Welcome to the ISSCT Bulletin for March 2022, in which we collect latest ISSCT updates, along with news, research, and past and upcoming events related to sugar cane technology.

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ISSCT XXXI Congress 21

News from ISSCT

Meetings of Executive Committee, Technical Programme Committee and Congress Organising Committee

The Mid-Term Meeting (MTM) of the Executive Committee was held virtually on Wednesday 2 March 2022. The pandemic meant that it is the first time ever that the meeting was not in person. The meeting was devoted to the affairs of the Society. On the following day the Executive Committee met firstly with the Technical Programme Committee (TPC) and then with the Congress Organising Committee (COC).

The Agenda of the ExCo Meeting included the Approval of Minutes of its Meetings held at the XXX Congress in Argentina in 2019, the Reports of the Chair of ExCo, Chair TPC, ISSCT Editor and the ISSCT General Secretary, the Approval of the Audited Final Accounts for the period 1 January 2017 to 30 September 2019, the Income and Expenditure Accounts from 1 October 2019 to 31 December 2021, the Cash Flow for the period 1 January 2022 to 28 February 2023, the Communication Strategy of ISSCT with its new Website, the monthly Bulletin and use of social media, the Registration of ISSCT as a Private Company Limited by Guarantee in Mauritius, Changes to Constitution as well as to Policy and Procedures, the Appointment of Councillors for the period 2019-2023, the Election of Executive of ExCo at XXXI Congress, the Nomination for Honorary Life Member at the XXXI Congress, the Laureateship at the XXXI Congress and miscellaneous matters.

At the joint Meeting of ExCo and TPC, the decisions taken concerned: the postponement of thematic workshops in the present inter-congress due the pandemic but the maintenance of the Management Commission Workshop at Congress in 2023, the holding of a series of seven Webinars from March to September 2022 in the different disciplines covered by ISSCT, the Themes of three Plenary Sessions at the XXXI Congress (***Sugar and Health, Organic Sugar Production*** and ***Green Harvest and Utilisation of Bagasse for Alternative Products***), the number of slots for papers (180) and posters at the XXXI Congress, Peer reviewing of papers and posters for Congress, Room, audio visual facilities and support personal needed for Congress sessions, Proceedings of papers and

posters, Abstract Book to be handed to Congress delegates, the processes for the Mid-Career Award and designation of the Laureate, the renewal of Office Bearers in Commissions and Sections at Congress and the Revision of the TPC Operations Manual. The deadline for the receipt of intents to submit papers/posters for the XXXI Congress was extended from to 31 March 2022. The other important dates being

- 15 April 2022 - Authors have received confirmation to proceed to prepare the paper/poster.
- 15 June 2022 – Deadline for receipt of the manuscripts of full-length papers and posters.
- 30 November 2022 – Deadline for finalisation of all papers and posters. Any received after this deadline will not be included in the proceedings and will not be accepted for presentation at congress.

It was also decided that ExCo and TPC would reconvene at the end of May to consider the celebrations of the Centenary of ISSCT in 2024.

Finally, ExCo and TPC met with COC to consider all aspects related to the XXXI Congress that will be held from 20 to 23 February 2023 in Hyderabad, India and will include Pre and Post Congress Tours, Social Programme, Trade Exhibition and other activities. Four Congress Newsletters will be sent out to members, the first one in March 2022 and the last one in January 2023. The facilities and the venues for the various activities of the Congress were shown by video to ExCo and TPC Members. The facilities requested by ExCo and TPC for the technical sessions will be met by COC. The cost of Congress was discussed to ensure that the best offer would be made to congress participants in terms of value for money. Detailed information was conveyed by COC on the Trade Exhibition in terms of floor area, booth size and cost. COC representatives gave the assurance that they would do the utmost to make the XXXI Congress a successful and memorable event.

Actions are being taken by the Secretariat for the implementation of the decisions taken at the above meetings. Members will be informed of developments through emails, the monthly bulletin, the ISSCT and Congress websites and use of social media: Twitter, LinkedIn and Facebook.

Factory Commission Webinar

The first of the seven Webinars to be organised by ISSCT this year will be the one of the Factory Commission which will be held on Tuesday 29 March 2022 at 11:00 AM Central European Time (GMT+2). The theme is "*The contribution of the cane sugar industry for decarbonisation*"

Programme

Introduction by Boris Morgenroth, Chair ISSCT Engineering Section

Main topics

Drying of bagasse feedstocks

- Experiences with low temperature dryers in the cane sugar industry by Stefan Szymkiewicz & Thomas Kimmenauer
- Low temperature bagasse dryer applications for fuel saving and power export by Saiedeh Wicht & Boris Morgenroth

Decarbonization

- An overview of the role of sugar milling for decarbonisation by Marguerite Renouf
- Contribution potential of the cane sugar industry for decarbonization by Boris Morgenroth & Stefan Jahnke

Energy management

- The predicted effects of swirl spreader combustion system retrofits on bagasse boiler efficiency by Floren Plaza and A.P. Mann
- Energy management in view of current ethanol diversification in Indian Sugar Industry by Narendra Mohan

The facilitators/organizers are:

- Dr. Boris Morgenroth, IPRO Industrieprojekt GmbH, Germany
- Dr. Geoff Kent, Queensland University of Technology (QUT), Australia
- Rainer Talanda, Illovo Pty. Ltd, South Africa
- and other Engineering Section members

Discussions

Q&A Session

Conclusion

> **Register here:**

https://zoom.us/meeting/register/tJcsc-CspjkpHdz_GC65aXHufoSo7PRidXW8

Management Commission Workshop

As mentioned above, the Management Commission Workshop will be held at the XXXI Congress and the first announcement is to be found below:

FIRST ANNOUNCEMENT

MANAGEMENT COMMISSION WORKSHOP

INDIA

20 - 23 February 2023

THEME

REGENERATIVE AGRICULTURE:
IMPLICATIONS FOR R&D MANAGEMENT

The Management Commission Workshop will take place during the XXXI International Society of Sugar Cane Technologists Congress that will be held in Hyderabad in India on 20 – 23 February 2023.

The Workshop will provide an opportunity for a discussion on the topic of regenerative agriculture, defining what it is and how it can contribute to sustainability, examining current and future management practices, integration into research priorities and its overall value proposition.

Participants are invited to prepare abstracts related to the theme of the Workshop.

Workshop Format

The formal programme will comprise three workshop sessions, each of which will be preceded by selected oral presentations that will be designed to elicit discussion relevant to the workshop theme. Any proposed presentations that are not selected for oral presentation will be considered as posters.

Abstracts of oral presentations and posters will be distributed to participants at the Workshop.

Abstracts for all contributions (oral and poster) must be received by 31 March 2022. Please note that this is a one-month extension on the deadline for the Congress. Please find the requisite format at:

Call for papers and posters – 2023 ISSCT Hyderabad Congress - International Society of Sugar Cane Technologists

Important Deadlines

- 30 April 2022: Deadline for submission of abstract(s) (oral or poster).
- 15 May 2022: Organizing Committee to advise on acceptance of oral presentations and posters.
- 15 June 2022: Closing date for manuscript submission for posters and papers.
- 30 November 2022: Closing date for submission of finalised manuscript.

Costs

Since the Workshop will form part of the ISSCT Congress, it will not attract an additional fee, and the costs are as prescribed for the Congress.

Note: ISSCT Membership

All participants must be current ISSCT members in order to register for the Workshop. Membership details are available on the ISSCT website (http://www.issct.org/member.html).

Sugar Cane News

Bonsucro launches new Impact Fund to invest in innovative projects at sugarcane origins

	Bonsucro	March 09, 2022	https://bonsucro.com/impact-fund/
	The Bonsucro Impact Fund supports projects that address critical sustainability challenges in the sugarcane sector. Using income from the Bonsucro Credit Trading Platform, our Fund offers our members the chance to apply for thematic grants for initiatives and projects that catalyse sustainable sugarcane production.		

Volkswagen Researching Ethanol-Based Fuel Cells

	Agwired.com	March 2. 2022	https://energy.agwired.com/2022/03/02/volkswagen-researching-ethanol-based-fuel-cells/
	Volkswagen has a vision for how ethanol can help achieve net-zero carbon emissions by 2050 or sooner, which includes research on reforming ethanol to create hydrogen for fuel cells. *Di Si says Volkswagen is doing research and development on "how we can form ethanol into a fuel cell or how can we make batteries out of (sugarcane) bagasse."*		

Rethinking polymers: The challenges of commercializing biobased materials

	Packaging Europe	February 3, 2022	https://packagingeurope.com/features/rethinking-polymers-the-challenges-of-commercializing-biobased-materials/7901.article
	There are several newer classes of polymer that have the potential to challenge traditional fossil-based materials and reduce the carbon impact of plastic packaging. But commercializing these can be a process of many years and there are a number of barriers to overcome, as Victoria Hattersley discovers. *Today's packaging market is, as we know, still largely dominated by polyesters like PET and polyolefins like PE and PP, which offer almost infinite recyclability, sterility and excellent barrier performance. Can these ever really be replaced with biobased materials?* *Perhaps. There is an increasing awareness that polymers such as PET, PE and PP can all be made from biobased feedstocks to create what many would see as more 'sustainable' versions of these polymers (depending, of course, on what metrics you are measuring 'sustainability' by): PET, for*		

	example, can be made from sugar cane (Coca-Cola's plant bottle is a famous example) and PP can be made from a number of waste oils. These are often known as 'drop-ins' as they have the same material structure and properties as conventional plastics.

Strawberries, lobsters, sugarcane industries grow with AI [Australia]

GriffithNews	Griffith News	March 9, 2022	https://news.griffith.edu.au/2022/03/09/strawberries-lobsters-sugarcane-industries-grow-with-ai/
	Driving farming production and disease prevention through artificial intelligence technologies is the key aim of an Australian Research Council Research Hub, which has been officially unveiled at the hub's host site at Griffith University. *The hub received Australian Government funding of $5 million through the Australian Research Council Industrial Transformation Research Program in 2018.* *Professor Gao said the Hub combined world-leading capabilities in image processing, machine learning, robotics, and software, with additional input from experts in agronomy, biology, water use, and farming technology.*		

How IFFCO Kisan Tech-led Farming Practices Benefit Sugarcane Farmers [India]

KRISHI JAGRAN	Krishi Jagran	January 16, 2022	https://krishijagran.com/agriculture-world/how-iffco-kisan-tech-led-farming-practices-benefit-sugarcane-farmers/
	Kalyan Singh, 40, a manager at a 4.5-acre farm in Sikandari village in Uttar Pradesh's Bijnor district, turned off the power and wondered how the water pump started automatically. Later, he realized that the pump had been operated by someone in Delhi, 130 kilometres away. *It is an IoT-based automated drip system in which the pump is managed remotely using a standard 2-G connection via an app and water flow is regulated according to soil requirements. There are also soil sensors installed on the ground that are linked to the app, allowing the user to monitor soil conditions and nutrient deficiency.*		

New Tech For Processing Of Sugarcane Juice [India]

THE TIMES OF INDIA	Times of India	February 22, 2022	https://timesofindia.indiatimes.com/city/kanpur/new-tech-for-processing-of-

			sugarcane-juice/articleshow/89735701.cms
	National Sugar Institute - Kanpur on Monday stated that it has made a major breakthrough in the processing technique of sugarcane juice clarification. The technology has been successfully tried in the Experimental Sugar Factor of the institute in collaboration with The Sugar Technologists Association of India and M/s Chemical System Technologies, New Delhi.		

Prepare for takeoff with plant-powered planes [Jamaica]

	Landscape News	February 15, 2022	https://news.globallandscapesforum.org/56278/safs-prepare-for-takeoff-with-plant-powered-planes/
LANDSCAPE NEWS	*Two years ago, air travel was a ubiquitous part of life for much of the world. But COVID-19 changed that. Our global footprints diminished as international conferences ran remotely, work trips were done via Zoom and people began keeping their holidays domestic, in fear of being stranded abroad.* *And so our carbon footprint reduced in stride: emissions from aviation, which make up 2.1 percent of all human-induced carbon emissions, dropped by 48 percent in 2020 from their 2019 level.* *But as countries begin the staggering dance of re-opening and managing the risks that presents, air traffic is on the rise once again, with predictions it will return to pre-pandemic levels in 2024. That's reassuring for long-distance relatives, tourism and the airline industry – but less so for the climate.* *So, what would it take to 'green' our flying habits?*		

MSM Malaysia, Wilmar Sugar collaborate to build a sustainable sugar supply chain [Malaysia]

	New Straits Times	February 15, 2022	https://www.nst.com.my/business/2022/02/771584/msm-malaysia-wilmar-sugar-collaborate-build-sustainable-sugar-supply-chain
NEW STRAITS TIMES	*MSM Malaysia Holdings Bhd (MSM Malaysia) and Wilmar Sugar Pte Ltd (Wilmar Sugar) inked a collaboration agreement in December 2021 to build a sustainable sugar supply chain.* *MSM Malaysia and Wilmar Sugar will embark on joint efforts to assist and support each other to pilot an approach to enable sustainable raw sugar sourcing within both company's joint supply chains by focusing on traceability reporting of sugar supplies and monitoring of sustainability performance based on the NDPE Sugar Policy.*		

NASIDA Attracts over $500m Investment to Nasarawa, Says MD [Nigeria]

THISDAY	This Day	February 22, 2022	https://www.thisdaylive.com/index.php/2022/02/22/nasida-attracts-over-500m-investment-to-nasarawa-says-md/

	The Nasarawa State Investment Development Agency (NASIDA) has said it has attracted over $500 million investment, both domestic and foreign, into key sectors of Nasarawa State. *The Managing Director of NASIDA, Ibrahim Abdullahi who disclosed this at a news briefing in Lafia added that the feat was achieved over the past three years of the coming to office of Governor Abdullahi Sule.* *He said: "We have welcome a pictorial of investors and investments in the state. And notably Flour Mills of Nigeria has signed an agreement to acquire and do a development of 20,000 hectres sugarcane plantation and sugar industrial estate in Nasarawa around Toto. That has an investment initially at a minimum of $300 million.*

Bacita Sugar Company New Investor To Employ 20,000 Workers- FG [Nigeria]

	The Whistler	February 8. 2022	https://thewhistler.ng/bacita-sugar-company-new-investor-to-employ-20000-workers-fg/
	The Executive Secretary, National Sugar Development Council, Mr Zacch Adedeji, has said government will not tolerate deliberate distortion of the Nigerian Sugar Master Plan by any of the operators under whatever guise. *The master plan is a 10-year roadmap designed for the sector to enable Nigeria attain self-sufficiency in sugar production, create jobs, and generate electricity among other noble objectives.*		

'Economic sabotage': Philippines sugar dispute grinds on as producers demand import plan is scrapped [Philippines]

	Food Navigator Asia	February 28, 2022	https://www.foodnavigator-asia.com/Article/2022/02/28/philippines-sugar-dispute-continues-as-producers-demand-import-plan-is-scrapped
	Controversy continues to surround the Philippines' Sugar Regulatory Administration's (SRA) efforts to import 200,000 metric tonnes of premium refined sugar into the country, with the domestic industry securing a temporary halt to the measures. Following a civil case against the order brought by United Sugar Producers Federation (UNIFED) member, the Rural Sugar Planters Association Inc., the Regional Trial Court (RTC) in Sagay City, Negros Occidental issued a 20-day temporary restraining order (TRO) blocking the import last week — just days after the SRA approved it.		

Latest Research

Research and Development Prospects for Sugarcane Industry in Vietnam



Sugarcane is one of the most important industrial crops in Vietnam and covers a total of 127,000 hectares of plantation area. In the season 2020–2021, Vietnam has produced 0.763 million tons of sugar (accounting for 0.34% total world sugar production). A current sugarcane production of 7.498 million tons is being used mainly for sugar production for direct consumption, ethanol production, bio-electricity and fertilization. To ensure crop sustainability, various policies and plans have been implemented. Crop breeding and zoning improvement programme significantly influence sugarcane production and sugar yield. Over 25 years since the programme "one million ton of sugar" was promoted, Vietnam currently possesses 25 sugar mills with a total capacity of 110,000 tons of sugarcane per day. Major problems of sugarcane industry as well as research and development have been discussed in this review. Recent research and development work focused on the added values of co-products to ensure sustainability of the sugarcane industry. Molasses will be used for ethanol production, and bagasse is used as the biomass for the alternative energy. Sugarcane and sugar would be the main feedstocks for those bio-economy growths in Vietnam. To keep the sustainable development of the sugar industry, and to meet the demand of the food and non-food requirements, it is necessary to upgrade the sugar value chain through the adoption and the development of co-products of the sugar industry.

Journal published 5 March 2022, article available online now

> Link

Study on characterization of bio-oil derived from sugarcane bagasse (Saccharum barberi) for application as biofuel



Lignocellulosic biomass especially, sugarcane bagasse Saccharum barberi sp., appears to be a more suitable material for partial substitution of transport fuel (diesel) than Saccharum officinarum sp., due to its structural similarity to transport fuel (diesel). Besides that, less research has been implemented on this type of species. Bio-oil can be implemented as biodiesel by processing it further using chemical reactions such as hydrodeoxygenation and cracking with zeolite catalyst. Hence, the purpose of this study is to determine the compatibility of pyrolytic bio-oil produced from Saccharum barberi sp. in comparison with S. officinarum sp. for use as transport fuel (diesel) in automotive applications. This purpose can be accomplished by comparing the oil's bio-physiochemical properties for both species. The experiment is conducted on a bench-scale on which bio-oil of Saccharum barberi sp. is secured from the catalytic pyrolysis process at a temperature of 500°C and heating rate of 50°C/min with the addition of ZSM-Zeolite catalyst. Thermogravimetric analysis of Saccharum barberi sp. reveals that cellulose is more reactive than lignin, evidenced by the high percentage of weight loss at temperatures ranging from 251°C to 390°C. The high contents of carbon (40.7%) and hydrogen (6.50%), as well as slight

traces of sulphur (0.08%) and nitrogen (0.85%), in bio-oil (Saccharum barberi sp.) indicate that it is conceivable to be partially used for replacement in biofuel production. Overall physiochemical properties reveal that Saccharum barberi sp. shows more potential than S. officinarum sp. Gas chromatography–mass spectrometry analysis reveals that bio-oil consists of high amounts of aromatic hydrocarbon (26.2%), phenol (14.8%) and furfural (13.0%) in comparison to S. officinarum sp.

Biofuel was produced from sugarcane bagasse (Saccharum barberi sp.) in a bench-scale pyrolysis reactor at 500°C using a zeolite catalyst. Measured properties of the biofuel make it suitable for partial substitution of diesel in transport fuel.

Journal published 5 March 2022

> Link

Breeding for Drought Tolerance in Sugarcane: Indian Perspective



Drought is a common abiotic disaster in India, affecting the states that are prominent for sugarcane production, viz., Tamil Nadu, Maharashtra, Andhra Pradesh, Bihar, Haryana, Rajasthan, and Uttar Pradesh. As sugarcane is a high water requirement crop with a long life cycle, water deficit conditions adversely affect its growth and production especially during the key water requirement time i.e., the tillering and grand growth phases which in turn, critically affects the sugar content in sugarcane. Sugarcane undergoes a variety of morpho-physiological, biochemical, molecular alterations, adaptations, and reactions to cope up with drought stress. Drought tolerance in sugarcane is bestowed by the traits of having a deep and widespread root system as well as root dispersion and abundance, and leaf characteristics which are evident in drought-tolerant genotypes such as Badila, Co 285, and Co 312. Nearly 40 sugarcane varieties having drought resistance potential have been identified under the All India Coordinated Research Project on Sugarcane in the last two decades. Some clones of Saccharum barberi, Hemja, Khari, Katha, and Ikhri are also recognized for drought tolerance. Additionally, molecular markers and potential genes associated with drought tolerance in sugarcane have also been identified like SCAR (sequence characterized amplified region) markers, Superoxide dismutase, and Indole-3-glycerol phosphate synthase genes. With the transgenic approach, Erianthus arundinaceus Glyoxalase III (EaGlyIII), Arabidopsis Vacuolar Pyrophosphatase (AVP1) and tomato ethylene-responsive factor 1 genes have successfully been identified for developing drought-tolerant transgenic sugarcane in India.

Journal published 4 March 2022

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The Effects of Cobalt on Sugarcane Growth and Development in Plant Cane and Two Ratoon Crops

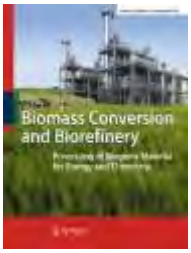


This study was conducted to identify the effect of cobalt (Co) in three successive crops of sugarcane grown in Louisiana, USA. The treatments consisted of an untreated control and four rates of Co (29, 58, 87 and 116 g ha-1). In the plant cane and second ratoon crops, the following variables were determined: the number of leaves and tillers, stalk diameter, plant height, stomatal conductance (gs), chlorophyll index (SPAD), cane yield, sugar yield and sugar quality (TRS, purity and fiber). For the first ratoon, it was only possible to determine the number of leaves, tillers and plant height, as well as yield parameters. The plant cane results demonstrate that foliar application of Co at 29 and 59 g ha–1 increased the number of open stomata, the number of leaves and tillers and the sugar yield. When Co was not applied to the first ratoon crop, the effects on measured parameters were less pronounced, although positive effects on tillers were still observed. Results for the second ratoon crop showed positive benefits on stomatal conductance, the number of leaves and tillers, stalk heights, stalk weight, stalk diameter and sugar yield. Higher rates of Co (85 and 116 g ha-1) decreased the growth parameters except the number of internodes and tillers during second ratoon crop. Results from this study demonstrated that foliar application of low levels of Co to sugarcane can increase sugarcane growth and yields. Further research is needed to optimize Co fertilization rates and to elucidate the effects of Co on plant hormone levels.

Journal published 4 March 2022

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Microwave-assisted hot water treatment of sugarcane bagasse for fast pyrolysis

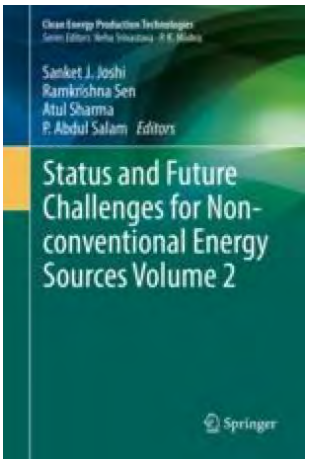


Pretreatment is an essential pathway to improve agro-based feedstock (sugarcane bagasse) for fast pyrolysis. The undesirable changes in the chemical composition and large amounts of alkali metals are obstacles in using common pretreatment process of sugarcane bagasse. To address this challenge, microwave-assisted hot water treatment (MW-HT) was introduced as an environment-friendly and low-cost pretreatment process. Other pretreatments such as sulfuric acid, formic acid, and hot water were compared with MW-HT at ambient temperature before pyrolyzing the treated bagasse at 500 °C in a tandem microreactor. Higher amounts of cellulose and hemicellulose derivatives including levoglucosan, furfural, and HMF were obtained with MW-HT, finding immense applications in polymer and chemical industries, while lignin-rich components such as phenols, guaiacol, benzene, and char formation increased with sulfuric acid pretreatment. The yield of compounds containing C5-C12 alkane chains increased significantly from 6.5 to 13.6% by weight through MW-HT, while the yield of compounds containing C5-C12 olefinic chains increased from 9.8 to 16.9% by weight for sulfuric acid pretreatment. In terms of compounds containing aromatic hydrocarbon yield, an increase from 3.2 to 10.1% by weight was obtained after applying formic acid pretreatment but was reduced to 5.7 wt% when hot water treatment was considered.

Journal published 4 March 2022

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Cellulosic Biorefinery: Concepts, Potential, and Challenges

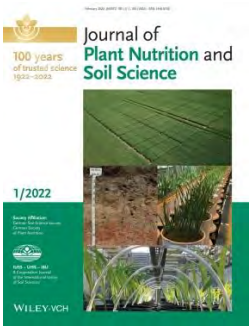


A large amount of energy is required worldwide to support and run industries, society, and community centers. The present energy distribution is directly reliant on the accessibility of nonrenewable energy reserves, which results in rising energy demands, atmospheric carbon dioxide accumulation, and an increase in greenhouse gases. It elevates the concept of the circular bio-economy of "the sustainable utilization of the lignocellulosic waste into a range of by-products and biofuels" generally recognized as biorefinery as defined by the International Energy Agency (IEA). The essential target for biorefineries is to obtain both high-volume biofuels and high-value structural chemicals. A lignocellulosic biorefinery is a second-generation system that mainly depends upon the utilization of lignocellulosic crops and non-crop feedstock, and different industrial waste such as sugarcane bagasse via thermochemical conversion. At the same time, various challenges are also aligned with the development of the lignocellulosic biorefineries such as seasonal availability, land usage, yields, and accumulation of various inhibitors during the pretreatment steps. Improved strains, streamlining of the regional substrates, integrated bioprocess, and compatibility to the existing petrochemical infrastructure will hold the key to the circular bio-economy-based biorefineries.

Published: 1 January 2022

> Link

Waste-derived fertilizers can increase phosphorus uptake by sugarcane and availability in a tropical soil



*The use of highly water-soluble phosphorus (P) fertilizers can lead to P fixation in the soil, reducing fertilization efficiency. Waste-derived, low water-solubility sources can potentially increase sugarcane's P uptake compared to triple superphosphate by reducing adsorption to the soil. **We aimed to test struvite, hazenite, and AshDec® for their agronomic potential as recycled fertilizers for sugarcane production in a typical tropical soil. We hypothesize that these sources can reduce P fixation in the soil, increasing its availability and sugarcane's absorption. In a greenhouse pot experiment, two consecutive sugarcane cycles, 90 days each, were conducted in a Ferralsol. The recovered sources struvite, hazenite, AshDec®, and the conventional triple superphosphate were mixed in the soil in three P doses (30, 60, and 90 mg kg−1), aside a control (nil-P). At both harvests, sugarcane number of sprouts, plant height, stem diameter, dry mass yield, shoot phosphorus, and soil P fractionation were investigated. At 90 days, struvite and hazenite performed better for dry mass yield (70.7 and 68.3 g pot−1, respectively) than AshDec® and triple superphosphate (59.8 and 57.4 g pot−1, respectively) and for shoot P, with 98.1, 91.6, 75.6, and 66.3 mg pot−1, respectively. At 180 days, struvite outperformed all treatments for dry mass yield (95.3*

g pot–1) and AshDec® (75.5 mg pot–1) for shoot P. Struvite was 38% and hazenite 21% more efficient than triple superphosphate in P uptake, while AshDec® was 6% less efficient. Soil had higher labile P under struvite, hazenite, and AshDec® than triple superphosphate by the end of the first cycle, while only the later increased nonlabile P by the end of the experiment (180 days). Waste-derived P sources were more efficient in supplying P for sugarcane and delivering labile P in 180 days than triple superphosphate.

Published: 2 March 2022

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Predicting Canopy Chlorophyll Content in Sugarcane Crops Using Machine Learning Algorithms and Spectral Vegetation Indices Derived from UAV Multispectral Imagery

The use of satellite-based Remote Sensing (RS) is a well-developed field of research. RS techniques have been successfully utilized to evaluate the chlorophyll content for the monitoring of sugarcane crops. This research provides a new framework for inferring the chlorophyll content in sugarcane crops at the canopy level using unmanned aerial vehicles (UAVs) and spectral vegetation indices processed with multiple machine learning algorithms. Studies were conducted in a sugarcane field located in Sugarcane Research Institute (SRI, Uda Walawe, Sri Lanka), with various fertilizer applications over the entire growing season from 2020 to 2021. An UAV with multispectral camera was used to collect the aerial images to generate the vegetation indices. Ground measurements of leaf chlorophyll were used as indications for fertilizer status in the sugarcane field. Different machine learning (ML) algorithms were used ground-truthing data of chlorophyll content and spectral vegetation indices to forecast sugarcane chlorophyll content. Several machine learning algorithms such as MLR, RF, DT, SVR, XGB, KNN and ANN were applied in two ways: before feature selection (BFS) by training the algorithms with all twenty-four (24) vegetation indices with five (05) spectral bands and after feature selection (AFS) by training algorithms with fifteen (15) vegetation indices. All the algorithms with both BFS and AFS methods were compared with an estimated coefficient of determination (R2) and root mean square error (RMSE). Spectral indices such as RVI and DVI were shown to be the most reliable indices for estimating chlorophyll content in sugarcane fields, with coefficients of determination (R2) of 0.94 and 0.93, respectively. XGB model shows the highest validation score (R2) and lowest RMSE in both methods of BFS (0.96 and 0.14) and AFS (0.98 and 0.78), respectively. However, KNN and SVR algorithms show the lowest validation accuracy than other models. According to the results, the AFS validation score is higher than BFS in MLR, SVR, XGB and KNN. Even though, validation score of the ANN model is decreased in AFS. The findings demonstrated that the use of multispectral UAV could be utilized to estimate chlorophyll content and measure crop health status over a larger sugarcane field. This methodology will aid in real-time crop nutrition management in sugarcane plantations by reducing the need for conventional measurement of sugarcane chlorophyll content.

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A sustainable robust optimization model to design a sugarcane-based bioenergy supply network: A case study



Reasons such as volatile fossil fuel prices, environmental limitations, and swift economic growth have increased the demand for clean renewable energy. Bioenergy has been received much attention from researchers due to its various benefits compared to other renewable energy alternatives. In this paper, a three-stage approach is developed to design a sustainable sugarcane-based bioenergy supply chain network under an uncertain environment. The fuzzy data envelopment analysis method is employed in the first stage to determine the appropriate regions for opening the sugarcane fields according to climatic, ecological, and social criteria. The nominated regions are then integrated into a mathematical optimization model as candidate locations for sugarcane fields to configure the proposed supply chain design. This stage helps reduce the computational complexity and provides a reasonable solution by excluding the inappropriate regions. In the second stage, a robust mixed-integer linear programming model (MILP) is formulated to optimize a set of strategic and tactical decision variables. The enviromental impacts from CO2 equivalent emissions (CO2-eq emissions), water, and energy consumption in all echelons of the supply chain are incorporated in the developed model. This model is capable of providing a steady design against different expected scenarios. In the last stage, an experimental analysis is conducted, to examine the performance of the developed model in comparison with an expected scenario model. A real case study in Iraq is applied to check the applicability of the developed model. The results demonstrated the superiority of the proposed robust model over the expected scenario model in terms of the mean and standard deviation of their objective functions by 18% and 51% respectively.

Journal to be published April 2022, article online now

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Design and Evaluation of a Machine Integrating Ridge-Breaking, Fertilizing, and Ridging for Ratoon Sugarcane Without Intertillage



Existing ratoon sugarcane management machinery cannot satisfy the new agronomic requirements for the integration of ratoon sugarcane ridge-breaking, fertilizing, and re-ridging. Thus, a machine integrating these functions for ratoon sugarcane was designed. The machine structure and key components were designed in accordance with the analysis results of the agronomic requirements. The field orthogonal experiments indicated that the factors affecting the broken rate of soil are speed of rotary shaft, forward speed, and working depth. The influence on the hilling height includes the following aspects: working depth, speed of rotary shaft, and forward speed. Analysis of variance showed that the speed of rotary shaft and forward speed had exceedingly significant effect on the broken rate of soil, the working depth had exceedingly significant effect on the hilling height, and the speed of the rotary shaft reached a significant level. When the tractor was at low gear III and its forward speed was 1.2 m/s, the speed of the

rotary shaft was 300 r/min, and the working depth was 20 cm, the verification experiments indicated that the hilling height and the broken rate of soil were 87.4% and 17.0 cm, respectively. The combination of these operating parameters could obtain a better balance between effect and efficiency. Results of production experiments showed that the field performance of the machine satisfied the agronomic requirements, and the ratoon sugarcane sprouted and grew well in the experimental area. The research provided a supporting machine to promote the application of new agronomic practice for ratoon sugarcane management.

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A review of UAV platforms, sensors, and applications for monitoring of sugarcane crops



There are growing evidence that nitrogen (N) recommendation based on the expected yield concept developed by Stanford in 1973 lacks in agronomic principles, despite it widespread use worldwide. In Brazil, the main sugarcane producer worldwide, for example, a fixed N factor of 1 kg N per Mg-1 of stalk is used. However, literature demonstrates that sugarcane responsiveness to N is much higher in sandy soils rather than in clayey soils, whereas the recommended N is usually higher in clayey soils because of its improved yield potential. We investigated 146 response curves of sugarcane (Saccharum spp.) to N to define a better approach for determining N rates instead of using exclusively the expected yield concept. First, we found no correlation between the economically optimal N rate (Nopt, kg ha-1) and the yield (Mg ha-1) obtained in Nopt. Second, we calculate the N requirement (Nreq, kg N Mg-1 stalk) as the quotient between Nopt and the yield, for each response curve. There was a negative correlation between yield at control plot and Nreq, demonstrating that higher N rates are required to maximize yield in sandy (low yield) sites. The Nreq was 1.3, 0.9, 0.7 and 0.6 kg N Mg-1 stalk for expected yields < 69, 69–84, 84–102, and > 102 Mg ha-1, respectively, differing from the standard 1 kg N Mg-1 stalk currently used. The method proposed here is based indirectly on the N-supplying power of the soil and should be tested for other crops to deliver an improved N recommendation system.

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Events

International Society of Sugar Cane Technologists Founded 1924	Factory Commission Webinar Theme: The contribution of the cane sugar industry for decarbonization *International Society of Sugar Cane Technologists*

	Tuesday 29 March, 11am CET > Link
	**The Dubai Sugar Conference** *Dubai Sugar Conference* 13–16 March 2022 InterContinental Dubai Festival City > Link
	**2022 S.I.T. Orlando Conference** *Sugar Industry Technologists* 17–19 April 2022 Orlando, Florida, USA > Link
	**2022 Australian Society of Sugar Cane Technologists Conference** *Australian Society of Sugar Cane Technologists* 19–22 April 2022 Mackay MECC, Queensland, Australia > Link
	**ASSCT Annual Florida & Louisiana Joint meeting** *American Society of Sugar Cane Technologists* 14–16 June 2022 Hyatt Regency Coconut Point Bonita Springs FL USA > Link
	**XVI International Congress on Sugar and Cane Derivatives: Diversification 2022** *AZCUBA Sugar Group, the Cuban Association of Sugar Technicians and the Cuban Institute of Research on Sugarcane Derivatives* 20–24 June 2022 Cuba > Link
	**American Sugar Alliance Symposium** *American Sugar Alliance* 29 July – 3 August 2022

	~~Seattle, WA, USA~~ Location TBC > Link
	**94th SASTA Congress 2022** *SASTA – South African Sugar Technologists' Association* 16–18 August 2022 ICC, Durban, 45 Bram Fischer Rd, Durban, 4001 South Africa > Link
	**28ª Feira Internacional da Bioenergia** *Fenasucro & Agrocana* 16–19 August 2022 Centro de Eventos Zanini, Sertãozinho, Brazil > Link
	**XII Congreso Tecnicaña (XII Tecnicaña Congress)** *Tecnicaña* 12–16 September 2022 *At Tecnicaña we are preparing to share a unique international scenario with the Sugarcane Agroindustrial Sector, for this reason, we invite you to participate in this great meeting that will allow us to have the opportunity to meet again around sugarcane to discuss and reflect on the future and projections of the agribusiness.* Cali, Valle del Cauca, Colombia > Link
 	**7th IAPSIT International Sugar Conference & Sugarcon–2022** *"Sustainability of the Sugar and Integrated Industries: Issues & Initiatives"* *Indian Institute of Sugarcane Research* ~~16–19 February 2022~~ Postponed to 16–19 October 2022 Lucknow, India & virtual platform (for international delegates) > Link

	31st ISO International Seminar 2022 *International Sugar Organization* **22–23 November 2022** • *Congress: 20–23 February* • *Pre-congress tour: 17–18 February* • *Post-congress tour 24–28 February* East Wintergarden, Canary Wharf, London, UK > Link
	ISSCT XXXI Congress *International Society of Sugar Cane Technologists / The Sugar Technologists' Association of India (STAI)* **February 2023** • *Congress: 20–23 February* • *Pre-congress tour: 17–18 February* • *Post-congress tour 24–28 February* Hyderabad International Convention Centre (HICC), India > Link