensatory stalk growth allowed plants in the stressed treatments to maintain an average stalk growth rate similar to the WW treatment. The findings of this study indicate that reasonable economic yields (>90% of potential) are achievable provided the stress periods are short (<5 days) and mild (SWP >-80 kPa and ASW >30% of capacity). Further research is required to test the applicability of the results on a ratoon crop, on different cultivars and soils, and in areas with different climates.

Keywords: cane yield, stalk growth, deficit irrigation, stalk elongation rate, water stress, soil water potential

Biography: Ryan Rossler

Ryan is a Master’s student in the Plant and Environmental Research Centre (PERC) at SASRI, supervised by Dr Abraham Singles (SASRI) and co-supervised by Francois Olivier (SASRI) and Professor Martin Steyn (University of Pretoria). Ryan obtained his BSc and BSc Honours at Rhodes University. He joined SASRI in 2011 and is currently in his final year of Master’s registered at the University of Pretoria.
SIMULATED IMPACTS OF CLIMATE CHANGE ON WATER USE AND YIELD OF IRRIGATED SUGARCANE IN SOUTH AFRICA

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Abstract

Reliable predictions of climate change impacts on water use, irrigation requirements and yields of irrigated sugarcane are necessary to plan adaptation strategies. The objective of this study was to evaluate a methodology for this by using the DSSAT-Canegro sugarcane model to simulate growth and development of sugarcane crops under typical management conditions at Malelane, Pongola and La Mercy for current ('baseline', 1980-2010) and future (2070-2100) climate scenarios. Future climate datasets were generated from three Global Climate Models (GCMs) assuming atmospheric CO₂ concentration [CO₂] of 734 ppm. GCM choice was based on the range of uncertainty of projected future rainfall at La Mercy (-11, +3 and +14%). The study found that irrigated yields are expected to increase at all three sites (15% at La Mercy, 10% at Pongola and 7% at Malelane), due to (i) increased interception of radiation due to accelerated canopy development and (ii) the direct [CO₂] fertilisation effect on photosynthesis. Evapotranspiration increased by 6% due to increased canopy cover and evaporative demand, while irrigation requirements increased by approximately 12%. Irrigation water use efficiency (IWUE, the increase in yield per unit irrigation applied) decreased by 6%, 11% and 12% at La Mercy, Pongola and Malelane, respectively. These results suggest that, at all sites, (i) economic returns on investment in irrigation could decline because of reduced IWUE; and (ii) increased irrigation capacity will be needed to achieve the increased yield potential of future irrigated sugarcane. For future climate impact studies it is recommended that high-temperature sensitivity of model processes be investigated further, and alternative GCM downscaling methods, which allow perturbations to the distribution (as well as amount) of rainfall, be explored.

Keywords: climate change, model, cane yield, irrigation requirement, water use

Biography: Matthew Jones

Matthew Jones is a Systems Modeller at SASRI. His research interests include climate change impacts, yield decline, and gene-to-phenotype modelling in sugarcane.”
INTEGRATING WEATHER-BASED CROP MODELLING AND SOIL WATER MONITORING TECHNOLOGIES TO PROVIDE IMPROVED DECISION SUPPORT FOR SUGARCANE IRRIGATION MANAGEMENT

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Abstract

This communication briefly describes the integration of electronic soil water monitoring technology into the weather data based MyCanesim modelling system and its implementation on 13 sugarcane fields in Malelane, Komatipoort and Mtubatuba.

Near real-time soil water data from capacitance sensors were converted to available soil water content (ASWC), and irrigation data were inferred from field recorded soil water and rainfall data. These data were incorporated programmatically into the MyCanesim database and used in subsequent simulations of the soil water balance and crop growth. Daily values of ASWC, crop water status, canopy cover and yield are provided via the web in tabular and graphical form. This information was used to assess irrigation practices and identify potential agronomic limitations.

The system was demonstrated to commercial and small-scale farmers and extension officers during a series of workshops. It is believed that integration of the two technologies enhances the value of information used to support irrigation management.

Keywords: irrigation, crop model, soil water, weather data, cane yield

Biography: Aresti Paraskevopoulos

Aresti has a BSc Honours degree in applied maths and computer science, from UKZN. He is currently in his sixth year working as a scientific programmer at SASRI, where he supports research and services in yield forecasting and irrigation scheduling. He is currently studying a part-time Master’s degree in BioResources Sciences at UKZ, from which he is presenting this short paper.
SHORT NON-REFEREED PAPER

A SIMPLE DEVICE TO
IMPROVE FURROW IRRIGATION EFFICIENCIES

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Abstract

Many of the ‘textbook’ evaluation and modelling techniques used to optimise the performance of furrow irrigation systems are difficult to apply on a wide scale and are not well suited to routine application on-farms or estates. As a result, the performance of furrow irrigation systems in practice is often poor. Considering that large proportions of the sugarcane grown in southern Africa are irrigated using furrows, an uncomplicated and practical procedure to monitor and improve the performance of furrow irrigation systems would be valuable. In this paper, a simple, low cost device named a ‘Greller’ is described together with an example of how it can be used in practice to improve the performance of furrow irrigation systems. Personnel on farms and estates have been trained to use the Greller and its use has shown that the non-beneficial and detrimental components of the water balance are often excessive. The Greller is packaged with ‘User Guidelines’ which, when applied, can result in substantial reductions in water losses. Water savings have often been in excess of 20%. In a relatively few fields the use of the Greller has highlighted substantial under-irrigation which can also be corrected. The Greller is an appropriate and practical technology for many sugarcane farmers and estates in southern Africa, due to the fact that it is low-cost, effective and simple to use.

Keywords: furrow irrigation, efficiency, water balance, evaluation, performance, sugarcane

Biography: Neil Lecler

Neil Lecler is a Principal Agricultural Engineer at the Zimbabwe Sugar Association Experiment Station (ZSAES) and an Honorary Associate Professor at the University of KwaZulu-Natal, where he earned his PhD. He was born and grew up in Rhodesia and then Zimbabwe but has worked mainly in South Africa; at Agricor in the former Bophuthatswana, at the University of Natal (now University of KwaZulu-Natal) and at the South African Sugarcane Research Institute. He was also at the ZSAES between 1998 and 2002. Most of his professional life and research effort have been aimed at developing systems to support more effective water use at both field and catchment scales. He moved back to Zimbabwe in June 2010, seeing opportunities to turn research on controlled traffic farming and automated short furrow irrigation into practice, thereby revolutionizing the way sugarcane is farmed in Zimbabwe. Neil has registered a patent, supervised or co-supervised nine successful Master’s students and authored or co-authored more than fifty publications. He is a keen golfer and also enjoys the odd game of cricket, tennis and squash and a little bass and fly fishing.
SURFACE AND SUBSURFACE DRAINAGE FOR SUGAR CANE

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Abstract

GPS is a precision tool that has come to the fore of the agricultural arena fairly recently, but has very quickly proved valuable in making farming operations more efficient, productive and profitable. This has been made possible by adding a value to precise points in a field. Agriculturalists now have the ability to pinpoint problem areas within their fields, one of which is poor drainage. GPS has become a key tool in optimising drainage on a field scale, as well as a full farm scale. This presentation will highlight the key use areas for GPS in field and farm drainage management which has proved so successful in increasing sugarcane yield.

Keywords: sugarcane, global positioning system, GPS, drainage, yield

Biography: Chris van der Loo

Chris van der Loo is Trimble’s Market Manager for the Water Management segment of the Agriculture Division. He is based in Westminster, Colorado, USA, where his current focus is on providing high performance solutions for the diverse global agriculture markets struggling with irrigation and drainage challenges. Water Management is a key component of Precision Agriculture which focuses on minimizing field inputs and maximizing crop yields, while promoting land stewardship and resource protection.

Mr. van der Loo is a native New Zealander and is a qualified Land Surveyor. He has spent 12 years at Trimble in both the Land Survey and Agriculture divisions and has extensive experience applying GNSS and optical technologies to improve productivity and profitability for many industries across the globe in both emerging and high end markets.
DEVELOPMENT OF A DNA FINGERPRINTING DATABASE AND CULTIVAR IDENTIFICATION IN SUGARCANE USING A GENETIC ANALYSER

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Abstract

Molecular markers are available for germplasm characterisation and identification of cultivated plant varieties. Additionally, molecular markers are stable, in contrast to morphological characters which may be influenced by environmental factors contributing to continuous variation and high plasticity. Microsatellites, or simple sequence repeats (SSRs), have become the genetic marker of choice internationally for fingerprinting of sugarcane cultivars, as they identify co-dominantly inherited, multi-allelic loci. The profile analysis of multilocus DNA markers, also called DNA fingerprinting, is a potential source of informative marker bands, which allows reliable differentiation amongst cultivars, wild populations, species and even related genera. DNA fingerprinting of plants has become an invaluable tool in forensic, scientific and industrial laboratories all over the world. In the past, radioisotope ($^{33}$P dCTPs) labelling was used to visualise the amplified DNA fragments on auto-radiographs. In recent years, due to increasing costs and limited availability of isotopes, researchers have made use of alternative visualisation techniques. Modern technological advances in electronics and genomics have made genetic analysers popular for fragment analysis. Genetic analysers produce electropherograms by separating fragments generated using fluorescently labelled primers. Amplified allelic variation is identified using advanced software. At the South African Sugarcane Research Institute (SASRI), a technique was developed and standardised for fingerprinting using an ABI 3500 genetic analyser and SoftGenetics GeneMarker™ software. A fingerprinting database, consisting of 84 sugarcane genotypes, including all SASRI released varieties, was developed using four microsatellite primer pairs. This quick and accurate technique is used routinely for varietal identification.

Keywords: sugarcane, microsatellites, SSR, fingerprinting, cultivar identification, genetic analyser

Biography: Shailesh Joshi

Shailesh Vinay Joshi is a Scientist: Plant Breeding at SASRI, a position held for the last six years. His current research projects focus on improving the efficacy of the conventional breeding programme by identifying and using molecular markers associated with high cane yielding sugarcane varieties, which are resistant to pests and diseases. He holds a PhD in Genetics, Plant Breeding and Biotechnology from Punjab Agricultural University, India. He has presented his work at international and national conferences and workshops.
PREDICTING TRACTOR ENGINE LOADING IN TILLAGE OPERATIONS

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Abstract

Studies show that, cumulatively, grid electricity and diesel fuel account for between 50% and 70% of the total energy used in irrigated sugarcane production. With the rapidly increasing cost of energy and global concern over carbon emissions and taxes, modelling tools have been developed to estimate energy use in agricultural production systems. In order to create an ‘energy calculator tool specific to sugarcane production in South Africa, it is necessary to assess the accuracy of methods available to estimate in-field tractor performance and energy use. Electricity consumption in irrigation systems can be determined using hydraulic calculations. Estimating diesel use in tractor operations is, however, more subjective and is dependent on the method used to calculate engine loading. The purpose of this paper is to assess the accuracy of three methods of calculating engine loading by comparing estimated loading against measured values obtained during sub-soiling, ploughing and disking operations. Two methods, one by the Department of Agriculture Forestry and Fisheries (DAFF) and the other by Pretorius, were developed in South Africa, and the third method is based on standards published by the American Society for Agricultural and Biological Engineering (ASABE). For all three operations the ASABE method estimated loading most accurately with, on average, 2% underestimation compared to the actual measured values. A comparison of each method’s ability to define an operation suggests that the ASABE method takes into account more variables, and has greater flexibility in describing field conditions.

Keywords: energy, carbon emissions, diesel, tillage, engine load, draft, power

Biography: Darran Boote

Darran Boote is currently employed by the South African Sugarcane Research Institute (SASRI). He forms part of the agricultural engineering department in the systems design and optimisation research programme. Darran is a BSc Engineering (Ag) graduate from the University of KwaZulu-Natal (UKZN). He is currently completing a MSc Engineering through UKZN, the title of which is: “Energy Use and Carbon Footprint of Sugarcane Production”. For the two years spent at SASRI, he has focused on issues surrounding energy use, mechanisation and new farming systems. This is his first SASTA paper.
THE USE OF NETWORK ANALYSIS TECHNIQUES TO IDENTIFY OPPORTUNITIES FOR SYSTEM PERFORMANCE IMPROVEMENT IN THE KOMATI TRANSPORT SYSTEM

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Abstract

Identifying opportunities for system performance improvement is often a difficult task when analysing a Complex Adaptive System (CAS) such as the sugarcane supply network of a mill area. With regards to the sugar industry, transport is the thread that connects all the primary agents. Hence, it is where most system problems in the supply chain are bound to transpire. Analysing the transport segment is often important in unlocking opportunities to improve overall system efficiency. In this study, network analysis techniques in the form of correlation graphs were used to study Komati mill delivery data. The application of the graphs revealed interactions within the system which would otherwise have been overlooked or ignored. If implemented correctly, the application of correlation graphs may become a valuable tool to drive system improvements, and thus justifies further research.

Keywords: Complex Adaptive Systems, system performance, network analysis, correlation graphs, Poisson distribution

Biography: Carel Bezuidenhout

Carel Bezuidenhout is a systems analyst and fills a sugar industry funded associate professorship in the School of Engineering at the University of KwaZulu-Natal (South Africa). He holds a BSc in Computer Science and Statistics, a Masters degree in Engineering and a PhD in sugarcane production forecasting. His primary research interest is the sugarcane supply chain, which involves a continuum of harvesting, transport, milling and many other economic and soft issues.
UTILISING A BIOMASS-TO-ENERGY SOLUTION TO IMPROVE SMALL SCALE GROWER RETURNS IN THE NKomazi DISTRICT OF MPUMALANGA

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Abstract

The small scale grower sector in Mpumalanga is declining rapidly. Yields continue to fall, resulting in 34% of small scale growers being reliant on industry grants to generate a re- muneration surplus. As there is little return to management effort, growers are exiting the sector. This has a detrimental impact on rural livelihoods, and declining cane supply places additional pressure on a very capital intensive milling sector.

The sector faces these challenges despite South African sugarcane farmers being the custodians of one of the largest reservoirs of short cycle renewable biomass. An opportunity exists to arrest the decline in this critical rural development catalyst by developing markets for biomass.

This study succeeded in matching the existing reservoir of biomass in the Nkomazi District of Mpumalanga Province with appropriate thermochemical technology to create a new market for growers. Detailed feedstock studies indicate a sustainable source of biomass, while logistics studies optimise the efficiencies associated with biomass. The technological and market studies suggest that slow pyrolysis offers the simplest technology and that charcoal offers the most direct route to market.

The establishment of one pyrolysis plant in the Nkomazi District is likely to create 29 direct employment opportunities. By offering small scale growers a cash payment for their biomass collected infield, the proposed enterprise generates an internal rate of return which exceeds the estimated weighted average cost of capital.

This study indicates that the pyrolysis process makes it possible to improve grower revenue by creating a market for biomass. This market may also offer growers an opportunity to mitigate their monopsonistic position in the sugar and molasses markets by owning the value addition as well as the raw material.

Keywords: biomass, pyrolysis, employment, Nkomazi

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. Justin is currently enrolled in an Executive MBA at the Said Business School, University of Oxford where he is pursuing an interest in Social Entrepreneurship. Justin joined SASTA in 2007 and this is his sixth congress.
THE CHALLENGE OF MENTORING LANGELOOP PHASE II FROM ESTABLISHMENT TO SUSTAINABILITY

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Abstract

In 2002, the Langeloop Phase II (LLPII) irrigated sugarcane project was developed as part of the Nkomazi Irrigation Expansion Programme. In 2007/08, the project went out of production after the Local Pest, Disease and Variety Control Committee (LPD&VCC) found unacceptably high levels of smut disease in all fields, and an order was issued for the entire crop to be destroyed.

The 39 growers involved in the project were highly in debt to Land Bank and, to alleviate the situation, the South African Sugar Association (SASA) funded the development of a 30 ha seedcane nursery from the Grower Development Fund. Further grant funding was sourced from the Department of Agriculture, Rural Development and Land Administration (DARDLA) to revive the irrigation infrastructure. The Department of Rural Development and Land Reform (DRDLR) provided grant funding to recapitalise the project.

Land Bank restructured the LLPII debt from R24m to R6.8m, subject to the growers meeting a series of conditions. However, agreeing to conditions in order to access grant funding and secure ‘write downs’ in debt levels is a simple decision; changing business and farming practices to create a sustainable agribusiness is far more complicated. This was the challenge which faced LLPII mentors.

Ensuring that normal farm activities take place forms only 10% of the role of a mentor. The balance of the time is dedicated to a series of ‘soft’ issues such as changing the growers’ mindsets from small to large scale, mediating in conflicts of interest between elected executive members and between the executive and management, and introducing governance structures. Constructing a sustainable agribusiness out of the ashes of 39 failed entrepreneurial ventures requires tight financial discipline, as well as significant training and capacity building.

The change from small to large scale production involves significantly more than just a change in scale. It requires stakeholder support, professional business advice, patience, training and, most importantly, an understanding of social dynamics. This is where success or failure is determined. The LLPII project has grown from a fallow farm in 2010 into a burgeoning agribusiness in 2012, with 116 ha under cane. Many lessons have been learned along the way.

Keywords: sugarcane, small scale grower, SSG, irrigation project, mentorship, governance

Biography: Emmanuel Mashego

Emmanuel E Mashego works for CANEGROWERS as the Grower Support Officer (GSO) in Mpumalanga Province based in the Malelane Mill. Emmanuel completed a four year degree in BSC Agric Economics Management at University of Zululand (UNIZULU Ongoye). He graduated in 2010 with a 1st class qualification. Mr. Mashego started working for Department of Agriculture Rural Development and Land Reform in June 2010 until he joined CANEGROWERS in August 2011. He is supporting growers with technical & business advice, co-operative formation, and access to finance, monitoring of budgets and facilitating meetings and assessing SSG training needs.
POSTER SUMMARY

EFFECTIVE TECHNOLOGY TRANSFER FOR SMALL-SCALE SUGARCANE GROWERS THROUGH RADIO BROADCASTING

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Abstract

The South African Sugarcane Research Institute (SASRI) is continuously finding innovative ways of ensuring that its wealth of knowledge and technology is accessible to the industry. Small-scale growers (SSGs) remain a unique and challenging sector within the sugar industry with regards to getting information across in a manner that is suitable and relevant. Language barriers, low levels of literacy among SSGs and capacity of extension staff are some of the greatest challenges. Although the Extension Venture Agreement (EVA) partnership between SASRI and the Department of Agriculture and Environmental Affairs (DAEA) has assisted in increasing the capacity of field staff, providing extension service to approximately 20 000 small-scale sugarcane growers in KwaZulu-Natal, the wide geographical areas and displacement of SSGs in rural areas has made it difficult to maintain regular face-to-face contact with growers.

With 89% of the rural community in South Africa having access to radio, this medium has proved to be a cheap, unique and effective method of transferring information and providing advice to SSGs in KZN, thus helping to overcome the language and physical barriers. Since 2003, SASRI, in conjunction with the DAEA, has presented various agricultural topics relating to sugarcane production annually across 10 community radio stations, as well as SABC radio Ukhozi FM. Topics are presented in Zulu by trained EVA extension staff. Awareness created through the broadcasts has resulted in an increase of post-show callers of 38 in 2011 to 73 in 2012 across all radio stations, and an influx of phone calls to extension staff from growers. SASRI will continue this involvement with a focus on monitoring and evaluating the effectiveness and impact of radio as a technology transfer medium, with the objective of improving the quality and method of delivery so that it continues to draw a wider audience.

Keywords: radio broadcast, extension, technology transfer, small scale growers

Biography: Bongekile Bhengu

Bongekile obtained her B. Sc in Agriculture at the University of KwaZulu-Natal. She joined SASRI in 2008 as an Extension Specialist servicing small-scale growers (SSGs) in the irrigated Mpumalanga region. She currently holds the position of Extension Technology Resource Specialist at SASRI and is based in Mount Edgecombe. Her role includes developing appropriate technology resources required for enhancing extension delivery. She is also responsible for overseeing the SASRI SSG extension programme development and implementation.
WETLAND MANAGEMENT FOR PEST REGULATORY ECOSYSTEM SERVICES

COCKBURN JJ1,2, KOOPMAN V3, CONLONG DE4,5, VAN DEN BERG J1 AND WEBSTER, TM2

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Abstract

Pest regulation is recognised as an important ecosystem service in agricultural environments, and wetlands have been shown to provide such pest regulatory services on sugarcane farms. Although sugarcane farmers are encouraged to manage wetlands on their farms, the high cost of wetland rehabilitation and management, including the clearing of invasive alien plants (IAPs), means that many landowners do not practise good wetland management. A more focused approach to management of wetlands on sugarcane farms, in which the emphasis is placed on the benefits of pest regulation which wetlands can provide, is presented here. Push-pull, a form of habitat management, is proposed for the management of Eldana saccharina on sugarcane farms within an integrated pest management (IPM) framework. Wetlands provide habitats for the growth of ‘pull’ plants which are alternate habitats for E. saccharina and its natural enemies, and can thus contribute to reducing pest pressure in the sugarcane crop. By completing wetland health assessments on four model farms, a tool was developed to assist farmers in better managing wetlands on their farms, thus maximising the pest regulatory ecosystem services which can provide. The ‘Wetland Action Plan for Push-Pull’ is presented, along with generalised recommendations and information for farmers on how to increase natural habitat for E. saccharina and its natural enemies on their farms.

Keywords: decision support system, ecosystem services, Eldana saccharina, habitat management, push-pull, wetland management

Biography: Jessica Cockburn

From 2011 to 2013 Jessica Cockburn completed her MSc (Zoology) through SASRI, working with Des Conlong. She was registered at North-West University where she was supervised by Professor Johnnie van den Berg. The aim of her MSc project was to implement push-pull for the control of Eldana saccharina in the Midlands North area of KwaZulu-Natal. The work she is presenting at SASTA 2013 forms part of that project. Jessica completed her BSc (Honours) in Entomology at Rhodes University in 2007. Jessica enjoys working at the interface of science and society to address environmental and agricultural questions. She is currently working on environmental research and management projects in collaboration with UKZN, Working on Fire and eThekwini Municipality’s Environmental Planning and Climate Protection Department.
POSTER SUMMARY

SMALL-SCALE SUGARCANE FARMERS’ KNOWLEDGE OF SUGARCANE INSECT PESTS

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Abstract

Understanding farmers’ knowledge and perceptions of pests is an important precursor to successful implementation of knowledge-intensive pest management approaches such as integrated pest management (IPM). A study was therefore conducted with small-scale sugarcane growers in the Midlands North region to explore farmers’ knowledge and perceptions of insect pests of sugarcane, pest management activities, and the isiZulu names of insects found in sugarcane. Mixed methods social research was used and included focus group discussions, quantitative survey interviews and participatory group activities. Additional questions on food crop pests and weed management were used to compare farmers’ knowledge on various aspects of crop protection. Although most major sugarcane pests were mentioned in group discussions (stem borers, white grubs, grasshoppers, termites), the farmers’ ability to name key sugarcane pests in individual interviews was poor. The average knowledge score for naming insect pests out of a maximum of 2 was 0.7, compared to 1.6 for weeds. Furthermore, food crop pests were mentioned a total of 40 times in focus group discussions, compared with only 12 times for sugarcane pests, and farmers did not perceive the latter insect pests as a major production constraint. Focus group discussions indicated that farmers did not know about beneficial insects such as predators and parasitoids, and their understanding of insect life cycles was rudimentary. Such knowledge gaps in basic insect ecology and biology need to be addressed through appropriate extension activities if IPM is to be implemented successfully.

Keywords: beneficial insects, farmers’ knowledge and perceptions, integrated pest management, IPM, isiZulu insect names, small-scale growers, sugarcane pests

Biography - Jessica Cockburn

From 2011 to 2013 Jessica Cockburn completed her MSc (Zoology) through SASRI, working with Des Conlong. She was registered at North-West University where she was supervised by Professor Johnnie van den Berg. The aim of her MSc project was to implement push-pull for the control of Eldana saccharina in the Midlands North area of KwaZulu-Natal. The work she is presenting at SASTA 2013 forms part of that project. Jessica completed her BSc (Honours) in Entomology at Rhodes University in 2007. Jessica enjoys working at the interface of science and society to address environmental and agricultural questions. She is currently working on environmental research and management projects in collaboration with UKZN, Working on Fire and eThekwini Municipality’s Environmental Planning and Climate Protection Department.
POSTER SUMMARY

EFFECT OF KNOWN PUSH-PULL PLANTS ON THE BEHAVIOUR OF ELDANA SACCHARINA MOTHS AND LARVAE

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Abstract

In South Africa, Eldana saccharina Walker (Lepidoptera: Pyralidae) has been an important sugarcane pest for more than 40 years. SASRI advocates an Integrated Pest Management plan to limit the damage caused by this insect in sugarcane fields, which includes the ‘push-pull’ strategy. This method is based on using indigenous plants to attract (pull) or repel (push) a pest from a crop and is already successfully applied in Kenyan maize fields. The present laboratory study focused on the influence of the odours of three known host plants (the pull-plant Cyperus papyrus, and two sugarcane varieties) and three selected push-plants (Melinis minutiflora, Desmodium intortum and D. uncinatum) on the behaviour of E. saccharina moths and larvae. In a four-way olfactometer, volatiles from the three push-plants significantly repelled moths. However, none of the odours from the three push-plants significantly affected the exploratory behaviour of larvae. Similarly, the larvae did not show a preference between the odours of the three host plants. It was concluded that the first larval stage of E. saccharina does not seem to use olfaction to select its host plant. Nevertheless, these results suggest a broader choice of companion plants to combine with sugarcane in order to naturally reduce invasion by E. saccharina moths.

Keywords: chemical ecology, sugarcane, plant volatiles, push-pull, olfactometer

Biography: Diane Dentinger

Diane is doing her last year of studies in an agronomy engineering school; aiming to get her degree in October 2013.

Biography: Stuart Rutherford

Dr Stuart Rutherford is a senior scientist and programme manager at the South African Sugarcane Research Institute. He holds a Ph.D. in Plant Physiology/Biochemistry from the University of KZN and an MBA from the University of Wales. He is an Honorary Lecturer at the University of KZN and has supervised/co-supervised 8 MSc and 2 PhD students in subjects as diverse as mutation breeding, the genomics of rust resistance, and the use of near infra-red spectroscopy to predict pest and disease resistance in sugarcane. His main role at SASRI is to initiate and conduct research into plant interactions with pathogens and insects with a view to developing novel control measures.
GERMINATION OF SOUTH AFRICAN SUGARCANE VARIETIES AFTER HOT WATER TREATMENT

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Abstract

Ratoon stunting disease (RSD) caused by the bacterium Leifsonia xyli subsp xyli, is currently the most prevalent and important bacterial disease in the South African sugar industry. Hot water treatment (HWT) of seedcane at 50°C for two hours forms part of an integrated management strategy for the disease, but can have a negative effect on germination percentage and rate. For this reason, all released varieties are tested under controlled glasshouse conditions to determine the effect of HWT on germination.

Three-budded setts of 32 commercial and five unreleased varieties were HWT before being planted into seedling trays. Untreated setts of the same varieties were planted next to the HWT setts to serve as controls. Two reference varieties were included in each experiment: (i) NCo376, which generally germinates well (73%) after HWT, and (ii) N12, which tends to germinate poorly (60%). The date of germination was recorded for each bud to determine germination rates, and the final percentage germination was recorded after 22 days. Varieties N12, N42 (59%), N47 (56%) and N50 (40%) did not germinate well after HWT, whereas varieties N24, N31, N32, N51, N52, 98B0460 and 99F3575 showed an increase in the percentage and rate of germination after HWT. The germination performance of the other varieties after HWT was similar to the controls. The information from this research will be of value to managers of seedcane schemes and farm nurseries when determining the quantity of seedcane required to establish new seed beds.

Keywords: sugarcane, seedcane, germination, ratoon stunting disease (RSD), hot water treatment, HWT, setts

Biography: Aimee Koch

Aimee Koch is currently an Assistant Research Officer in the Pathology Department at the South African Sugarcane Research Institute (SASRI). She was awarded her MSc (cum laude) from the School of Biological and Conservation Sciences (UKZN) in 2010. Her MSc focussed on obtaining herbicide tolerant sugarcane through mutagenesis. In 2010 she was employed by SASRI on a permanent basis in the Pathology Department, where she undertakes projects which involve Brown, African and Orange rust. She is also involved in the registration of new fungicides and is trained in the use of the HPLC.
PROPORTION OF ELITE FAMILIES FOR CANE YIELD AMONG SASRI BREEDING POPULATIONS

LICHAKANE M AND ZHOU M

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Abstract

Family selection in sugarcane has been shown to produce higher genetic gains for traits controlled by multiple genes such as cane yield when compared with mass selection. During family selection for cane yield, whole families of seedlings are either selected or rejected based on their family mean. Elite sugarcane families consist of a higher proportion of progenies that produce high cane yield. The objective of this study was to determine the proportion of elite families among South African Sugarcane Research Institute (SASRI) breeding populations. Data were collected from the Midlands humic and sandy soils, coastal short cycle high potential (CSC) and irrigated breeding populations in 2012. Yield components (stalk numbers, height and diameter) were measured from a sample of 20 single stools in each of the three replications per family and used to calculate cane yield. Data were analysed for family effects using SAS mixed models and elite families were defined as those that produced significantly (P<0.10) more cane yield than the population mean. There were highly significant differences (P<0.0001) for family effects for cane yield for all breeding populations, indicating potential for family selection. The humic soils produced a significantly (P<0.05) higher proportion of elite families than the sandy soils, CSC and irrigated areas, whereas the irrigated population produced a significantly (P<0.05) higher proportion of elite families than the sandy soils population. Populations on the humic soils had the greatest potential to increase gains for cane yield using family selection, and the parents will be used in other programmes.

Keywords: family selection, yield components, seedling stage, genetic gains

Biography: Moipei Lichakane

Miss Moipei Lichakane is a Plant Breeder at the South African Sugarcane Research Institute. Before joining SASRI in 2011 she worked as a Researcher in maize for the Agricultural Research Council and Monsanto. She graduated from the University of Free State with MSc Agric (Plant Breeding).
POSTER SUMMARY

A NEW SPECIES OF RUST INFECTING SUGARCANE IN SOUTH AFRICA AND SWAZILAND

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Abstract

This poster describes a new species of rust, referred to as African rust, which has been found on a number of popular South African sugarcane varieties, including N25, N31, N41, N46, N49, N53 and more recently N12. This new rust species was first observed on sugarcane in Swaziland, and later found infecting sugarcane in Pongola and Umfolozi. It has since been observed in most cane growing areas in South Africa. Its symptoms appear as dark brown lesions on the leaf, with bright orange spores developing in pustules on the upper and lower leaf surfaces. General internal transcribed spacer (ITS) sequences confirmed that the unknown isolate belongs to the Puccinia genus. Although closely related to Puccinia sparganioides (ash rust) and P. physalidis (infecting Physalis species of the Solanaceae), no identical matches were obtained through sequencing of the 28S nuclear large subunit (rLSU) gene region, and subsequent comparative analysis against the NCBI database. Preliminary phylogenetic analyses show that this rust is closely related to taxa within a group of rusts genetically distinct from Puccinia melanocephala and Puccinia kuehni, the pathogens that cause brown and orange rust, respectively. These results suggest that African rust forms its own distinct clade with other ‘grass-infecting’ rusts which have dicotyledonous alternative hosts. Further phylogenetic analysis will be carried out to finalise the results from the 28S rLSU gene region and include additional rust taxa should more reference sequences become available on the NCBI database. This work will allow the preliminary phylogenetic placement of African rust within a broader context of the Pucciniales taxon, which may assist in determining its point of origin and ultimately assist in the management of this disease.

Keywords: African rust, brown rust, Puccinia melanocephala, orange rust, Puccinia kuehni, gene sequencing, phylogenetics

Biography: Lauren Martin

Lauren Martin is a Microbiologist at SASRI. She joined the research institute in 2006 as a Masters student and in 2008 she was employed in her current position as Assistant research officer in Pathology. She is involved in a broad range of projects and activities ranging from investigations into African rust, molecular phylogenetics of rust, biosecurity efforts involving molecular identification of potential insect pests, and investigating an alternative method for RSD detection.
POSTER SUMMARY

SOUR ROT: STUDIES ON THE PATHOGEN

PHAEOCYSTROMA SACCHARI AND THE DISEASE IT CAUSES

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Abstract

Sour rot, which is caused by the fungal pathogen Phaeocystostroma sacchari, was first reported in sugarcane in South Africa in 1998 and has become an increasingly common and important disease in the industry, particularly in the KwaZulu-Natal Midlands. In this study, isolation and culturing conditions for P. sacchari were optimised and screening methods for varietal resistance were developed. Varieties N31 and N39 were found to be the most susceptible of the five varieties tested. Sour rot surveys in 2010 and 2011 confirmed that the disease is favoured by extended dry periods and is less prevalent when rainfall is adequate in spring and early summer. Trials investigating the effect of nutrition on sour rot incidence and severity were inconclusive. However, the trials did indicate that the application of chicken litter might increase the risk of infection when cane becomes stressed.

Keywords: sour rot, Phaeocystostroma sacchari, sugarcane diseases, disease screening, pathogen isolation, disease survey

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 an MSc 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.
POSTER SUMMARY

EVALUATION OF SACCHARUM OFFICINARUM POPULATION FOR YIELD, QUALITY AND ELDANA DAMAGE

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Abstract

A Saccharum officinarum population is one of seven germplasm populations maintained by the South African Sugarcane Research Institute (SASRI) for breeding new sugarcane varieties. The S. officinarum genome is a valuable source of high sucrose content genes, although it may also be a source of undesirable genes. Hence, effective utilisation of this germplasm for breeding purposes necessitates that each genotype within the population be evaluated for both strengths and weaknesses. The objectives of this study were (i) to determine yield, quality, morphological traits and damage caused by the African stalk borer Eldana saccharina (eldana) among 37 S. officinarum genotypes, (ii) to determine diversity within the population and (iii) to identify potential genotypes combining desirable traits for use in sugarcane breeding. Yield components (stalk numbers, stalk height, stalk diameter) for each genotype were measured and used to estimate cane yield using an established empirical equation. Six stalks per genotype were randomly sampled to determine sucrose and fibre content. Twenty stalks per genotype were randomly cut and split longitudinally to evaluate eldana damage. There were highly significant (P<0.001) genotype differences for stalk height, stalk diameter, leaf length, leaf width and brix. Genotypes could be categorised into low, medium and high values for cane yield and eldana damage. Genotypes BTSEL, IK76-95, IM76-248 and NG77-61 showed high cane yields, and genotypes BTSEL, IJ76-419, IJ76-424, IJ76-429, IK76-33, IK76-35, IM76-248, NG77-94, SAWHY and TOLEDO had low eldana damage. Genotypes BTSEL, IJ76-419, IJ76-429 and IM76-248 produced high cane yields and low eldana damage and are therefore potential parents for introgression.

Keywords: germplasm evaluation, sugarcane breeding, Eldana saccharina

Biography: Alfred Mokwele

Mr Alfred Mpenyo Mokwele is a Plant Breeding Intern at the South African Sugarcane Research Institute. Before joining SASRI in 2012, he worked as a Pasture Scientist Intern at Limpopo Department of Agriculture (Head Office) for twelve months, where he was involved in giving advice on Veld pasture management and providing technical support to agricultural technicians and farmers on veld management. Alfred was educated at Chechema Secondary School and graduated from University of Limpopo (Turfloop campus) with a BSc Agriculture (Pasture Science). He joined SASRI in 2012 and is conducting germplasm evaluation of Saccharum officinarum and assists plant breeders with crossing and selection programmes.
EVALUATING THE ACCURACY OF CANESIM YIELD FORECASTS DERIVED FROM SEASONAL RAINFALL AND ENSO FORECASTS

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Abstract

Forecasting sugarcane yields is important for planning crop harvesting, milling and marketing of the sugar. The Canesim model is used to forecast sugarcane yields on a monthly basis for 14 mill areas in the South African sugar industry, using historical and likely future daily weather data. Future weather data are derived either from categorical seasonal rainfall forecasts (RAIN method) or from the forecast state of the El Niño Southern Oscillation phenomenon (ENSO method). The yield forecast consists of the central value (mean of several simulation runs) and forecast uncertainty (standard error of several simulation runs representing the uncertainty associated with weather forecasts), both expressed as percentages of the simulated yield of the preceding season. The objective of this study was to evaluate the accuracy of Canesim yield forecasts when using the RAIN and ENSO methods for generating expected future weather data for the 2010/11, 2011/12 and the 2012/13 milling seasons, by comparing yield forecasts to actual yields. The two methods produced very similar yield forecasts, with similar forecast errors (average absolute difference between forecast and actual yield, see Figure 1). The ENSO method resulted in slightly more accurate forecasts than the RAIN method in nine and 10 out of the 14 mill areas in 2010/11 and 2011/12, respectively. In 2012/13, the RAIN method was slightly more accurate in eight mill areas. There was no consistent forecast bias with either of the methods. The similarity between the forecasts from these two methods is reassuring. Although only yield forecasts from the RAIN method are reported to the industry, both methods will be continued for benchmarking purposes.

Keywords: Canesim, yield forecast, ENSO, rainfall

Biography: Phil Sithole

Phil is an Agrometeorologist with the South African Sugarcane Research Institute (SASRI). He completed his MSc in Agrometeorology with the University of Zimbabwe in 2005 and worked briefly with the Zimbabwe Sugar Association before joining SASRI in 2007. One of his key duties at SASRI is to estimate and relate sugarcane yields at zone, mill or industry level as influenced by climatic factors over the growth cycle. This is his third SASTA presentation.
POSTER SUMMARY

DEVELOPMENT OF A NEW DETECTION METHOD FOR THE DIAGNOSIS OF SUGARCANE YELLOW LEAF VIRUS IN SUGARCANE

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Abstract

Sugarcane yellow leaf virus (SCYLV) is the causal agent of yellow leaf disease in sugarcane. SCYLV has been reported to cause significant yield losses in sugarcane worldwide. Common symptoms of SCYLV infection include the yellowing of the leaf midrib, reduced sucrose and biomass, short terminal internodes and reduced growth. Visible symptoms are not always presented, and therefore sensitive diagnostic tests are needed for the detection of the virus. Reverse Transcriptase Polymerase chain reaction (RT-PCR) as well as tissue blot immunoassay (TBIA) are currently used for SCYLV detection in the South African Sugarcane Research Institute (SASRI) quarantine glasshouse and in research projects. Rapid and reliable methods which will reduce time, costs and labour are important for routine diagnosis. In this project, a new diagnostic tool, namely quantitative real-time polymerase chain reaction (real-time qPCR) was introduced and optimised for use in the quarantine facility. Specific qPCR primers were designed from published sequences of conserved fragments from different strains of SCYLV. The primers amplified a 165bp fragment and were effective for the detection of SCYLV infected sugarcane leaves. Future work will include the detection and quantification of viruses such as Sugarcane mosaic virus and Maize streak virus.

Keywords: Sugarcane yellow leaf virus, SCYLV, quarantine, tissue blot immunoassay, TBIA, RT-PCR, qRT-PCR

Biography: Tania van Antwerpen

Tania van Antwerpen is a plant pathologist and has been working at SASRI for 23 years. She obtained her Master’s degree (cum laude) in Plant biotechnology from the University of Stellenbosch in 1999. She is currently in charge of sugarcane quarantine in South Africa and is also doing research on molecular diagnostic tests for plant pathogens, new diseases and also some soil microbiology. Tania has presented 9 papers at SASTA and was a co-author in 10 other SASTA papers.
POSTER SUMMARY

WATER FOOTPRINT:
ASSESSING WATER RISK AND OPPORTUNITIES FOR BUSINESS

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Abstract

Water is fast becoming the next major global issue. It is an essential natural resource and is crucial to the economy. Most industry operations rely directly on water, some more than others. With water scarcity becoming increasingly prevalent, companies are being faced more frequently with physical shortages or declining quality of available water. This results in disruptions to continuity and volumes of production, consequently reduced revenues, and has the potential to cause reliability and reputational concerns. Even where such risks may not be obvious for direct operations, the supply chain may well hold substantial concerns, especially for businesses that rely on resources from agriculture or the extractives industry.

In many parts of Africa, water demand is expected to exceed reliable supply within the next five to ten years, with little possibility of supply augmentation within that time frame. As the demand and competition for scarce water resources grows, it is imperative for companies to better understand their water consumption and impacts (needs for water and the ways in which they use, dispose of and operate their water facilities). In addition, there is a growing demand from shareholders and investors that companies assess and disclose their business or product ‘water footprint’. Businesses are therefore participating in numerous initiatives to help evaluate and effectively address water risks. The concept of the water footprint has gained significant traction over the past decade in both the private and public sectors, and is being explored as a strategic tool to identify, manage and mitigate water risks. Not only do water footprints quantify direct water use, but they illustrate the impact of water consumption on water quality and ultimately water resources. In addition, water footprints can provide an understanding of water dependencies and vulnerabilities throughout the supply chain of a product. This poster highlights the relevance of water footprints to industry, including the potential for turning risks into opportunities that proactively respond to the challenge of global fresh water scarcity.

Keywords: water scarcity, water footprint, water risks, industry, reputational concerns, shareholders and investors

Biography: Timony Siebert

Timony Siebert is an Environmental Consultant at Talbot Engineering, a business division of Talbot & Talbot (Pty) Ltd. She is currently involved in researching, copy writing, sustainable development and strategy consulting, and has a specific focus in water resource management. Timony comes with considerable working experience in related sustainability fields and has a deep interest in sustainable development issues. She has a MPhil in Marine Ecology from the University of Cape Town.
REFEREEED PAPER

YIELD LOSS DUE TO SUGAR CANE YELLOW LEAF VIRUS AND ITS PREVALENCE IN THE SOUTH AFRICAN SUGAR INDUSTRY

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Abstract

Sugarcane yellow leaf virus (SCYLV) was first detected in the South African (SA) sugar industry in 1997 and was found mainly in the northern irrigated areas. Information on yield loss due to the disease in the SA industry is limited. The objective of this study was to quantify the yield effects of SCYLV on five commonly-grown sugarcane varieties in SA. Surveys were also conducted to determine its prevalence. Healthy and infected plots of varieties NC0376, N12, N31, N33 and N39 were planted in a replicated field trial at Mount Edgecombe in September 2009. A similar trial with variety N32 was planted in September 2004 using tissue culture plants. The trials were harvested annually and taken through to the second ratoon. At each harvest, cane yield, Recoverable Value (RV) yield and cane quality were determined. Variety NC0376 was severely affected by SCYLV in this trial, consistently showing losses in cane yield of 35-43% over the trial period. Conversely, yield losses in N31 were limited, while yield increases were observed in N33 and N32. Although increases in RV % and Estimated Recoverable Crystal were recorded in some infected varieties, in most cases these were not statistically significant. A similar trend for cane and RV yield was noted. A significant increase in juice colour was noted in infected NC0376. Surveys indicate that SCYLV is now more prevalent in the southern and inland parts of the industry than in 2003 particularly so in the Maidstone and Gledhow areas. The virus was detected in a range of commonly-grown varieties, including the varieties planted in the yield loss trial. This study indicated that the reaction of varieties to SCYLV infection is variable, with losses likely in varieties such as NC0376, N12 and N39 when infected, and that the virus is spreading within all mill areas.

Keywords: sugarcane yellow leaf virus, SCYLV, sugarcane diseases, yield loss

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 an MSc 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.
RAPID DIAGNOSIS OF RATOON STUNTING DISEASE BY LOOP-MEDIATED ISOThERMAL AMPLIFICATION

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Abstract

Ratoon stunting disease (RSD), caused by the bacterial pathogen Leifsonia xyli subsp. xyli, is one of the most important diseases of sugarcane worldwide. Yield losses have frequently been estimated at 5-10% and may exceed to 60% due to moisture stress or varietal susceptibility. L. xyli subsp. xyli produces no reliable or characteristic external symptoms. Disease detection is normally done by diagnostic assays, including immunofluorescence microscopy, serology (EB-EIA) and DNA-based detection by PCR. All these methods are time-consuming and require sophisticated laboratory equipment. A recently developed assay called Loop-mediated isothermal amplification (LAMP) has proven to be rapid, sensitive and specific, and does not require expensive laboratory tools. This study reports the development of a LAMP assay for diagnosis of RSD. A total of six LAMP primer sets were designed, targeting the L. xyli subsp. xyli genome. The primers were tested with L. xyli subsp. xyli genomic DNA, crude xylem sap and bacterial cell cultures in broth. One set of primers was found to be specific to L. xyli subsp. xyli DNA. Different concentrations of reaction components and incubation times were tested. The LAMP reaction was optimised at 65°C for 60 minutes in a water bath. The primers worked well with crude xylem sap thus eliminating the need to isolate DNA. The LAMP primer set proved to be highly specific to L. xyli subsp. xyli when tested against other bacterial pathogens of sugarcane. The assay could detect up to 3 pg/µl of genomic DNA per reaction. Preliminary results indicate that the LAMP assay is as sensitive as the ELISA but much quicker. The RSD LAMP method shows potential to be applicable in field laboratories, without expensive equipment, thus decreasing the overall cost and the diagnosis time.

Keywords: Leifsonia xyli subsp. xyli, sugarcane, ratoon stunting disease, diagnostics, Loop-mediated isothermal amplification

Biography: Meenu Ghai

Meenu Ghai is currently employed as a lecturer (Genetics) at the school of life sciences at UKZN. She worked as a post-doctoral researcher at SASRI from 2012-2013. During this tenure she worked on developing LAMP method for detection of ratoon stunting disease. She has also obtained post-doctoral experience at Stellenbosch University, while working on salt tolerance in native wild grass. She obtained her Ph.D (Genetics and Biotechnology) from Punjab Agricultural University in India, where she worked on mapping and transfer of leaf rust resistance genes in diploid wheat. She has published in peer-reviewed international and national journals and also presented at various scientific conferences.
REFEREED PAPER

REVIEW AND ANALYSIS OF VARIETY DISTRIBUTION TRENDS IN THE SOUTH AFRICAN SUGAR INDUSTRY: A 2013 PERSPECTIVE

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Abstract

The South African sugar industry has experienced decades of sustainable sugar production due in part to continuous variety changes, yet the historic variety trends have not been reviewed. The objectives of this study were to (i) review the historic trends in variety distribution and discuss the impact of variety changes on industry sustainability, (ii) analyse trends in adoption patterns to elucidate future variety inclinations, and (iii) evaluate the accuracy of mill delivery data as a tool to study variety distribution. Historic variety distribution and Cane Testing Service (CTS) data from 1926 to 2011 was analysed. The historic changes in variety distribution in relation to pest and disease (P&D) incursions are discussed to highlight the role of variety changes in ensuring sustainability. Of the 40 gazetted commercial varieties available, 17 contribute more than 1% to total industry production. At an industry level, no single variety currently contributes more than 20% of total production. This is in contrast to periods before the 1990s, when single varieties such as NC0376, NC0310 and Uba contributed well over 40% to total industry distribution. At a regional level, variety distribution remains skewed toward one or two varieties, posing a P&D risk (particularly in the midlands region). There has been a decline in the adoption rates of varieties due to more focused selection and recommendations for niche conditions (a dilution effect). CTS data are good representation of the general variety distribution within a mill supply area, and may therefore be suitable for use in future distribution studies.

Keywords: sugarcane, variety adoption, variety distribution

Biography: Sanesh Ramburan

Sanesh Ramburan is currently employed as a Crop Scientist (Variety Evaluation) at SASRI. His research focuses on variety evaluation under different environmental conditions and management practices. He manages projects at SASRI dealing with variety interactions with agronomic factors, including the effects of abiotic stresses. He is lead author of more than 20 peer-reviewed publications and numerous popular publications. He is a board member of the South African Society of Crop Production and a member of the editorial board for the international Journal of Crop Improvement. He holds an MSc Agric. from UKZN and a PhD in plant breeding from the University of the Free State.
REALISED SELECTION GAINS FOR CANE YIELD, SUCROSE CONTENT AND SUGAR YIELD AMONG SOUTH AFRICAN BREEDING PROGRAMMES

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Abstract

Realised selection gains provide a parametric evaluation of the potential of breeding programmes to produce genetic gains in their released varieties. The objective of this study was to determine the realised selection gains for cane yield, sucrose content and sugar yield, and evaluate their implication in variety improvement. The study was based on data collected from advanced variety trials at the South African Sugarcane Research Institute (SASRI). Data were analysed using the mixed procedure of Statistical Analysis System (SAS) to estimate least square means. Simple linear regression of least square means versus years of selection was used to test the significance of the trends. The Midlands programmes produced the highest gains followed by the coastal long cycle, while the coastal short cycle produced no gains. The gains for sugar yield from the Midlands programmes were derived from the additive gains from cane yield and sucrose content. The gains for the coastal long cycle and irrigated populations were derived from cane yield and sucrose content, respectively. The large gains for the Midlands were attributed to stable populations and low levels of eldana damage and smut disease resulting in two fewer traits at selection. The poorer performance of the coastal short cycle indicates the difficulty associated with breeding for 12 month crop varieties from populations initially designed for an 18 month crop. Development of coastal short cycle parents is expected to reverse the negative gains. Recurrent selection for cane yield (irrigated programme) and sucrose content (coastal programmes) is expected to increase realised selection gains for sugar yield.

Keywords: sugarcane, advanced variety trials, regional breeding programmes, genetic gains

Biography: Marvellous Zhou

Dr Marvellous Zhou is a Senior Plant Breeder and Plant Breeding Project Manager at SASRI and Associate Professor of Plant Breeding, University of the Free State. Before joining SASRI, he worked as a Plant Breeder at the Cotton Research Institute and later Zimbabwe Sugar Association Experiment Station before taking a PhD Research Fellowship in the Sugarcane Genetics Laboratory at Louisiana State University. He graduated from the University of Zimbabwe with a BSc Agriculture Honours (Plant Breeding), MSc Agriculture from the University of Natal, Masters in Applied Statistics and PhD (Plant Breeding and Genetics) from Louisiana State University. He has published extensively in peer reviewed journals, refereed conference proceedings and presented at several conferences including SASTA, ISSCT, ASSCT, SAPBA, SAGS and EUCARPIA. His research interest includes optimising plant breeding programmes, Plant Breeding methodology, Quantitative Genetics and Applied Statistics.
EFFECT OF PHOTOPERIOD TREATMENTS ON POLLEN VIABILITY AND FLOWERING AT THE SOUTH AFRICAN SUGARCANE RESEARCH INSTITUTE

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Abstract

Sugarcane does not produce viable pollen in South Africa because flowering occurs in winter when temperatures fluctuate below 20°C, the minimum threshold for pollen survival. Photoperiod treatments are required to enhance pollen survival and induce, synchronise and distribute flowering across the pollination season. At the South African Sugarcane Research Institute (SASRI) six photoperiod treatments are deployed: G1, G2 and G3 in the glasshouse and P1, P2 and P3 in the photoperiod house. In the glasshouse, natural day-length is extended by reducing the rate at which it declines naturally. In the photoperiod house, day-length is reduced by 30 seconds per day and the treatments are started at different times. The aim is to synchronise flowering between G1 and P1, G2 and P3, and G3 and P2. The objective of this study was to evaluate the effect of photoperiod treatment on ‘pollen viability’ and ‘days until flowering’. Analysis over a five-year period showed that genotypes from the photoperiod house produced significantly (P<0.001) more fertile pollen than genotypes from the glasshouse. None of the photoperiod treatments showed synchronised flowering. Genotypes from G1 flowered two days earlier than those from P1 (P<0.001); G2 genotypes flowered 12 days earlier than P3 genotypes (P<0.001); and G3 genotypes flowered three days later than P2 genotypes (P<0.001). Since sugarcane pollen is generally viable for only 20 minutes, female flowers from G1 and G2 could lose receptivity before male flowers from P1 and P3 are fertile. Likewise, males from P2 could shed pollen before females from G3 are receptive. These results emphasise the need for further optimisation of photoperiod treatments at SASRI.

Keywords: plant breeding, flowering, photoperiod treatments, glasshouse, pollen viability

Biography: Tasmien Horsley

Dr Tasmien Horsley is a Plant Breeding Scientist at the South African Sugarcane Research Institute. Before joining SASRI in 2012, she was a Principal Researcher at Sappi Forests for 12 years, where she specialised in Seed Technology and Tree Reproductive Biology. She graduated from the University of KwaZulu-Natal with a BSc Honours (Biological Science), MSc (Plant Biotechnology) and PhD (Forestry). Her main role at SASRI involves the development, co-ordination and implementation of the Introgression Breeding project.
COMPARISON OF METHODS FOR DETERMINING THRIPS (FULMEKIOLA SERRATA) DAMAGE AND IMPLICATIONS FOR RESISTANCE SCREENING

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Abstract

The sugarcane thrips, Fulmekiola serrata Kobus, is a pest of the South African sugarcane industry. One of the strategies to control the pest is by breeding and selecting resistant genotypes. The main objective of this study was to compare different methods of predicting thrips damage to establish a method for resistance screening. Thrips number count and phenotypic assessment of damage were compared. Ninety genotypes were planted in replicated field trials at the Mount Edgecombe and Kearsney research stations. Data were collected for the extent of leaf damage caused by thrips from a three month old crop in January, February and March of the 2009, 2010 and 2012 seasons. One spindle per plot was sampled from the three month old crop to count the number of thrips. Data was analysed for genotype, month and years as fixed effects. Results showed significant differences (P<0.0001) between years and sites for both traits. Significant differences (P<0.0001) exist among genotypes for thrips damage. Although the F values (F=1.61 to 2.81, P<0.0001) for genotypic effect of thrips numbers were significant, they were lower than those for thrips damage (F=5.47 to 7.93, P<0.0001), indicating lower discrimination among genotypes when using thrips numbers. Thrips damage in genotypes was highly correlated (r=0.79 to 0.80) across all site/season combinations when compared with thrips numbers (r=0.31 to 0.43). The parameters indicate that thrips numbers are less reliable for determining genotype differences compared with thrips damage. Thrips damage based on phenotypic symptoms will be recommended for routine resistance screening.

Keywords: sugarcane thrips, Fulmekiola serrata, scoring system, resistance screening

Biography: Shailesh Joshi

Shailesh Vinay Joshi has been a Scientist: Plant Breeding at SASRI for the last six years. His current research projects focuses on improving the efficacy of conventional breeding programme by identifying and using molecular markers associated with high cane yielding sugarcane varieties, which are resistant to pests and diseases. He holds a PhD in Genetics, Plant Breeding and Biotechnology from Punjab Agricultural University, India. He has presented his work at international and national conferences and workshops.
SURVEYING WHITE GRUBS (SCARABAEIDAE) IN THE SWAZILAND SUGARCANE INDUSTRY: THE 2006-2012 SURVEYS

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Abstract

In Swaziland, damage by scarab beetle grubs/larvae to sugarcane roots is of concern and occasionally necessitates replanting. Annual white grub surveys are carried out by the industry to detect fields with excessive infestations. Survey records from 2006 to 2012 showed that most larvae were recovered from fields on Tambankulu Sugar Estate, specifically sections 1 and 2, and fewer on the Umbuluzi Sugar Estate. Over this survey period, 11,618 larvae were recovered from 29,096 pits, representing an average area-wide density of 0.4 larvae/pit. The highest mean larval infestation was recorded in 2009 of 0.62 larvae from 30x30x30 cm sized pits dug beneath sugarcane stools. The maximum number of larvae found in a single pit was 7 individuals, and it was believed that these localities were where replant was required.

From the specimens recovered the field teams identified a large proportion of the specimens as Asthenopholis minor (Melolonthinae). For example, in 2010 there were 94.4% of this species. In the same year, Heteronychus licas (Dynastinae) comprised 2.7% of larval recoveries. Past area-wide surveys showed that, during the 1960s, H. licas was the most common species encountered in this sugar industry, and then during the 1980s, A. minor was recorded as the predominant species. The other two taxa usually recorded during these surveys are Anomala spp. and Adoretus spp. that typically represented a substantially lower proportion of 0.9% and 1.6%, respectively, during the 2010 survey, while a group of unknown scarab taxa routinely recorded each year comprised 0.43%. Low density and relatively small body size of the last mentioned three groups probably preclude them from causing appreciable damage. The subject of the identity of white grub larvae in sugarcane fields is being studied at present.

To this end, this paper gives a simple identification key that can be used in the field to identify third instar larvae of A. minor and H. licas. Additional research is recommended to confirm the identity of all four species recorded during these surveys and the unknown taxa using integrative (morphological and molecular) taxonomic techniques.

Keywords: sugarcane, Swaziland, Scarabaeoidea, Adoretus, Anomala, Asthenopholis, Heteronychus

Biography: Mike Way

Mike Way is an entomologist in the Crop Protection Resource Centre at SASRI. He researches various aspects about the sugarcane pests: eldana, white grubs, sugarcane thrips and incidental crop spoilers. This research contributes information that will be used when current control measures are implemented, and during the process of researching and developing novel pest management strategies for this sugar industry.
SHORT NON-REFEREED PAPER

GRASSHOPPER (ORTHOPTERA) OUTBREAKS ON SUGARCANE IN THE EMPANGENI REGION OF ZULULAND, KWAZULU-NATAL, SOUTH AFRICA

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Abstract

This paper identifies, for the first time, hoppers and adults of a complex of locust and grasshopper species attacking sugarcane in the Empangeni area. The most abundant species are Nomadacris septemfasciata (a locust) and Petamella prosternalis (a grasshopper). Ornithacris cyanea and five other grasshopper species occur, but at lower abundance levels. The relative abundance of the species varies according to location within the area, with N. septemfasciata abundant in the southerly region, and P. prosternalis most abundant in the northerly region. Relative abundances of life stages of the two most common species over the sampling period show that adult N. septemfasciata are present throughout the winter period, and mate and oviposit when the spring rains commence in September/October. In contrast, adults of P. prosternalis mate and oviposit in autumn (April/May) and die before winter sets in. Eggs of P. prosternalis diapause through winter. Eggs of all species hatch in late spring (November) as hoppers, which develop to adults throughout summer. During winter, N. septemfasciata is the most abundant species, while P. prosternalis dominates in summer. These basic data are very important knowledge blocks on which to base a sustainable, environmentally friendly Integrated Pest Management plan for this complex of species attacking sugarcane in the Empangeni region, and indicate that a common single control tactic could exacerbate rather than minimise the problem.

Keywords: grasshopper outbreaks, Empangeni sugarcane, population monitoring, integrated pest management

Biography: Adrian Bam

Adrian Bam is a second year MSc student at SASRI, registered at Stellenbosch University. The aim of the project is to investigate Orthoptera outbreaks in sugarcane in the Empangeni region. The project seeks to understand the population dynamics and characteristics of this species assemblage with the hope that an increased knowledge of the pest will lead to more effective and sustainable management being implemented. Adrian’s main interest lies in the relationship between agriculture and the surrounding environment and in particular the development of Integrated pest management (IPM) techniques.
SHORT NON-REFERRED PAPER

MONITORING CHILO SACCHARIPHAGUS (LEPIDOPTERA: CRAMBIDAE) IN ZIMBABWE, SOUTH AFRICA AND SWAZILAND

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Abstract

Chilo sacchariphagus (Lepidoptera: Crambidae) persists in Mozambique on the northern sugar estates, and therefore the risk exists that this stalk borer could spread to southern estates in Mozambique, and to South Africa, Zimbabwe and other sugarcane growing countries on the African continent. Monitoring continues under the umbrella of a regional bio-security initiative driven by the South African Sugarcane Research Institute (SASRI). In Zimbabwe during 2011/2012, damage in sugarcane grown on smallholder homesteads in the Rusitu River valley along the Mozambique border in the eastern highlands region were 7.7% and 6.9% stalks bored (n=766 stalks from 41 smallholdings and n=2657 from 64 smallholdings, respectively). No C. sacchariphagus were recovered. C. partellus, C. orichalcociliellus and Sesamia calamistis were identified from a batch of larvae processed at SASRI using molecular taxonomic techniques. These borer species are not major pests of sugarcane in Zimbabwe. Routine stalk surveys and pheromone trapping operations conducted over the same period in strategic localities in South Africa and Swaziland show that this pest remains absent from these countries. Monitoring programmes demonstrate that C. sacchariphagus has not invaded the southern sugar estates in Mozambique.

Keywords: sugarcane, bio-security, Chilo partellus, Sesamia calamistis, Chilo orichalcociliellus

Biography: Audrey Mabveni

Dr. Audrey Mabveni is a Senior Entomologist at the Zimbabwe Sugar Association Experiment Station (ZSAES). 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 presented at SASTA and ISSCT.
ON ASPECTS OF SAMPLING *ELDANA SACCHARINA* WALKER (LEPIDOPTERA: PYRALIDAE) POPULATIONS AND DAMAGE IN SUGARCANE

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**Abstract**

During 2000-2004 a series of field-based insecticide trials were conducted against the sugarcane borer *Eldana saccharina* Walker (Lepidoptera: Pyralidae) (Eldana) in carry-over cane. Opportunity was taken to re-analyse data assessing Eldana damage and larval numbers in the untreated plots of these trials. The aim was to examine trends in damage and populations over time and their sampling errors. In addition, the relationship between measures of damage was examined as well as position of damage over time. A sequential sampling plan was also developed.

Results showed that over the period August to April, damage and larval numbers increased four and nine-fold, respectively. Also shown was that estimates of damage were more reliable than estimates of larval numbers (average \( r^2 0.71 \) and 0.64, respectively). The analysis revealed that there was a reasonable association between the measures ‘% internodes bored’ and ‘% stalks bored’ (\( r^2 0.39-0.83 \)). Because the latter measure is the simpler of the two to assess, this association may allow a more rapid estimate to be made of the former, the critical measure associated with Eldana losses. Sampling error was highest in the initial surveys, (August) and lowest in the final surveys (April). Trends in the position of damage confirmed that most damage is restricted to the lower section of the stalk but that, over time, damage can occur higher up the stalk.

A sequential sampling plan was developed based on the percentage of internodes bored and using the negative binomial distribution. This demonstrated the possible value of this technique in field sampling for Eldana.

**Keywords:** sugarcane, Eldana, field sampling errors, damage trends

**Biography: Graeme Leslie**

Graeme Leslie is a Principal Scientist at SASRI. Over the past 38 years he has been involved in all aspects of Integrated Pest Management strategies against Eldana, whitegrubs, thrips and more recently, grasshoppers control. Current research focus is the economic use of insecticides and the development of new chemistries for effective pest control. He has authored or co-authored over 47 research papers as well as posters and Conference abstracts for national and international research meetings.
UNDERSTANDING ADOPTION OF PUSH-PULL FOR CONTROL OF ELDANA SACCHARINA WALKER (LEPIDOPTERA: PYRALIDAE) USING EXPLORATORY NETWORK ANALYSIS

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Abstract

‘Push-pull’, a pest management strategy recommended for control of Eldana saccharina in sugarcane, is currently being implemented as part of an integrated pest management programme in the Midlands North region of KwaZulu-Natal, South Africa. However, adoption of new agricultural practices takes place within a complex system in which social, technical, economic and environmental factors all play a role. Understanding such complex systems is important, but difficult. A novel network analysis method for exploring adoption of new pest management technologies was employed to identify drivers of and barriers to adoption. Analysis of the resulting network indicated that the biggest barriers to adoption were perceived ‘hassle’ and cost of implementation at farm level, and insufficient knowledge of how to implement the technology. The adoption ‘leverage points’ identified in the exploratory network analysis provide opportunities for more relevant and focused extension activities.

Keywords: exploratory network analysis, farmers’ perceptions and behaviour, integrated pest management, IPM, technology adoption

Biography - Jessica Cockburn

From 2011 to 2013 Jessica Cockburn completed her MSc (Zoology) through SASRI, working with Des Conlong. She was registered at North-West University where she was supervised by Professor Johnnie van den Berg. The aim of her MSc project was to implement push-pull for the control of Eldana saccharina in the Midlands North area of KwaZulu-Natal. The work she is presenting at SASTA 2013 forms part of that project. Jessica completed her BSc (Honours) in Entomology at Rhodes University in 2007. Jessica enjoys working at the interface of science and society to address environmental and agricultural questions. She is currently working on environmental research and management projects in collaboration with UKZN, Working on Fire and eThekwini Municipality’s Environmental Planning and Climate Protection Department.
RELEASES OF IRRADIATED MOTHS TO SUPPRESS WILD POPULATIONS OF ELDANA SACCHARINA WALKER (LEPIDOPTERA: PYRALIDAE)

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Abstract

Pilot shade house trials were conducted to measure the impact of sustained releases of partially sterile adult males of the stalk borer Eldana saccharina Walker (Lepidoptera: Pyralidae) at an over-flooding moth ratio of 10T:1U (treated to untreated). Their efficacy in stopping E. saccharina incursions and suppressing wild populations was measured prior to testing under true season-long and area-wide conditions. Results from the current study demonstrated that releasing partially irradiated (200 Gy) adult male moths at the above-mentioned release rate significantly reduced sugarcane stalk damage, and also reduced the number of fertile progeny from F₁ to succeeding generations in a stable E. saccharina population initiated in a cage-house. There were more damaged internodes per stalk in the control than in the sugarcane receiving regular releases of partially sterile male moths. Overall, there were significantly more undamaged stalks in the treated sugarcane than the untreated control. Furthermore, there were significantly more larvae per stalk retrieved from the control than from the treated sugarcane, suggesting that the sustained release of steriles was efficacious in reducing emergence of fertile larvae in the succeeding generations. The results of this study indicate that there is considerable scope for the Sterile Insect Technique (SIT) against this damaging pest of sugarcane.

Keywords: Sterile Insect Technique, Eldana saccharina, pilot field release, inherited sterility

Biography: Pride Mudavanhu

Pride Mudavanhu holds a PhD in Agriculture Entomology from Stellenbosch University. He received his undergraduate and postgraduate training in Zimbabwe and South Africa respectively. His research interests cover a wide territory ranging from insect pest biology, physiology and ecology to area-wide integrated pest management. Dr Mudavanhu has received a number of awards for academic excellence and authored a number of research papers published in international peer-review journals.


**REFEREED PAPER**

**RECIRCULATION RATE FOR ROBERT EVAPORATORS**

**SHAH S AND PEACOCK SD**

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**Abstract**

Research has shown that a higher fluid velocity, as a result of increased recirculation, results in improved Robert evaporator performance. Although no conclusive correlation for the optimum recirculation rate can be found in literature, extensive experimental data was made available. With the aid of a digitising program, data was extracted from existing graphs and was mathematically manipulated to yield a number of correlations. The first set of correlations allow the minimum recirculation rate and liquid level to be predicted for juice of up to 65 brix, corresponding to various temperature driving forces and the optimum heat transfer coefficient. The prediction of the juice velocity as a function of temperature driving force allows a second correlation between the Reynold number and the Grashof number to be developed, presenting the results in terms of dimensionless numbers which can be easily interpreted in terms of heat transfer theory. The correlations developed will assist in the design of semi-sealed down-takes to ensure adequate recirculation and a sufficient liquid level within the Robert evaporator to optimise heat transfer.

**Keywords:** Robert evaporator, recirculation rate, liquid level, down-take

**Biography: Shaista Shah**

*Shaista qualified as a Chemical Engineer from the University of Kwa-Zulu Natal in 2008 and was thereafter employed at Tongaat Hulett Sugar as an Engineer-in-Training at Maidstone Mill from January 2009 to November 2010. She then worked as a Process Engineer at Maidstone Mill until May 2011, after which she joined TEG (Technology and Engineering Group) as a Process Design Engineer. Shaista is currently studying part-time toward a Master of Science degree in Engineering.*
MODULAR EVAPORATORS

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Abstract

Reboiler evaporators are common in process industries, including cane ethanol plants. They are used to provide heat to distillation columns by boiling the liquid from the bottom of a distillation column to generate vapours, which are returned to the column to drive the distillation separation. Typically, a reboiler is situated externally to the distillation column. Recently the concept has been applied to cane juice evaporation and has a number of advantages worth considering. Firstly, the heating surface capacity of an existing evaporator vessel can be increased by the addition of a reboiler, thus offering a simple means of increasing the capacity of an evaporation train. Secondly, multi-reboilers can be used as a single effect in an evaporator train, all connected to a single separator. The advantage of this arrangement is that each reboiler can be removed from service individually for cleaning, without removing the entire effect from service. A second advantage is that mechanical cleaning can be performed without entering an enclosed vessel, as this is considered in some industries to be a health and safety risk. Thirdly, the capacity of a multi-reboiler effect can be increased by the addition of reboilers that use the existing separator vessel.

Effectively, the multi-reboiler concept is a modular evaporator.

Modular evaporators are now gaining favour in the Brazilian cane industry. Bosch Projects and Bosch Engenharia have developed unique arrangements of modular evaporator systems for use in any effect of an evaporator train, with evaporator tube lengths of 2-7 metres. This paper discusses the concept of modular evaporators and the unique arrangement of the system developed by Bosch Projects.

Keywords: evaporators, reboilers

Biography: Ivan Voigt

Ivan Voigt (BSc Eng (Mech), GCC, MBA) is the Director: Sugar Equipment at Bosch Projects Pty (Ltd). He has managed all aspects of Bosch Projects Sugar Equipment business, including marketing, engineering, technology development and projects. Noteworthy achievements include the commercialisation of the Bosch Projects Chainless Diffuser in Africa, South America and Asia, and the establishment of the Bosch Projects business in Brazil.
SOME KEY PRINCIPLES FOR THE DESIGN OF ROBERT EVAPORATORS

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Abstract

The performance of an evaporator station cannot be attributed solely to the vessel design, but to the design of the station as a whole. This paper aims to summarise some key principles pertinent to the South African design of Robert evaporators, with a particular focus on feed distribution and piping design. The pressure drop associated with the piping design can alter the hydraulics within a system and result in preferential flow, which can prevent adequate distribution of juice, the venting of incondensible gases or the draining of condensate. Advances in down-take design have resulted in a move toward semi-sealed down-takes which, coupled with the installation of feed rings, allows for improved evaporator performance through increased recirculation. The presence of flash vapour in the feed stream, as a result of the decreasing pressure profile, assists in circulation of juice through the tubes and thus increases the heat transfer coefficient. However, excess vapour in the feed stream can result in violent eruptions, spouting and entrainment, all of which can be reduced with the installation of a partial flash tank. Conflicting research regarding the optimum distribution of feed and flash vapour has resulted in the development of a feed distribution model to quantify the brix effect. A trade-off appears to exist between optimum juice distribution and optimum flash distribution, where an even distribution of the flash vapour is considered to be most advantageous.

Keywords: Robert evaporator, incondensible gases, feed ring, down-take

Biography: Shaista Shah

Shaista qualified as a Chemical Engineer from the University of Kwa-Zulu Natal in 2008 and was thereafter employed at Tongaat Hulett Sugar as an Engineer-in-Training at Maidstone Mill from January 2009 to November 2010. She then worked as a Process Engineer at Maidstone Mill until May 2011, after which she joined TEG (Technology and Engineering Group) as a Process Design Engineer. Shaista is currently studying part-time toward a Master of Science degree in Engineering.
REFEREED PAPER

FELIXTON MILL EVAPORATOR STATION:
FINAL EFFECT PARTIAL FLASH TANK

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Abstract

Severe spouting in the final effect evaporators at Felixton contributed to high undetermined loss. Tube leaks at the tube sheet interface were identified in the area of the feed pipe nozzles and were suspected of contributing to the spouting. Expansion of leaking tubes was necessary during the weekly shutdown. It was noticed that some of these tubes had to be expanded on a regular basis. Operation of the final effects was accompanied by a persistent banging or percussion. External feed rings had been modified and the banging was initially thought to be as a result of condensate hang-up. This was later identified to be as a result of feed flashing into the 5th effect vessel. A partial flash tank was designed to reduce the flash into these vessels.

Keywords: final effect, spouting, undetermined loss, feed flashing, partial flash tank

Biography: B M Wiseman Dlamini

Mr. Wiseman Dlamini is currently working as production manager at Felixton sugar mill. He is a chemical engineer, and has worked in a sugar industry since 1990. He also holds a degree in B Com management (Cum Laude) from the University of Zululand. His experience in the sugar industry includes working at various sugar factories and also at Technical Management Department during the Xinavane mill expansion project.
SOLUTIONS TO HIPPO VALLEY EVAPORATOR PROBLEMS

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Abstract

Hippo Valley (HV) sugar factory is located in the south-east area of Zimbabwe. For many years, HV has experienced problems with low Brix syrup and high undetermined loss. Over a period of four years, a number of corrections and changes were made to the evaporator station to improve syrup Brix and Vapour 1 pressure. Rearrangement of the evaporator condensate flash pipe layout eliminated uncontrolled condensate flashing. The pressure and temperature differences across the evaporators increased. Incondensable gas removal systems were changed to eliminate preferential removal of light incondensable gas from the Roberts evaporators and provide separate light and heavy gas removal. The combined result of the flash and incondensable gas changes was an improvement in syrup Brix from well below 60% on average to 63% after the changes. Elimination of excessive entrainment from the Kestner separator and the two last effect evaporator vessels contributed to a reduction in undetermined loss (UDL) from 6-7% down to about 1%. Planned changes are in place to further reduce undetermined loss and improve evaporator operating efficiency. This paper covers the details of the changes that were implemented.

Keywords: entrainment, juice flash, feed rings, entrainment separator, entrainment return, partial feed flash

Biography: Dave Muzzell

Dave started working life as a science teacher at Hamilton High School in Bulawayo. After 4 years teaching, Dave joined Zimbabwe Sugar Refinery in Bulawayo in April 1971 which saw the start of an extended career in the sugar industry. Apart from a short period of 2 years where Dave started a branch of a cooling tower company in KwaZulu Natal, the rest of the 40 years has been spent in the sugar industry, predominantly in Process operations. Dave has seen service at Zimbabwe Sugar Refinery, Hippo Valley Estates, Felixton 1 and Felixton 2, TMD, Darnall, Entumeni, Simunye in Swaziland, Nakambala in Zambia, Raceland Raw Sugar Company in Louisiana USA, TEG.
CONTINUOUS PERCOLATION RATE MEASUREMENT IN A SUGARCANE DIFFUSER

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Abstract

Percolation rate in a sugarcane diffuser is the volumetric flow rate of juice through a unit area of the cane bed. Maximising the percolation rate is important for maximising the sucrose extraction from the cane. For each consignment of cane in the diffuser, a maximum percolation rate (MPR) exists. Increasing the rate of juice applied to the cane to above the MPR results in flooding, with well-known negative consequences. Applying juice to the cane at well below the MPR results in lower extraction levels than could otherwise be obtained. There is currently no means of continuously measuring percolation rate in any of the diffusers installed in South African sugar factories. Spot checks, for example tracer tests, are periodically performed, but these are usually labour intensive and do not account for fluctuations in percolation rate with cane throughput, imbibition flow rate, or different cane varieties. A magnetic flowmeter was installed on one of the interstage flow lines on the BMA diffuser installed at the Maidstone factory (the ‘Tongaat’ diffuser). The flowmeter provided real time data of the percolation rate of juice through the cane above the tray from which the flow was measured. The results showed that the percolation rate was well below the expected MPR of the cane, and this explained the ‘dry’ bed which was observed through the diffuser sight glass. A wide range of interstage flow rates were observed and fibre blockages in the line were the most likely cause. Suggestions were given for how to use the continuous percolation rate measurement method to automatically control diffuser spray flap positions.

Keywords: diffusion, percolation rate, extraction

Biography: Paul Jensen

Paul is a 2001 UKZN Chemical Engineering Graduate. His career in the sugar industry began as an EIT at Maidstone factory. After completion of his EIT he spent a year at THS’s Technology and Engineering group before moving to Norway for three years from 2008 to 2011. In Norway he worked as a process engineer in a fiberglass factory, never managed to catch a wild salmon, and broke his wrist while snowboarding. Paul returned to South Africa in 2011 and joined the SMRI as a process engineer in their research department. Much of his work in the last few years has focused on understanding diffusers, and how they might be better operated to improve the profitability of a sugar factory.
INTEGRATION OF A PLC AND SCADA CONTROL AND REPORTING SYSTEM WITH AN EXISTING DCS

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Abstract
Komati Mill was built 20 years ago as a fully automated sugar mill utilising a factory-wide Distributed Control System (DCS) to achieve a high level of factory automation. During this interval, the process control industry has seen rapid growth in technology and many components of the control system hardware have become obsolete. Faced with this scenario, Komati Mill has been prompted to consider a cost effective migration pathway to accommodate the newer technology.

In 2010, the mill embarked on a phased project to replace the obsolete Legacy DCS system with a PLC and SCADA system. The project included the implementation of a Management Execution System (MES) to monitor and report the availability and productivity of the plant from real time feedback. The project roll-out commenced with a Manufacturing Application Alignment (MAA) study which provided a roadmap of the technology and functions needed, based on the Key Performance Indicators (KPI) of the mill.

The migration path comprised five phases, and is currently in the third phase. The solution at the end of phase two includes integration between the old Legacy DCS, the new DCS, the new PLCs, LIMS and manual operator inputs. It also provides real time monitoring and reporting of the extraction plant Lost Time Available (LTA) and throughput, as well as a daily crush prediction model. This information is fed back to the manager’s desk as a single point of information on a web portal.

Keywords: Legacy DCS, PLC, SCADA, control system migration, management execution system, web portal

Biography: Pieter van Tonder

Pieter van Tonder was born on the 2nd of April 1969 in Pretoria. He matriculated from Secunda High School in 1987, and then worked at Sasol while studying for his National Diploma - Electrical Engineering until 1996. He then joined Columbus Stainless Steel and studied part time for his B-Tech Process Instrumentation degree, which he obtained in 2006. In 2007 he did a Management development program (MDP) at The Graduate Institute of Technology (GMT). Pieter joined Tsb Sugar at the end of 2009, and is the Instrumentation  control engineer in the engineering services department and oversees all control and instrumentation responsibilities at the Komati Mill. Pieter is a goal-driven professional with over twenty two years of experience in Control Instrumentation. He is a single parent of two boys Dihan and Hernu van Tonder ages 8 and 10 years.
UNDETERMINED LOSS REDUCTION AT MAFAMBISSE SUGAR FACTORY IN MOZAMBIQUE

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Abstract

Undetermined loss, while by name suggesting a measure of ‘uncontrollability’, is considered by many production managers as a key measure of performance in the raw house. The control and reduction of undetermined loss can present many challenges to operational staff in a raw sugar factory.

Mafambisse (MB) factory is situated in central Mozambique in the Sofala Province. From 2005 through to 2009, undetermined loss averaged 3% at MB. Investigations revealed that the main cause of these sucrose losses was entrainment via the evaporator and Oliver filter condensers. This paper discusses interventions made during 2007 and 2008 to overcome these problems and eventually reduce undetermined loss to an acceptable average of 1.25%.

Keywords: undetermined loss, boiling house recovery, BHR, entrainment, condensers

Biography: Nelson Dunn

Nelson Dunn’s career in the sugar industry spans a period of 41 years, starting as Pan Boiler with Huletts Sugar Ltd, at Felixton in 1972. Through self study and determination, he has worked his way up through the ranks. After brief stints with the then C.G Smith Umzimkulu Mill and RSSC Simunye in Swaziland from 1975 to 1980, he returned to the now Tongaat-Hulett group at Darnall in 1981. In 2000 he was seconded to Xinavane as part of the pioneer management group for Tongaat-Hulett in Mozambique. Nelson was promoted to Assistant Process Manager in 2005. In 2008 Nelson was later transferred to Mafambisse Sugar Mill as Production Manager, his current position.
ENGINEER TO LEADER: THE TRANSITION

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Abstract

A leader has various definitions, but is essentially a person who is able to inspire and steer a particular organisation towards success. Since human beings are non-linear (i.e. multiple reactions are possible in any given situation), they contribute a great deal to the complexity of an organisation and no standard procedure can be developed to deal with the conflicting perceptions that exist within an organisation. The leader therefore has to use his/her power of influence in getting the best out of people for the success of the organisation. Engineers, on the other hand, are more technically orientated and even though they deal with people it is usually on a smaller scale. An engineer outside operations will have even less exposure to managing or leading people. The transition from engineer to leader is therefore usually clouded with numerous challenges.

This report uses a qualitative approach called ‘action research’ methodology to understand and respond to challenges that are encountered by engineers when they progress to a senior leadership role in a complex organisation. Interviews were conducted with personnel who are in leadership positions who have engineering backgrounds and had undergone this transition. These challenges are highlighted, and recommendations are based on the role of the individual going through the transition, the organisation’s role and possible contribution of the tertiary institutions during under/post-graduate studies and through partnerships with the organisation.

The adoption of the engineer-in-training programme approach at leadership level was recommended to ensure a less turbulent transition and supply adequate leaders into the system.

Keywords: management, engineer, leadership, action research

Biography: Cebisile Mbanjwa

Ms Cebisile Mbanjwa is a process engineer at Tongaat Hulett refinery. She holds a Bachelor of Technology degree in Chemical Engineering from Mangosuthu Technikon (now Mangosuthu University of Technology) and a Postgraduate Diploma in Leadership and Management from University of KwaZulu Natal (UKZN). She joined Tongaat Hulett Sugar as an Engineer in training in 2007 at Amatikulu Mill before being appointed at the refinery.
The handling of raw sugar refinery molasses is a problem most sugar refineries are faced with. To this end, many processing options have been proposed and evaluated over the years. The advantages of such processes include the beneficiation of a low value stream, the reduction of recovery crystallisation and recovery house operations, the reduction of a low purity sugar recycle stream and an increased overall refinery throughput. The processing option discussed in this paper is the beneficiation of refinery molasses into liquid sugars. A process utilising continuous and batch ion exchange technology for de-ashing, inversion and decolourisation, followed by evaporation and carbon treatment, was developed, trialled and implemented. Return syrup is currently being treated using this process at the Huletts Refinery to produce a medium/high invert liquid sugar.

Keywords: liquid sugars, beneficiation, return syrup, ion exchange, waste stream, de-ashing

Biography: Ashveer Raghunandan

Ashveer Raghunandan is currently the Technology Manager at Bosch Projects, having recently joined from Tongaat Hulett Sugar. He holds a B. Sc. in Chemical Engineering from the University of KwaZulu Natal, and an MSc in Engineering from the University of Pretoria. He has worked as a process engineer as well as a development engineer. His development work has primarily been focused on the development of new technologies and processes in the sugar industry.
NEW POLYMER CHEMISTRY FOR REFINERY LIQUOR DECOLOURISATION

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Abstract
A new colour precipitant was investigated in the removal of visual colour in sugar refining processes. The results of laboratory evaluations and a short plant trial are presented. Laboratory investigations have indicated that a colour reduction in the region of 30 to 55% is achievable using the enhanced performance chemistry of the colour precipitant Bulab® 5154. Bulab® 5154 facilitated a higher colour removal than that achieved with polyamine chemistry colour precipitants conventionally used to assist in the refinery colour removal process. Bulab® 5154 can be used as a process aid to consistently achieve final sugar colour targets, as well as providing additional decolourisation during periods of high colour loading. Laboratory investigations were conducted at two refineries using different refining processes to facilitate colour removal. Refinery A uses a carbonatation followed by sulphitation process and Refinery B uses a phosphatation followed by ion exchange process. Bulab® 5154 facilitated excellent colour removal in liquor from both refining processes.

Keywords: colour precipitant, sugar refinery, refinery colour removal, decolourisation

Biography: Shannon Goddard
Shannon Goddard currently holds the position of Project Chemist and is part of the Technology Division of Buckman Africa based in Hammarsdale KwaZulu-Natal. Shannon obtained her Masters of Science degree at the University of Natal. She has been with Buckman for 16 years and her key focus areas include providing technical support to the Buckman technical sales team and their customer base across Sub Saharan Africa. Technical and technological support includes sustainable and innovative solutions for various water and direct process related applications for the various markets Buckman serves, with particular interest in the Sub Saharan African Sugar and Ethanol Industry.
Transformer Oil Maintenance

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Abstract

In electrical distribution, the transformer is the workhorse of the industry. The majority of transformers are oil filled, air cooled units which are frequently neglected after installation. However, even a poorly maintained transformer may perform adequately for many years without incident. Water retention resulting in corrosion is the major cause of failure in transformers that have passed the initial high failure time zone. The secondary effects of corrosion, acid formation, and the degeneration of the insulation material can lead to failures under short term stress conditions while the protection clears the fault. Traditional drying methods take long periods of time and involve heating, hot oil sprays and vacuum techniques, and will result in only partial compliance. The majority of the water will reside in the insulation and over time will migrate back into the oil. The moisture will return to unacceptable levels, lowering the insulation levels and attacking the internal parts. Only the removal of the transformer and drying it out over a number of days in a large oven over several cycles will guarantee a positive result. The cost of installing a standby unit and the accompanying loss of revenue may be prohibitive.

The method of preventing transformer failure described in this paper utilises low energy and standard equipment, and allows the maintenance work to be completed on site over a comparatively short period of time. The documented results prove that there is an alternative method of drying the oil and extending the life of the transformer.

Keywords: transformer, low frequency heating, variable speed drive, VSD, VpCI

Biography: Barrie Skinner

Barrie was born in Zambia, raised in Rhodesia, left Zimbabwe, and qualified in South Africa. He qualified as an electrician and electrical technician with the City and Guilds of London institute and a South African S4. Barrie obtained his GCC for Electrical Engineering, Factories in 1989. He has worked in the motor industry, National Railways, worked with cranes, FMCG Industry, Paper and Pulp, contracting and the sugar industry where he has spent the past 11 years with Illovo Sugar. He started in Eston Sugar mill and has been involved with projects like the Nakambala and Ubombo upgrades. He is presently working in the Illovo Sugar Technical Services division.
Abstract

The increasing cost of coal and the opportunity to export electricity has caused many sugar factories to review the energy efficiency of their operations. The optimisation of the steam system can benefit factories that burn coal or other fuels by reducing their fuel bill. Factories considering generating surplus electricity for export or to support estate agricultural operations such as irrigation, often need to evaluate projects to improve steam economy and predict electrical energy that can be generated using available bagasse.

The development of an accurate and reliable model of the thermodynamic behaviour of the steam system of a sugar factory is a logical starting point for this analysis. This paper describes how an energy, mass and economic model can be built for the steam system of a sugar factory using freely available software that can be downloaded from the internet. This software, called SSAT, is capable of modelling the steam system of the sugar mill, including boilers, turbines, deaerator and steam distribution system, as well as steam end use and condensate recovery. Once the base case has been modelled, the energy and economic impact of projects to improve energy efficiency of the factory can be evaluated.

A case study demonstrating how SSAT is used to evaluate energy improvement projects such as boiler efficiency improvements and the replacement of turbine drives on mills with electric motors, is presented.

Keywords: energy efficiency, steam, boilers, turbines, co-generation, software, modelling

Biography: Barry Parkin

Barry is registered with ESCA as a professional engineer and hold a Government Certificate of Competency. Barry has 26 years experience as a practising engineer, 10 years of which were served in the sugar industry.

He obtained his BSc Mechanical Engineering degree from University of Witwatersrand in 1987. After graduating he was employed by Eskom for 10 years where he completed an EIT program and was posted to various business units including Tutuka Power Station and the Head Office Power Station Engineering Division. In 1997 Barry entered the sugar industry as plant engineer at Simunye Sugar Mill and went on to Umfolozi Mill in 2000. In 2004 Barry joined Sappi and was promoted to Engineering Manager at LignoTech in 2007. In 2009 Barry returned to the sugar industry as engineering manager at Gledhow Mill. Throughout his career Barry has been involved in with boilers and steam systems and has lead various energy efficiency projects.
Abstract

The variable speed drive is now a standard asset used in sugar factories to control air flow, fluid flow and conveyor speeds. The added features of analogue inputs and outputs allow coupling of drives in complex cascaded systems, and new programming features allow PLC-like controls. Applications are many and varied. Although speed control is the primary function, torque limitation can also be achieved. Variations of these features can be differentiated from the forward to the reverse direction, and can be changed with the flick of a switch. Generation back into the mains for energy recovery can be used to recover energy costs on high inertia loads - The perfect electrical solution to any mechanical problem. But now the electrical solution for electrical problems is achievable. The variable speed drive is now the perfect variable frequency, variable voltage, and variable current for every application - The truly perfect transformer for all occasions. An open mind can provide solutions where only obstacles existed before.

Keywords: variable speed drive, VSD, low frequency, energy recovery

Biography: Barrie Skinner

Barrie was born in Zambia, raised in Rhodesia, left Zimbabwe, and qualified in South Africa. He qualified as an electrician and electrical technician with the City and Guilds of London Institute and a South African S4. Barrie obtained his GCC for Electrical Engineering, Factories in 1989. He has worked in the motor industry, National Railways, worked with cranes, FMCG Industry, Paper and Pulp, contracting and the sugar industry where he has spent the past 11 years with Illovo Sugar. He started in Eston Sugar mill and has been involved with projects like the Nakambala and Ubombo upgrades. He is presently working in the Illovo Sugar Technical Services division.
CHALLENGES AND POTENTIAL SOLUTIONS FOR STORAGE OF LARGE QUANTITIES OF BAGASSE FOR POWER GENERATION

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Abstract

Prolonged storage of large quantities of bagasse for off-season power generation presents challenges different from those associated with small-scale storage or large-scale, wet storage for pulp and paper production. The challenges include loss of fuel value, spontaneous combustion, bagasse handling and a variety of health and environmental impacts. Experiences with these challenges in Australia and Brazil are reviewed and suggestions made for alternative storage methods. Theoretical requirements for good storage are outlined. The possible special requirement of pasteurised bagasse from diffusers is highlighted.

Keywords: bagasse, storage, power generation, bagassosis, combustion, diffuser bagasse

Biography: Brian Purchase

Brian Purchase is retired but holds part-time positions as a consultant and mentor at Bosch Projects and SMRI. He is a former Director of the SMRI. His qualifications include BSc (Agric.) Natal, PhD (London) and Dip Chem. Eng. (International Correspondence School). His interest in bagasse originated in the 1980s when he worked on a project to convert bagasse to ethanol, and also worked on wet bulk storage of bagasse at Felixton.
COMMERCIAL PRESENTATION

ALFA LAVAL DECANTER TECHNOLOGY IMPROVES SUGAR MILL PROFITS

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Abstract

Sugar mills throughout the world have conventionally used rotary vacuum drum filters to dewater the sugar mill mud that is produced after lime treatment or sulphitation of the sugar juice and subsequent sedimentation in short retention time clarifiers (SRTCs) or in conventional clarifiers. An alternative technology for clarification of the sugar mud juice and dewatering of the sugar mud, using Alfa Laval decanter centrifuges, has been established with encouraging results.

The advantages of using Alfa Laval decanter technology are:
• Higher electricity output from the co-generation plant due to savings in bagacillo.
• Increase in the recovery of sugar by maximising mud cake dryness.
• Lower steam consumption in the sugar juice evaporator, since there is no wash water to dilute the juice.
• Easy disposal of the mud due to the low moisture content, and a reduced quality mud as there is no addition of bagacillo as a filter media.
• Avoidance or reduction of inversion losses arising from longer residence time in the drum filter system and bacteria associated with the addition of bagacillo as a filter aid.

In the past few years, several major decanter installations have been commissioned with SugarDec 400 decanters manufactured by Alfa Laval. Performance of the decanters was established. Mud cakes with very low moisture content and residual pol levels could be produced using the decanters. The centrate clarity was such that it could be recycled to the process for further recover of sugar content. Substantial savings and thus be generated by using decanters in place of drum filters.

Keywords: filtration, clarification, dewatering, decanters, bagacillo

Biography: Moses Modibela

Moses Modibela has been working for Alfa Laval for 9 years. He started as a thermal design specialist and worked through technical sales representative to a Divisional manager position. Moses has more than 20 year’s working experience in different industries. He has been in mining, petrochemical; cryogenic gas and chemical industries in both sales & marketing and plant operation.
POSTER SUMMARY

REDUCING RAW SUGAR COLOUR BY WASHING WITH HYDROGEN PEROXIDE DURING CENTRIFUGATION

BARKER B AND MADHO S
Sugar Milling Research Institute NPC, c/o University of KwaZulu-Natal, Howard College Campus, Durban, 4041, South Africa
bbarker@smri.org  smadho@smri.org

Abstract

Producing low colour raw sugar is highly desirable, as it reduces the amount of work required by a refinery. In some cases, if the colour specifications are met, low colour sugar can be sold to preferential markets at higher premiums. Hydrogen peroxide is a strong oxidant that is capable of lowering the colour of raw sugar. The advantage of using hydrogen peroxide in the centrifuge is that low dosages of the peroxide can be applied to only the thin film of molasses remaining on the crystal. Tests were conducted on a laboratory scale to investigate the use of hydrogen peroxide in centrifugal wash water. A batch laboratory basket centrifugal, which can cure about 7.5 kg of A-massecuite, was used to conduct the tests. Dosages of hydrogen peroxide from 200-3000 mg/kg sugar were used. The tests were also designed to investigate effects of a water pre-wash before peroxide addition during the wash cycle. The poster discusses the most effective method of peroxide addition. Results of the tests will be used to determine whether hydrogen peroxide would be a cost-effective decolourant.

Keywords: hydrogen peroxide, colour removal, centrifugal washing, A-massecuite, sugar quality, refinery

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 a BSc in Chemistry. He has been at the SMRI for a number of years and in that time has been involved in research across all areas of sugar processing.
POSTER SUMMARY

ANALYSIS OF SUGARCANE BAGASSE PRODUCTS FROM HOT COMPRESSED WATER FRACTIONATION

DU CLOU H AND WALFORD SN
Sugar Milling Research Institute NPC, c/o University of KwaZulu-Natal,
Howard College Campus, Durban, 4041, South Africa
hduclou@smri.org  swalford@smri.org

Abstract

From a global perspective, lignocellulosic biomass is an abundant raw material that has the potential to provide intermediates for biofuels or valuable chemicals without competing with food crops. In South Africa, sugarcane bagasse cannot be considered as a freely abundant resource for possible biofuel production since it is used as a source of energy for the mill, other specialised products (animal feed, paper and chemicals) and for potential co-generation. Current and future uses will therefore limit the quantity of bagasse available for possible value added products. Value added products from bagasse would therefore need to be those which are low volume, specialised and have a higher monetary value than the current energy value.

Lignocellulosic biomass is composed of cellulose, hemicelluloses, and lignin that require fractionation for use as a raw material. Fractionation methods include physical methods (e.g. milling, ultrasonic, steam explosion) and chemical methods (e.g. acids, ionic liquids, hot compressed water). The method of fractionation used affects the type and quantity of the products and the potential to provide intermediate building block chemicals for value added products.

An investigation of the fractionation of bagasse using hot compressed water was carried out at the Sugar Milling Research Institute NPC. This poster details the design of the reactors and the development of various analytical techniques to determine the compounds arising from the fractionation of sugarcane bagasse with hot compressed water.

Keywords: bagasse, fractionation, hot compressed water, hemicellulose, cellulose, lignin

Biography: Heidi du Clou
Heidi du Clou joined the Sugar Milling Research Institute NPC (SMRI) in 2009 as a Research Assistant. During 2009 and 2010 the SMRI sponsored and co-supervised her research towards a Master’s Degree in Chemistry (MSc) in the area of polysaccharide structure determination through the University of KwaZulu-Natal. After the successful completion of her MSc in 2010, Heidi became one of the Research Officers at the SMRI. She is now currently involved in various research areas including projects which look at characterising gums in sugar processing streams, as well as the fractionation of biomass for application in the sugar industry. Her areas of interest lay in mass spectrometry, chromatography, carbohydrate chemistry, as well as method development.
PRELIMINARY ASSESSMENT OF SELECTED SOUTH AFRICAN BALL-MILLED SLURRIES

MADHO S AND RAHIMAN SN
Sugar Milling Research Institute NPC, c/o University of KwaZulu-Natal, Howard College Campus, Durban, 4041, South Africa
smadho@smri.org  srahiman@smri.org

Abstract

This poster paper reports on the progress made with assessing selected South African ball-milled slurries to assist in the choice of a slurry preparation method for southern African mills to follow.

Some laboratory crystallisation tests were performed on slurries of varying quality and assessed using median sizes, size coefficients of variance and crystal densities from an image analysis technique. The slurry crystals were grown at a constant temperature in the metastable zone of supersaturation and their growth properties determined. Also reported on is the large extent of dissolution of the crystals that occurred. Up to 70% of the original crystals introduced dissolved within the first 15 minutes of the tests, suggesting that slurry crystals below sizes 10-12 µm (from a cumulative size distribution) dissolve readily under typical panboiling conditions.

Stained slurry crystals were also used in the isothermal tests to show the extent of false nucleation that had occurred. Further to this, some factory tests with the stained slurries were performed to quantify the extent of ‘true seeding’ that occurs with ball-milled slurry graining.

Keywords: slurry, crystallisation, nucleation, panboiling, coefficient of variance, CV, median

Biography: Sayed Rahiman

Sayed Nawaazish Rahiman is a student employed on a contract basis at the Sugar Milling Research Institute. He received his Bachelor of Technology Degree in Chemical Engineering from the Durban University of Technology in 2013 and is currently focusing on his Masters Degree. His current work explores a mechanism of sucrose crystallization.
COMMERCIAL PRESENTATION

MANAGING SAFETY, HEALTH, ENVIRONMENT AND QUALITY (SHEQ) IN SUGAR, ETHANOL AND CO-GENERATION FACTORIES

MUZONDO BV AND HALSE G

5 Rydall Vale Crescent, La Lucia Ridge, Durban, 4019, South Africa
baldwin.muzondo@adaptit.co.za  gavin.halse@adaptit.co.za

Abstract

The global drive towards renewable energy has created new opportunities in the traditional sugar milling environments, with many investigations and ventures into ethanol production and co-generation. These activities bring to the sugar manufacturer new risk profiles and hazards that need to be adequately managed to ensure a safe workplace.

Effective management of safety incidents which encompasses their reporting, investigation and categorisation is a priority for every line manager. Adapt IT has developed SmartSURE to effectively manage safety, health, environment and quality (SHEQ) incidents from the time they are recorded to the time they are closed off and action plans implemented. SmartSURE also manages the determination of key SHEQ statistics, i.e. lost time injury frequency rates (LTIFR) according to preconfigured rules and categories.

With successful implementations at NCP Alcohols, Anchor Yeast and Eskom, Adapt IT understands the challenges of the ethanol and power generation industries. SmartSURE has been utilised to manage upwards of 700 safety incidents in a single calendar year at NCP Alcohols. The software is instrumental in their drive for excellence and certification in International Organization for Standardization (ISO) 9001:2008, ISO 14000 and Hazard Analysis and Critical Control Points (HACCP).

Reporting on the system is based on functional areas and/or line management responsibility, giving full accountability and control of all incidents. The structures of the functional areas are user defined and could include a back-end refinery or an attached ethanol plant as a separate factory for statistics. A built-in workflow ensures that all incidents are thoroughly investigated utilising templates, and escalations are triggered should timelines be exceeded for specific tasks and activities.

Keywords: ethanol, sugar, safety, SHEQ, safety management, incident

Biography: Baldwin Muzondo

Baldwin Muzondo, a Process Technologist at Adapt IT, has over 15 years’ experience in factory operations, performance determinations and performance reporting in the sugar industry. Muzondo joined Adapt IT in 2008 providing the industrial expertise required to make the company’s products the best in the sugar business. He currently consults in the area of scoping, designing and implementation of IT solutions for sugar and ethanol manufacturers.
COMMERCIAL PRESENTATION

LATEST DEVELOPMENT OF CENTRIFUGALS FOR HIGH AND LOW PURITY MASSECUITES

GEYER I

BMA AG, PO Box 3225, 38122 Braunschweig, Germany
sales@bma-de.com

Abstract

Centrifugals feature among the core equipment in sugar production. Consistent product development for increased efficiency has led to new BMA centrifugal series for both batch-type and continuous sugar centrifugation. With the new E series (batch) and the K3300 machine, completely new solutions can thus be implemented.

The new batch-type centrifugals have been developed on the basis of the latest calculation methods. Essential results are (a) a new basket design, with a much longer expected service life, (b) a compact housing that provides for smoother running thanks to its higher stability, and (c) a new discharger with only one motion axis. The syrup separation device accounts for the results of practical tests, which have led to a simple and yet highly effective solution.

The continuous K3300 centrifugal is also a completely newly developed machine. The basket incorporates an additional pre-separation stage and therefore provides for higher throughputs - at an enhanced sugar quality and lower power consumption. Thanks to a compact drive and housing, the machine also features (a) a small footprint, (b) easy operation, and (c) low maintenance requirements, because all parts are easily accessible.

The expectations placed upon these design innovations have been confirmed in practical operation.

Keywords: batch and continuous centrifugals, high/low massecuites, basket design, syrup separation, throughput, low maintenance

Biography: Irma Geyer

Born in Strasbourg, France, Irma graduated in analytical instrumentation and business administration. She is the head of BMA’s product marketing and standard business which major product is the centrifugal. She also covers her own sales territories, e.g. France, United Kingdom, Germany, Belgium and Switzerland. With more than 25 years of sales experience with high-technology equipment (nuclear spectroscopy, infrared spectroscopy, microwave technology), she has worked in the sugar industry since 2004, and joined BMA in October 2008.
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ACTOM John Thompson
Booth Number: 17
Sponsored: Congress delegate bags and flyers in delegate bags
Email: fabiom@johnthompson.co.za
Telephone: 031-408 9700
Website: www.johnthompson.co.za
Company description: We are a boiler and environmental solutions company serving the power generation and industrial markets, both locally and internationally, with innovation and enthusiastic response

Adapt IT (PTY) Ltd
Booth Number: 16
Email: nikki.beech@adaptit.co.za
Telephone: 031 514 7300
Website: www.adaptit.co.za
Company description: Adapt IT is the preferred supplier of business software to the sugar producers across the globe. We have been working with customers in agro-processing for over 15 years, to understand their challenges and create innovative solutions to address them. We pride ourselves on our long standing customer relationships, and our proven ability to create lasting business value through our services and products.

Anton Paar
Booth Number: 58
Email: info.za@anton-paar.com
Telephone: 011 021 5165
Website: www.anton-paar.com
Company description: On January 1, 2013, our new subsidiary Anton Paar Southern Africa opened its doors – to directly distribute Anton Paar’s high precision instruments in many Southern African countries. This new subsidiary, a joint venture with our longstanding sales partner Swiss Lab, provides customers in the region with fast on-site support and service for all product lines – and represents a dedicated local resource for trainings, product demos and more.

Bell Equipment Company SA (Pty) Ltd
Booth Number: 18 & 19
Sponsored: Flyers in delegate bags
Email: LeeE@bell.co.za
Telephone: 035-907 9239
Website: www.bellequipment.com
Company description: Born and bred in the hard African environment, Bell cane machinery has what it takes to thrive anywhere where conditions are extreme. Bell also provides a comprehensive range of construction, mining and agricultural machines.

Bilfinger Water Technologies / Johnson Screens
Booth Number: 8
Sponsored: Flyers in delegate bags
Email: sales@johnsonscreens.com
Telephone: +44 7979 69 1415
Website: www.water.bilfinger.com / www.johnsonscreens.com
Company description: As the manufacturer of the Johnson Screens brand, Bilfinger Water Technologies offers a wide range of products and services for the sugar industry. Bilfinger Water Technologies’ products and equipment provide low operating and maintenance costs, whilst providing maximum performance and functionality.

BMA / Sucrotech
Booth Number: 56
Email: engineering@sucrotech.co.za
Telephone: 031-5792211
Company description: Supply of technology plus the design and manufacture of equipment for the processing of sugar

BMG
Booth Number: 36
Email: laurenh@bmgworld.net
Telephone: 011-6201717
Website:
Company description: BMG is Africa’s leading distributor of dynamic engineering consumable products with a vast product range of premium branded products that is beyond comparison throughout Southern Africa. The range includes BEARINGS & SEALS, MOTOR & GEAR PRODUCTS, POWER TRANSMISSION COMPONENTS, FASTENERS, OSCILLATING SYSTEMS, CONVEYOR BELTING PRODUCTS, FILTRATION AND HYDRAULIC components. BMG is continually seeking to expand their range to provide a “total solutions” package to customers.

BNC Industrial Services
Booth Number: 28
Sponsored: Congress Lanyards
Email: vineshh@bncindustrial.co.za
Telephone: 031-902 6244
Website: www.bncindustrial.co.za
Company description: BNC Industrial Services CC is a service provider of high quality products to the Sugar Milling industry for the applications of Tube Descaling, Centrifugal services and a host of other specialised consumables. Included in this range is Batch and Continuous Screens, Mud Filter Screens, Batch and Continuous basket repairs.
Bonfiglioli S.A.

Booth Number: 4
Email: kevin.coull@bonfiglioli.com
Telephone: 031-7014150
Website: www.bonfiglioli.com

Company description: Bonfiglioli is a benchmark in the sugar processing industry for the supply of high quality power transmission equipment. This versatile range of industrial gearboxes provides solutions across a full spectrum of sugar processing applications and has earned it an unrivalled reputation for performance quality and reliability.

Bosch Projects (Pty) Ltd

Booth Number: 41
Email: mail@boschprojects.co.za
Telephone: 031-535 6000
Website: www.boschprojects.co.za

- Feasibility Studies and Factory EMB’s
- Complete Sugar Factories and Refineries
- Cogeneration
- Ethanol Plants
- Sugar Equipment Design and Supply
- Sugar Cane Agriculture

Brenley Engineering Sales

Booth Number: 5
Email: dudley@brenley.co.za
Telephone: 013-751 1417
Website: www.brenley.co.za

Company description: The range of products that is sold and serviced by Brenley has led to the building of a solid customer base within leading companies in South Africa, Swaziland, and Mozambique. Brenley Engineering supplies a range of highly specialized instruments.

Brevini Power Transmissions

Booth Number: 39
Email: ccrause@brevinisouthafrica.co.za
Telephone: 011-421 9949
Website: www.brevinisouthafrica.com

Company description: Brevini planetary gearboxes have a complete range of modular design gearboxes, combines high performance with low cost and compact size. Many years of successes achieved testifies to the excellent quality and reliability, simple installation and limited maintenance. A vast range of input and output options and standard accessories are available.

Bruker SA Pty Ltd

Booth Number: 7
Email: neil.oosthuizen@bruker.co.za
Telephone: 011-4636040
Website: www.bruker.com/za

Company description: Bruker is the leading supplier of FT-IR and FT-NIR instrumentation in the sugar and soil industry. FT-IR is used for the analysis of soil samples for components like organic carbon and clay. FT-NIR is used for the analysis of mixed juice, molasses etc. for POL, BRIX, Sucrose, Fructose, Glucose, Ash and Dry matter. The analysis of raw and refined sugar is also performed with the FT-NIR and components like POL, Colour, Moisture, Dextran and Starch are performed. A complete Cane Presentation System, consisting of shredder, presentation system and NIR is also available for the analysis of POL, BRIX, Moisture and Fibre on shredded cane.

Buckman Africa

Booth Number: 29
Sponsored: Authors Dinner
Email: wsdevalence@buckman.com
Telephone: 031-736 8800
Website: www.buckman.com

Company description: Extract all the value you can from your mill with solutions from Buckman! Just as you want to get the most from your extraction, you want to extract all the value you can from your process using Buckman speciality solutions. We don’t only know our own business, but also yours.

CarboUA Ltd

Booth Number: 32
Email: info@carboua.com
Telephone: +13109277125
Website: www.carboua.com

Company description: CarboUA manufacture high performance process aids for sugar milling and refining industries. Our products and services assist our customers in the following areas: 1 Improve capacity. 2 Reduce energy consumption. 3 Solve quality problems. 4 Lower conversion costs. 5 Reduce Sugar Loss. We also have a process engineering consultancy division.
CLM Positioning Solutions
Booth Number: 59
Email: tim_hulley@sitech.co.za
Telephone: 011-7087206
Website: www.clmps.com
Company description: CLM is a Trimble Construction Æ Trimble AG dealer. We supply advanced positioning solutions that maximise productivity Æ enhance profits. We provide precision farming, survey equipment, machine control, GPS and Auto Pilot machines.

Dresser-Rand
Booth Number: 30 Æ 31
Email: merasmus@dresser-rand.com
Telephone: 031-5848181
Website: www.dresser-rand.com
Company description: Dresser-Rand is a world leader in designing, manufacturing, installing, commissioning and servicing of steam turbines from 1kW to 100MW. The company has considerable experience in the sugar industry and has been designing and manufacturing steam turbines for more than 100 years. Dresser-Rand also provides parts, upgrades, revamps and completely new engineered internals for all makes of turbines through its industry leading Applied technology.

Elgin Engineering
Booth Number: 22
Sponsored: Congress pens and notepads
Email: mervinr@elgin.co.za
Telephone: 031-274 0000
Website: www.elgin.co.za
Company description: Since 1949, Elgin Engineering’s team have been the go-to guys for local sugar producers, manufacturing new machinery and ensuring that existing equipment is maintained in working order. Elgin supplies more than 350 sugar rolls per year to the global sugar industry and has a workshop specially dedicated to the manufacture and maintenance of all types of sugar industry plant and equipment. We are able to undertake fabrications and castings of any size using our own large scale foundry and furnace facilities. Elgin’s comprehensive capabilities include:
• Sugar milling equipment including shredders, cane knives, mills and hilo unloaders.
• Sugar process equipment including diffusers, vacuum pans, crystalisers, evaporators and juice heaters.
• Sugar maintenance spares including mill rolls/reshells, scrapers/trash plates, cane knives/shredder rotors, pinions and mill bearings.
- Level 2 BBBEE rated company, NOSA 4 Star safety rating, ISO 9001: 2008 accredited, SA Institute of Welding ISO 3834 certified and Gold Medal winner.

Filter Focus
Booth Number: 14
Email: info@filterfocus.co.za
Telephone: 011 466 1268
Website: www.filterfocus.co.za.
Company description: Filter Focus are successfully established as global leaders in Reliability Engineering and Wear Control; offering industry substantial and quantifiable performance improvements to Plant and Equipment. We combine expertise in the fields of Filtration, Lubrication and Tribology; yielding considerable financial benefit to our Customers, while diligently conserving the environment.

Fives Fletcher
Booth Number: 60
Email: fivesfletcher@fivesgroup.com
Telephone: 0044-1332636000
Website: http://www.fivesgroup.com/Fivescall/EN/Pages/Home.aspx
Company description: Fives Fletcher and Fives Cail design and supply process equipment and complete plants for cane raw, beet and refined sugar industries throughout the world. We focus on high energy efficiency equipment covering all stages of the sugar process; wherever possible we manufacture locally to keep costs down.

GEA Nilenca (PTY) Ltd
Booth Number: 26
Email: eddie.wepener@gea.com
Telephone: 011-805 6910
Website: www.geanilenca.co.za
Company description: GEA Africa Heat Exchangers is responsible for a wide range of Heat Exchanger Technology, with its key strength is its ability to address and provide process related solutions through in-house expertise, offering state of the art equipment backed by services in many fields and competent maintenance and spare parts.
Hagglunds Drives South Africa

Booth Number: 27
Email: info@za.hagglunds.com
Telephone: 011-454 4933
Website: www.hagglunds.com

Company description: Our compact and modular solution will prepare you for the demands of today and tomorrow. You can rest assure that your milling process is in reliable hands with our flexible solution that will maximize your production and allow you to focus on your core business. Let us know your demands.

Industrial Water Cooling

Booth Number: 9 & 10
Email: mail@iwc.co.za
Telephone: 011-4660699
Website: www.iwc.co.za

Company description: IWC offers a range of heat exchangers and cooling towers for many applications and the servicing and maintenance of all plate heat exchanger and cooling tower brands. We also design, manufacture and supply fibreglass components for industrial applications such as pipes, tanks and acid resistant linings to name a few.

ITECA Socadei SAS

Booth Number: 50
Email: Claire.rua@iteca.fr
Telephone: +33 442977700
Website: www.iteca.fr

Company description: ITECA has long been developing specific sensors for sugar industry. Since 2002, its Colour & Vision Department has created requirements based on colour analysis and image processing. With a worldwide presence in Sugar Industry, ITECA devices help optimizing crystallization allowing customers to fully control their production at a lower cost.

John King Chains SA (PTY) Ltd

Booth Number: 54
Email: frikkier@jkc.com
Telephone: 011-8943570
Website: www.johnkingchains.com

Company description: John King Chains SA , is part of an international leading Chain manufacturer and distributor . We strive to offer the best quality products and also a guaranteed 24 hour service on breakdown. Our products range from: transmission chains, British and metric conveyor chains, forged chains, agricultural chains, heavy drive chains, round link and combination chains, leaf chains and cast link chains, sprockets, taper locks and accessories.

Company: Johnson Screens

Booth Number: 8
Sponsored: Flyers in delegate bags
Email: saleseurope@johnsonscreens.com
Telephone: +44 7979 69 1415
Website: www.water.bilfinger.com

Company description: Johnson Screens will now trading as Bilfinger Water Technologies, providing you with the highest quality products, service and reliability for the sugar industry. Please visit www.water.bilfinger.com or ask our staff how Bilfinger Water Technologies can help you.

Lakeside Equipment

Booth Number: 33
Email: tony@lakesidequipment.co.za
Telephone: 031-7002137
Website: www.lakesidequipment.com

Company description: Manufacturer of positive displacement pumps.

Mecosa (Pty) Ltd

Booth Number: 11
Email: measure@mecosa.co.za
Telephone: 011-257 6100
Website: www.mecosa.co.za

Company description: Mecosa (Pty) Ltd is a leading supplier of Process Measurement Instrumentation in Southern Africa. In the sugar industry Mecosa (Pty) Ltd specializes in Brix concentration, density, moisture, flow, level, pressure, pH and conductivity measurement. Mecosa (Pty) Ltd has been serving the industry for more than 30 years and continues to grow from strength to strength.

Mthiyane Engineering Services (MES)

Booth Number: 55
Email: turner34@iafrica.com
Telephone: 031-3052400
Website: www.cmgpumps.com

Company description: MES (Mthiyane Engineering Services) is the manufacturer and distributor of the CMG Masscuite Pump & Representative of Western States Centrifuges Africa
Netafim

Booth Number: 25
Email: san-mariev@netafim.net
Telephone: 021-9870477
Website: www.snetafim.co.za

Company description: Netafim is the global leader in smart drip and micro-irrigation solutions for a sustainable future. Over the past 21 years Netafim has earned a reputation for outstanding quality in product and service delivery. The knowledge in Netafim South Africa, through its people and the support from Netafim International, is the key to its success.

NG Allen Steam Turbines

Booth Number: 13
Email: ed.cliffe@weirgroup.com
Telephone: +44 7795 527800
Website: www.weirallensteamturbines.com

Company description: NG Allen Manufacture Steam Turbines from 0.5MW to 65MW for power generation and mechanical drive applications. In 2011 we supplied a 30MW extraction - condensing turbine to RSSC for their Simunye sugar factory. NG Allen work with TGS to provide local erection, commissioning and maintenance service as well as spare parts.

PGBI Engineers / group

Booth Number: 42
Email: info@pgbi.co.za
Telephone: 031-2023098
Website: www.pgbi.co.za

Company description: PGBI brings together a team of highly acclaimed technologists who offer a variety of specialist services to the sugar, ethanol, bio-fuels, power generating industries. These services include specialist project development, engineering, management and feasibility advice.

Praj Industries Ltd

Booth Number: 44
Email: SohiniDam@praj.net
Telephone: 0091-9096053312
Website: www.praj.net

Company description: Praj is a global Indian company that offers innovative solutions to add significant value to bio-ethanol facilities, brewery plants, water & wastewater treatment systems, Livestock Health & Nutrition products as well as process engineering, plant & equipment for customers worldwide. With over 500 references across five continents, Praj is a leading Ethanol Technology & Plant supplier with a strong focus on second-generation bioethanol process development. Praj Matrix - the innovation center, is the R & D Center of Praj Industries. Praj is a knowledge-based company with expertise and experience in bioprocesses and engineering. It delivers know-how, license, engineering design, plant & equipment, project management, commissioning and customer care, and turnkey projects. Led by an accomplished and caring leadership, Praj is a socially responsible corporate citizen. Praj is listed on the Bombay and National Stock Exchanges of India.

Process Valve Corp

Booth Number: 57
Email: paul@processvalve.co.za
Telephone: 031-7091777
Website: www.processvalve.co.za

Company description: Process Valve Corp is an industrial valve stockist distributor formed in 1987, specialising in mechanical and instrumentation Control Valves for “high end” applications. Steam, chemical, extreme pressure/temperature and difficult conditions are our field of speciality. Offering five stocking branches nationally with fully trained staff and repair facility in Durban.

Ronin GMS

Booth Number: 37
Email: edward@roningms.com
Telephone: 011-608 3666
Website: www.roningms.com

Company description: RoninGMS, RoninIS and RoninPFS are represented at SASTA this year, combined we offer affordable and highly accurate dry bulk inventory management solutions to mining and industry along with precision farming systems for agriculture. In addition we also provide on-board weighing and pedestrian detection systems with early warning facility.

Samco pumps (PTY) Ltd

Booth Number: 6
Email: Jason@samcopumps.com
Telephone: 031-7005858
Website: www.samcopumps.com

Company description: One of Kwa Zulu Natal’s biggest pump & supply companies. Committed to meeting all our customers needs - 24 Hours A Day. We offer a turn key solution to the pump industry, from supply, system design, service contacts and mechanical repairs for all industrial, process and general applications covering common or exotic material builds. Samco offers in house machining, seal refurbishing, motor repairs and fabrication facilities, which includes a pump test facility. If It Can Be Pumped We Can Do It For You Cost Effectively & Efficiently.
SGM Marketing

Booth Number: 34
Email: simon@sgmmarketing.co.za
Telephone: 031-5695514
Website: www.sgmworld.com

Company description: The SGM factory is based in Durban, South Africa. We are fully equipped to supply, service and repair all Enerpac, Brevini and Skatoskalo products as well as various engineered parts and pumps. Over the last 25 years, we have built strong business relationships with our OEMs, thereby ensuring streamlined processes and very competitive prices.

Sivest SA (Pty) Ltd

Booth Number: 47
Email: info@sivest.co.za
Telephone: 031-581 1500
Website: www.sivest.co.za

Company description: Sivest is a leading provider of engineering, project management, and construction services to the sugar and related sectors, including ethanol and power, both in the factory and agricultural areas.

Sizonke Trading Durban (PTY) Ltd

Booth Number: 15
Email: info@sizonkegroup.co.za
Telephone: 031-7004220
Website: www.sizonkegroup.co.za

Company description: CHESTERTON: Greases, De-Greases, Lubricants, Mechanical Pump packing, Mechanical seals, Hydraulic & Pneumatic Seals, Spiraltrac Environmental Controllers and much more

South African Sugar Association (SASA)

Booth Number: 20
Email: Jennifer.Crawford@sasa.org.za
Telephone: 031-5087031
Website: www.sasa.org.za

Organisation description: The South African Sugar Association provides a range of specialist services that enhance the profitability, global competitiveness and sustainability of the South African sugar industry. This R12 billion industry is one of the world’s leading cost-competitive producers of high quality sugar.

South African Sugar Technologists’ Association (SASTA)

Booth Number: 52 & 53
Email: sasta@sugar.org.za
Telephone: 031-5087543
Website: www.sasta.co.za

Organisation description: SASTA, founded in 1926, is an association of people interested in the technical aspects of the SA sugar industry. SASTA operates under the aegis of the South African Sugar Association, but is governed under its own constitution by a Council, elected by its members. SASTA organises the annual SASTA Congress, 2013 being the 86th! Workshops, visits to factories, farms and sites of interest are periodically arranged around topical issues. SASTA publishes the annual Congress Proceedings and the official methods SASTA Laboratory Manual.

SQR Software

Booth Number: 21
Email: Egmont@sqrsoftware.co.za
Telephone: 033-3475491
Website: www.sqrsoftware.com

Company description: SQR Software develops, markets and supports CanePro. CanePro is an agricultural information management and decision support system developed specifically for large commercial sugarcane growing operations.

Sugarequip (Pty) Ltd

Booth Number: 23
Email: finance@sugarequip.co.za
Telephone: 031-2010285
Website: www.sugarequip.co.za

Company description: Sugarequip is a manufacturer and supplier of cane sugar equipment worldwide.

Sugar Milling Research Institute NPC

Booth Number: 24
Email: gsmith@smri.org
Telephone: 031-2731300
Website: www.smri.org

Company description: The Sugar Milling Research Institute (SMRI) is the central scientific organisation involved in research work and technical services for the Southern African sugar industry.

Thermal Valve Manufacturers (Pty) Ltd

Booth Number: 48 & 49
Email: kznsales@t-v-m.com
Telephone: 031-914 2742
Website: www.tvm.co.za

Company description: TVM is an experienced 100% black women empowered company rated B-BBEE level 1. We specialise in reconditioning and distribution of valves.
Thomas Broadbent & Sons Ltd

Booth Number: 51
Email: sugar@broadbent.co.uk
Telephone: 0044-1484477230
Website: www.broadbent.co.uk

Company description: Thomas Broadbent design, manufacture and supply a full range of batch, continuous and decanter centrifugals together with ancillary equipment such as mixer tanks, for the sugar cane, beet and refinery industries Worldwide.

Topcon Precision Agriculture

Booth Number: 1
Email: chelm@topcon.com
Telephone: 083-233 5497
Website: www.topconpa.com

Company description: Topcon Precision Agriculture develops and manufactures leading-edge satellite positioning and guidance systems, electronic controls, mapping, monitoring, and land-leveling solutions for agriculture. Topcon has more than 25 years experience in agriculture and provide you with solutions for all the challenges you face.

Triveni Turbine Ltd

Booth Number: 43
Email: santosh.mc@triveniturbines.com
Telephone: +91 963 2366511
Website: www.triveniturbines.com

Company description: Triveni Turbine Ltd. has over 2500 installations across 40 countries with an impeccable 24/7 customer service & manufacturing capacity of 150 turbines per year, strategic positioning globally and 180 trained personnel to address customer service needs within 24 hours of call. We have a 50-50 JV with GE OIL & GAS for manufacture of steam turbines >30 mw up to 100 mw under GE-Triveni brand name.

Turbine Generator Services

Booth Number: 13
Email: jfield@tgs.co.za
Telephone: 031 705 3500
Website: www.tgs.co.za

Company description: Turbine Generator Services offers a wide range of specialist services to satisfy our customer’s power generation needs, from routine maintenance to major overhauls and complete co-generation upgrades. These services are enhanced by our principals, NG Allen, Allen Gears and Dawson Technology.

Turbofluid

Booth Number: 45
Email: shaun.a@turbofluid.co.za
Telephone: 031-7002525
Website: www.turbofluid.co.za

Company description: Turbofluid is a multi-disciplinary engineering and manufacturing company with its primary focus being on the Pump industry. We have serviced and maintained the sugar industry for more than 25 years with a large number of our products being standardised in many local and international sugar mills from South Africa to Thailand. Our product range covers the entire sugar manufacturing process.

Weir Power and Industrial TGS

Booth Number: 12
Email: powerindustrial@weirgroup.com
Telephone: 011-9292929
Website: www.weirpowerindustrial.com

Company description: Weir Power & Industrial are industry leaders in products and services for critical control & isolation applications. Our portfolio of products supports global best practice in power generation & oil & gas safety. Our customers include the world’s leading companies in these industries as well as the general industry.

Wirsam Scientific & Precision Equipment

Booth Number: 46
Email: miriana@wirsam.com / Jordan@wirsam.com
Telephone: 031 4821060
Website: www.wirsam.com

Company description: Wirsam Scientific was established in 1968 by Managing Director Peter Wirsam. Throughout its proud 45 year history, Wirsam has entrenched itself as one of the continents leading supplies of laboratory instrumentation. The company is categorised into Microscopy, Analytical, Material Testing, Petrochemical and General Laboratory Instrumentation divisions. To compliment the holistic product range, Wirsam has a fully equipped workshop providing complete sales and service capabilities via the head office (Johannesburg), and across South Africa’s major business centres (Cape Town, Durban, Port Elizabeth and Vanderbijlpark).
Zest Electric Motors

Booth Number: 35&38
Email: marketing @zest.co.za
Telephone: 0861009378
Website: www.zest.co.za

Company description: The ZEST WEG Group boasts an extended product line-up from electric motors to variable speed drives, soft starters, LV & MV switchgear to power transformers, diesel generator sets, motor control centers, electrical & instrumentation design, co-generation & energy solutions. The group comprises Zest Electric Motors; Shaw Controls; EML, Eni and Zest Energy.

EDITORIAL PANEL 2013

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Dr Sumita Ramgareeb (Editor: Agriculture), Dr Deborah Sweby (Editor: Agriculture),
Mrs Dorothy Carslow (Technical editor), Mrs Danile Macdonald (Administrative)

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Bester, Morne Harrison, James  Naidoo, Lola  Schumann, Arnold
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Bonnet, Graham Hurly, Kathy  Ortmann, Gerald  Smith, Gavin
Comstock, Jack Jackson, Phil  Pakendorf, Klaus  Van Antwerpen, Rianto
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Cronje, Pieter Lewis, Fonda  Piperidis, George  Van der Laan, Michael
Davis, Steve Love, Dave  Ramburan, Sanesh  Walford, Stephen
Dignon, Deric Madho, Shaun  Redshaw, Kerry  White, Bill
Du Preez, Chris Modi, Albert  Rutherford, Stuart  Wynne, Adrian
Gielink, Andrew Moore, Gavin  Samson, Peter
The 86th SASTA Congress Proceedings are now available on the Web

- The 86th Congress Proceedings will be available on-line to all paid delegates attending the 86th SASTA Congress.
- All paid delegates will be sent an email with a link to the Proceedings Web Page (www.sasta2013.co.za) and login instructions.
- Delegates will receive this email notification by 08h00 on 6 August 2013.
- Delegates who have registered on-site will be sent login instructions after Congress.
- In the event that a password is lost the delegate shall be able to obtain a new password via his/her registered email address.

Instructions for Access

- Users will first be directed to the sasta2013.co.za homepage (from the email that is sent) where they will be prompted for their username (which will be their email address) and password (which will be included in the email).
- Once the username and password has been entered users will have full access to the Congress Proceedings. These will be in a user-friendly, structured and organised format.
- Users will be allowed to change their password, to whatever they like, as long as it follows the safe password guidelines specified.
- If a user loses their password, they can request their password to be sent to their registered email address, from a “Request a New Password” link.

If any user has queries or difficulties they can contact the Administration team. Contact details are on the webpage and in the email instructions.
## Former Presidents

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## Former Vice-Presidents

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## Council of the Association 2012-13

- CN BEZUIDENHOUT
- K McFARLANE
- S RAMGAREEB
- PM SCHORN
- DL SWEBY (Congress Chair)
- A VAN DER NEST (Treasurer)

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- Patron: B LINDA
- Vice-President: KA REDSHAW
- Congress Chair: DL SWEBY
- Treasurer: AJ VAN DER NEST