SUSTAINABLE SUGARCANE PRODUCTION – THE 2012 ISSCT AGRONOMY AND AGRICULTURAL ENGINEERING WORKSHOP

By

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Abstract

The ISSCT Agriculture Commission Workshop on *Sustainable Sugarcane Production*, was held in Townsville, Australia from 9-14 September, 2012. The workshop attendees included 120 participants from 15 countries, and 66 papers (41 oral and 25 poster) from Australia, Brazil, China, Ecuador, India, Israel, Japan, Kenya, Mauritius, South Africa, Thailand, USA and Zimbabwe were presented. The workshop oral sessions included seven themes on nutrient management and implications for water quality, sugarcane agronomy, precision agriculture, harvesting and mechanisation, farming systems and productivity, climate change and gaseous emissions, and sugarcane nutrition. The poster session topics included main themes of sugarcane nutrition, harvest management and varietal selection. Sugarcane nutrient use, in terms of its effect on water quality, climate change, and sugarcane nutrition, was a topic that spanned several of the workshop themes. The organising committee, Bernard Schroeder, Kylie Wilford, David Calcino, Andrew Wood, Cam Whiteing, Marian Davis and Craig Baillie, used their extensive local knowledge to put together a comprehensive program, with many of the local issues highlighted in the field trips. For the first time, early career best presentation awards were presented, awarded to M. Empson and S. Ramburan. However, judging was difficult as there were many high-quality presentations from early-career scientists indicating a promising future for sugarcane research.

Introduction

An ISSCT Agriculture Commission Workshop was held in Townsville, Australia from 9 to 14 September 2012. The theme of the workshop was *Sustainable Sugarcane Production*. The workshop brought together the Agronomy and Agricultural Engineering sections and saw three days of presentations, posters and discussion, interspersed with day-long field trips south to the Burdekin region and north to the Herbert region. It was attended by 120 participants from 15 countries, presenting a total of 66 papers or posters from 13 different countries. Financial support was given by a number of sponsors with CANEGROWERS and MSF Sugar the Platinum Sponsors.

The organising committee, Bernard Schroeder, Kylie Wilford, David Calcino, Andrew Wood, Cam Whiteing, Marian Davis and Craig Baillie, used their extensive local knowledge to put together a comprehensive program around seven themes, with many of the local issues highlighted in the field trips. They also ensured that delegates were treated to a cornucopia of Australian hospitality through a welcoming function, a casual BBQ and a workshop dinner including a didgeridoo player and various ‘national’ presentations.

Opening

Rob Gilbert, the Agriculture Commissioner, delivered the opening keynote address on trends, opportunities and challenges for sugarcane agronomy. Sugarcane is increasing in worldwide importance as both a food and fuel crop, but there is public concern regarding the environmental effects of growing sugarcane, including water quality and quantity, air quality and soil sustainability. In addition, urbanisation and increasing competition for land make sugarcane production less profitable than other alternatives for some growers. The world economic downturn has also led many private and public institutions to reduce investment in R&D, leading to budgetary difficulties for many research organisations. In contrast, world market prices for sugar are high and some organisations have been able to increase investment in capital expenditure and R&D. Increasing interest in biofuels has increased demand for sugarcane and led to expansion of sugarcane production to new areas. As evidenced by the papers presented at this workshop, there is worldwide interest in sugarcane water quality, nutrient management and farming systems research. Agronomy as an integrative discipline will have an increasing role to play in coordinating research on complex topics such as green-cane harvest, water management, and farming systems on marginal lands.

Session 1: Nutrient management and Implications for Water Quality

The Queensland industry has a strong focus on nutrient use, because of a recognition that overuse is simply wasting money, and through concerns about the on-going environmental health of the nearby Great Barrier Reef (GBR). The latter saw the introduction of legislated mandatory soil testing and record keeping of nutrient inputs together with restrictions on the amount of nitrogen and phosphorus fertiliser that can be applied to sugarcane.

Wood *et al.* outlined the SIX EASY STEPS program, an integrated nutrient management package developed in Australia to facilitate the adoption of best-practice nutrient management by sugarcane growers. The program provides guidelines that lead to sustainable, soil-specific and balanced nutrient management across the industry. Whilst the methodology for calculating the legislated 'optimum' amount of N and P was derived from the SIX EASY STEPS program, the flexibility for varying application rates based on local knowledge has been reduced and has made it more difficult to alter N and P guidelines as more knowledge about particular soils becomes available. They reviewed some of the issues that have arisen since the regulations.

Skocaj *et al.* outlined work in the Wet Tropics area of Queensland to incorporate weather forecasting into the nutrient guidelines of SIX EASY STEPS. Current N calculations are limited in their ability to match N fertiliser inputs to crop requirements, as they do not consider the impact of natural climate variability despite its influence on sugarcane growth and N loss pathways. Use of seasonal weather forecasting to predict forthcoming sugarcane yields may allow N application rates to be tailored annually to suit more realistic yield potentials. The major challenge is determining an optimum N requirement that maximises profit and minimises environmental losses.

Imposition of legislated rates also raised industry concerns over its potential to negatively impact profitability and/or supply security, especially in Queensland's largest-producing area of the Burdekin. Responding to these concerns, Connellan and Schroeder established 10 trial sites in commercial plant cane to test responses to the rate determined using the regulated method (approx. 170 kg/ha of N), a rate significantly less than this (approx. 130 kg/ha of N), a rate with which growers associate (approx. 210 kg/ha of N) and a rate considerably higher than these (approx. 250 kg/ha of N). Key parameters being monitored include biomass accumulation, sugarcane yield and sugar yields. At the conclusion of this project, partial net grower returns per hectare for each N rate will be calculated, and the optimum N rate that maintains the profitability of sugarcane production will be identified with due consideration for environmental impacts.

Thorburn and Wilkinson used modelling to better understand relationships between nitrogen fertiliser management and dissolved nitrogen exports from GBR catchments. They concluded that N surpluses are much higher in sugarcane (> 100 kg/ha) than grains (~10 kg/ha). They tested two 'best' management scenarios, the current standards recommended by industry and/or government, and 'agri-environmental practices' (AEP) designed to meet environmental outcomes while maintaining productivity (Webster *et al.*) and predicted that only widespread adoption of the AEP will meet water quality improvement targets. However, it is unlikely that AEP will be adopted to the extent needed

and in the time frames needed to meet the targets as they are generally unproven in local cropping systems.

Milla and Davis worked with two Burdekin, Australia growers to determine the impacts of agronomic, production and environmental shifts to principles of the sugar industry's improved farming system. On one site the grower implemented controlled traffic, optimised nutrient and herbicide applications, used minimal amounts of residual herbicides, banded herbicide applications and scheduled furrow irrigation on the basis of soil moisture. These improved profitability through reduced inputs whilst maintaining yields. The second grower trialled the benefits of drip irrigation against furrow irrigation with interim results indicating reduced crop and labour inputs through drip irrigation.

A second concern in the GBR catchment has been sediment loss. Although green-cane harvesting and trash blanketing practices have been adopted broadly (80%), sediment export rates from catchments with high proportion of sugarcane production is high (4-5 t/ha/y). Empson *et al.* are using APSIM to simulate runoff and erosion on a daily scale for a crop cycle and over different management practices (controlled traffic, conventional, skip row planting, etc.). The results will be assessed in terms of reducing sediment loads that leave sugarcane fields and the capacity and potential to achieve a more sustainable and profitable sugar production.

However, nitrogen utilisation and loss is not the only nutrient issue. In a paper from Mauritius, Soobadar and Ng Kee Kwong looked at the impact of vinasse, when applied at high rates to sugarcane lands, on groundwater quality. They studied this in concrete lysimeters at two experimental sites with different rainfall regimes. Analyses of the leachates showed that vinasse at 100 m^3/ha did not enhance loss of P and nitrate-N. Fluorescence quenching studies of the dissolved organic matter and of its dialysis fractions confirmed the formation of complexes of the dissolved organic matter with copper. However, enhanced mobility of heavy metal cations down the soil profile did not occur and Cu, Ni and Zn concentrations remained well below WHO drinking-water limits. Groundwater quality in Mauritius would not be impaired by the disposal of high rates of vinasse on sugarcane land.

Delivery of excess phosphorus (P) is a major cause of eutrophication and ecosystem imbalances to the Florida Everglades. A mandatory Best Management Practice (BMP) program was implemented in 1995 to reduce P loads from drainage waters that enter the Everglades ecosystem. The program focuses on improving water quality exiting farm canals by implementing and verifying BMPs for reducing P loads, and through continuing educational BMP seminars and training workshops. BMPs are divided into three categories, water management, nutrient management and sediment controls. Two BMPs commonly used by most Everglades growers are soil testing and banding of P fertiliser. Bhadha *et al.* showed that the basin's P load reduction has averaged > 50% yearly since the BMP program's inception, with a record 79% reduction in 2011, attesting to the success of the partnership between the growers and extension personnel.

Session 2: Sugarcane Agronomy

This session saw five somewhat disparate papers illustrating the breadth of agronomic R&D.

Ramburan and Singels (South Africa) used the Canesim model to quantify environmental effects in cultivar trials with the aim of making more meaningful interpretations of cultivar performance. They simulated yields of two hypothetical cultivars (quick and slow canopy) in eight series of rainfed multi-environment cultivar trials. The 'adaptability' of each hypothetical cultivar to different environments was examined using genotype + genotype x environment (GGE) biplot analysis, illustrating a method to determine the efficacy of selection criteria for specific environments. Agro-climatic indices such as a crop water stress index (simulated evapotranspiration as a fraction of potential evapotranspiration), heat units, intercepted solar radiation and effective rainfall were calculated for each phase and statistically related to yield components. They showed that sugarcane crop models can be used to provide new insights into cultivar performance in given environments.

Potentially serious consequences of lodging on sugarcane productivity have not been quantified in South Africa, nor has the efficacy of Ethephon and Moddus to reduce lodging been investigated adequately. Van Heerden *et al.* used two irrigated field experiments where lodging was prevented with bamboo scaffolding or where Moddus and Ethephon were applied to young plants at the ninth-leaf stage. Where severe lodging occurred 10 weeks prior to harvest, prevention of lodging with bamboo scaffolding resulted in improved sugar yields. Where lodging was less severe, effects on

sugar yields varied between the varieties N25 and N36. Moddus gave only minor improvements in lodging resistance. Treating with Ethephon at the ninth-leaf stage improved sugar yields in N25 to levels achieved in the scaffolded plots where no lodging occurred. The underlying mechanism and consistency of this ameliorative effect across varieties requires further investigation.

Full retention of sugarcane post-harvest residue often reduces ratoon crop yields in temperate climates such as Louisiana. Viator used several approaches to determine an alternative to field burning of post-harvest residues. Varietal screening trials showed that commercial varieties currently grown in Louisiana have yield loss associated with non-removal, as compared to complete removal by burning, but that L99-226 yielded significantly higher than other varieties when grown with full residue retention. All mechanical removal methods produced yields lower than burning but higher than full retention. Increasing nitrogen rates did not aid in mitigating any yield loss. Finally, self-defoliating varieties demonstrated that early defoliation did not reduce the level of post-harvest residue, providing no advantage to the traditional variety in terms of residue management. The results highlight the difficulty in developing economical and practical residue management techniques that maintain sugarcane yield.

Ng Cheong and Teeluck described a decision-making tool for the sustainable management of irrigation in Mauritius and other African-Caribbean-Pacific countries. Irrigation application at different times of water scarcity has been prioritised, taking into consideration the age of the crop and its development stage. The software also addresses the availability of water from different sources and their relative flow rates, the application of deficit irrigation practice and the effect of water-conserving practices such as trash-blanketing. The end product will be flexible, user-friendly software that will give irrigation instructions for an entire farm on a daily basis and that will allow the easy visualisation of the soil water status of different irrigation management units through a GIS display.

Finally, Rice *et al.* described a University of Florida/IFAS and USDA-ARS extension model to cope with an outbreak of sugarcane orange rust (OR) in the Americas. ARS provided molecular identification tools to international sugarcane organisations and received suspect leaf samples for analysis. UF/IFAS Extension organised two international OR workshops, with on-site presentations from scientists. Workshops were video-streamed to an international audience, and interactively 'captured' off-site presentations from scientists in USA, Costa Rica, Guatemala and Brazil. Topics included successful scouting/fungicide programs, visual OR rating system, environmental factors favouring OR epidemics, impacts to internationally popular CP varieties, evolving molecular detection techniques, and OR-resistance breeding strategies. Workshop attendance was 167 (on-site) and > 1000 (off-site). This creative approach not only accelerated the dissemination of OR-related technologies from Florida to others, but also shared OR experiences from leading Central/South American sugarcane research institutions.

Session 3: Precision Agriculture

The session commenced with an invited presentation from Bramley (Australia) outlining opportunities for improved management of sugarcane production through precision agriculture. The recent availability of a suite of Precision Agriculture (PA) technologies provides the basis for recognising that a single uniform management strategy for each field may be far from optimal. Instead, information at high spatial resolution about a field's biophysical characteristics and performance is used as the basis for targeting management within it. Before targeted management can be implemented, some key questions need to be addressed, including: Can variation in production be measured robustly and is it of sufficient magnitude to warrant a change from conventional uniform management? Is the spatial variation temporally stable? Can the causes of this variation be identified and, if so, are management responses available which deliver an economic (and/or environmental) benefit? Bramley explored these questions and the opportunities presented by PA. Key findings include the dominant effect of variable access to soil water in driving yield potential, the consequent value of high resolution soil and topographic survey, and opportunities for targeting inputs, selective harvesting, product streaming and new experimental approaches.

Garcia *et al.* (Australia) outlined the use of Critical Control Point theory to identify PA technologies relevant to sugarcane farming, as well as constraints for farmers to adopt PA. Key factors driving sugarcane production will be identified and a monitoring system established to ensure that the optimum management is in place in order to optimise the production. A flowchart of the

process will be constructed and a series of questionnaires will be prepared to identify important factors influencing yield. This will help in defining and evaluating risk factors for problems, defining critical control points and choosing alarm values for the critical control points.

On-harvester yield monitors have been used to measure within-block yield, but recent work suggests that there are several areas in which there was room for marked improvement in commercially available sensors. Jensen *et al.* (Australia) evaluated some of the measurement concepts, including the pressure drop across the elevator and chopper motors, a load cell in the elevator floor, the angle of opening of the top feed roller, and an optical sensor measuring the presence of billets on the elevator flights. There are considerable similarities among the yield monitoring concepts in terms of their ability to measure yield, but how the sensor data are recorded and managed is critical to the accuracy and overall performance of such yield monitors.

Two presentations described Australian work on a machine-vision system to provide PA herbicide application. Rees *et al.* described a system that discriminates sugarcane from Guinea grass. The system combines shape analysis of colour images with depth images to assign depth information to individual grass leaves. Discrimination of Guinea grass from sugarcane is achieved based on the relative 3D positions of leaves that are detected from the images. Fillols *et al.* used the Weedseeker® technology with glyphosate to provide inter-row control of weeds such as Guinea grass. An inter-row shield housing the nozzles has been developed to prevent cane damage from the applied herbicide. The prototype shield has additional design features to protect and isolate the sensors, ensuring they are not triggered by exposure to cane leaves.

Session 4: Harvesting and Mechanisation

Norris opened the session with an invited presentation describing profit-optimising solutions for sucrose recovery and cogeneration. Mechanical harvesters have been developed with the goal of extracting trash and delivering relatively clean cane to the mill, but operating strategies where less trash is extracted by the harvester can offer significant benefits, particularly to cane loss and provide material for cogeneration. Norris' model investigates harvesting and haulage factors affecting system performance, recoveries and costs associated with multiple recovery concepts, and is a powerful profit-optimising tool to track and optimise changes and their impact on the industry value from field to mill. The relevant industry sectors' advantages and disadvantages are easily identified.

Experience in New South Wales is that to achieve world-class levels of efficiency in their harvesting sector, they must address issues over the whole supply chain. Attempting to fix any one sector of the supply chain will not necessarily improve its efficiency unless the other components of the supply chain have the capacity to handle the extra throughput. Crossley *et al.* outlined a suite of systems and strategies that industry adopted, ranging from long-term, seasonal and daily planning to real-time visualisation and scheduling tools. Implementation has enabled them to reduce the number of harvesters while increasing throughput.

Whilst the Australian industry is highly mechanised, countries such as China are facing a significant transformation from an agricultural base to manufacturing. This has created an unprecedented demand for factory labour, so that high wage rates and less labour available for manual farm work have driven a trend to mechanisation. With cane usually grown in small plots at close row spacing around 900 mm, using varieties adapted to that planting configuration, and some of the crop even grown on hillsides, the challenges to mechanised cane harvesting are significant. Only 10% of the existing Chinese canegrowing area could be harvested efficiently by large machines. Thus, more than one type of harvesting system may be needed in China. Wegener *et al.* described some of the innovation and testing of alternative harvester components and designs that are occurring and that have a distinctly Chinese aspect.

Energy represents a major cost and one of the fastest growing input costs to primary producers. In particular, agricultural producers are sensitive to increasing diesel and electricity prices at a time where the scientific and political debate on climate change is ongoing and there is conjecture on the best policy instruments to be used in response. Baillie described tools for on-farm energy assessment to improve energy use and reduce costs in Australia. Major uses of energy were for irrigation (~68%) and harvesting (~25%). The work identified significant savings in energy and GHGs for both a refinement in practices (e.g. up to 30% for irrigation) and a change in practice (e.g.

up to 20% in plant cane through minimum tillage). Potential savings in average energy costs of AUD30 to AUD100/ha were found to be practical.

Session 5: Farming Systems and Productivity

Salter and Garside set the scene by describing the Australian 'improved' farming system aimed at improving soil health, breaking the monoculture and reducing tillage and controlled traffic all within a trash-blanketed system. There is now widespread acceptance of legume break crops, with the additional benefit of reduced nitrogen applications to the following sugarcane crop. Double-disk opener planters make it possible to plant sugarcane into permanent beds and legumes through heavy cane trash, thus reducing the need for tillage. Restricting machinery tracks to the inter-row, to reduce compaction, has been achieved by widening row spacing. Guidance systems have also become more affordable and their use is increasing. Trials have shown that yield can be maintained on wide row spacing and current varieties have sufficient flexibility to perform similarly over row configurations. However, the farming system is not a recipe and each grower needs to use appropriate components. Overall, these new systems have lower input costs and adoption is being driven by increased profitability. In addition to this, adoption of these practices has been a critical component of government activities to improve water quality leaving sugarcane farms. A pilot project to introduce such a new controlled traffic farming system to the Zimbabwean sugarcane industry was outlined by Lecler. Implementing the system as a pilot project on 500 ha with a large-scale collaborator met some challenges.

Research on widening row spacing as part of this improved system was described by Salter *et al.* (Australia) and Núñez *et al.* (Ecuador). The former found that controlled traffic could be adopted without any effect on cane yield by using dual-row configurations. Any reduction in yield on wide single-row configurations is partially compensated for by a lower cost of production. However, ratoon yields dropped dramatically. Results suggest that yields in Ecuador could increase by using a higher planting density and, at the same time, better matching the wheel tracks of the vehicles with the spacing of the inter-rows. In Ecuador, average plant cane yield under the dual-row system was 14% higher, and in ratoon cane 10% higher than in 1.50 m rows. Single rows at 1.65 and 1.80 m yielded similar to the standard, but ratoon yields dropped dramatically. Results suggest that yields could be increased by using a higher planting density, and also better matching the wheel tracks of vehicles with the inter-row spacing.

Four sets of trials in South Africa examined by Ramburan *et al.* illustrate the dominant effects of environment and management practices on ratoon yield decline. Although the variety x environment interaction was significant for all coefficients of linear or quadratic functions of yield versus ratoon number, the effects of variety accounted for 0.8, 2.3, and 20.3% of the total variation in the A, B, and C coefficients, compared to the 57, 47, and 45% of the variation accounted for by environment. Similar conclusions were drawn by Salter and Schroeder in the Mackay area of Australia where they showed that adaptation to seasonal weather variability is an important factor in industry sustainability. Crop simulation over the 1990s-2000s suggested that weather conditions were more conducive to crop growth in the mid 1990s than recently, with the mid 1990s characterised by greater effective rainfall, lower total rainfall, better rainfall distribution and less frequent or intense waterlogging events.

The importance of matching varieties to environments was illustrated by Zhao *et al.* who were interested in the performance of sugarcane genotypes on sand soils of Florida. Here, water deficit during the growth phase limits growth and yield. Results suggest that selection for high stalk number (many tillers) and increased leaf area during early growth can help identify sugarcane genotypes with improved cane yields on these soils.

Session 6: Climate Change and Gaseous Emissions

Everingham outlined some of the potential effects of climate change in an invited presentation. She recognised that, on finer spatial scales, such as the narrow coastal north-eastern Australian sugar-growing regions whose climate is influenced by its unique topography, the reliability of model estimates of likely average maximum and minimum temperature change and, even more, average rainfall change, are questionable. Estimates of the possible change in future weather variability about future average temperature and rainfall changes are not known at all. Without these

estimates, it is difficult to approximate future crop production and maximise resources under a changing climate.

To understand such changes better, Singels *et al.* have used models to predict impacts on sugarcane production at sites in Australia, Brazil and South Africa. Yield responses to changes in temperature, rainfall and CO_2 were analysed by investigating their impacts on phenological development, radiation capture, water use, crop water status, biomass component growth and yield. Simulation similarities and discrepancies among crop models and the credibility of simulated responses to predicted climate change were discussed, and refinements to the methodology were recommended. Biggs *et al.* used a similar approach to estimate effects on water quality in Australia. Differences in cane yields among management systems were compared to the effect of climate change and the improvement in farm management needed to meet water quality goals was predicted to be little affected by climate change. However, without any interventions, the frequency of years with very high N losses was predicted to increase by up to 10-15%.

Two presentations, from Thorburn *et al.* (Australia) and Vargas *et al.* (Brazil), focussed on emissions of nitrous oxide. The first used the APSIM model to investigate the degree to which the biological nitrous oxide-generating pathways represented in the model might account for the high emissions measured in some sugarcane crops grown on acid-sulfate soils, and to provide a broader understanding of the basis for the wide range of emissions associated with this crop. Results suggest that the biological pathways represented in the model are capable of producing the range of nitrous oxide emissions measured in sugarcane crops, and that the contribution of chemical pathways need not be great. The second study found large differences between their two study sites in Brazil that they attributed to soil type and to the presence of trash on the soil surface. There was no effect of inoculating the soil with diazotrophic bacteria.

Session 7: Sugarcane Nutrition

Phosphate broadcast applications before planting are rarely used in Brazil mainly due to their high cost. De Sousa *et al.* tested different sources of P and found that the sum of three harvest yields decreased in the order: triple superphosphate (100%) > magnesium thermophosphate (89%) > mono-ammonium phosphate (80%) > itafós phosphate rock (67%) > arad phosphate rock (60%). Economic analysis showed that the maximum profit of approximately US$760/ha was obtained with triple superphosphate.

Van Antwerpen *et al.* confirmed the impact of crop removal on the depletion of soil-available silicon from a negative correlation between long-term yields and current soil Si levels in a long-term trial in South Africa. The decrease in soil-extractable Si in fertilised treatments was reflected in markedly lower leaf Si levels, generally well below 1.0%, and marginal in terms of Si norms for sugarcane. With sugarcane generally being cultivated on soils with inherently lower Si reserves than those in the soil they used, they suggested that Si depletion is an important and underrated contributory factor in sugarcane yield decline.

Approximately 20% of the sugarcane grown in Florida is on sands which have very low organic matter content and low capacity to hold water and nutrients. McCray *et al.* discussed the potential for increasing sugarcane yields on these soils by incorporating organic material, mill mud and compost. The most consistent sugarcane yield responses to organic amendments were with broadcast applications of mill mud and compost/sewage sludge.

To achieve high biomass yields in sugarcane, high amounts of nitrogen are usually required and better indicators of N status in the plant, especially in early development stages, would be useful to establish fertilisation programs. Joris *et al.* made preliminary comparisons of SPAD and NDVI with sap and leaf analysis in Brazil. Preliminary results showed differences in sap analysis, due mainly to the nitrate content, and some positive responses of NDVI and SPAD, exhibiting a positive relationship with total nitrogen in the leaves. The technique requires further development.

Poster Session

There were 25 posters presented at the workshop from sugarcane research in Australia, Brazil, Israel, India, Japan, Kenya, Thailand, and the USA, The themes of sugarcane nutrition (8 posters), harvest management (5 posters) and varietal selection (4 posters) were predominant in the session.

Business Meeting

For the first time, an "Early Career Award" for best abstract and presentation for authors < 35 years old was awarded at the workshop. After scoring led to a tie, two awards were presented, to M. Empson and S. Ramburan. They will compete with early career award winners from other ISSCT workshops for a sponsored trip to the next workshop. It was a great pleasure to have a large number of high-quality presentations from early-career members to judge at this meeting, indicating a promising future for sugarcane research.

Both the location and logistics of the next Agronomy workshop were discussed. Dr Rianto Van Antwerpen indicated that South Africa was interested in hosting the next workshop, and the audience proposed and accepted this venue, pending final approval at the ISSCT congress in Brazil in June, 2013. There were comments that, at the next workshop, the number of oral presentations should be reduced to allow for more interactive workshops on themes of interest. Presumably the poster session would be increased to accommodate authors interested in attending.