

SHARKARA

JANUARY - MARCH 2020

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NATIONAL SUGAR INSTITUTE

Department of Food & Public Distribution
Ministry of Consumer Affairs, Food & Public Distribution
Government of India

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SHARKARA

VOLUME-51 No .01

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CONTENTS PAGES

<i>MESSAGE FROM DIRECTOR</i>	<i>0</i>
<i>OUR PROVISIONS</i>	<i>1 – 3</i>
<i>OUR RESEARCH AREAS</i>	<i>4 – 9</i>
<i>OUR ADVISORY</i>	<i>9 – 12</i>
<i>OUR OTHER ACTIVITIES</i>	<i>13 – 17</i>
<i>HAPPENING IN THE SUGAR INDUSTRY</i>	<i>18 – 23</i>
<i>RESEARCH ARTICLE</i>	<i>24 – 30</i>
<i>ABSTRACTS</i>	<i>31 – 35</i>

From Director's Desk.....



The pandemic of COVID-19 has affected the Indian as well as global sugar prices. Till 15th March 2020, the country has already produced about 21.5 million tonnes of sugar and looks forward toward export of sugar to the extent of 6.0 million tonnes for reducing sugar stocks in the country. As per reports available, sugar mills have dispatched almost 3.0 million of sugar from their factories for export against MAEQ of 6.0 million tonnes till 15.3.2020. As per market sources, about 3.7 million tonnes of sugar have been contracted for exports so far. Under the present situation to meet the target, it seems an arduous task but lower sugar production in Thailand by around 5.0 million tonnes and increased demand for 600 IU raw sugar at concessional import duty from Indonesia may help the sugar exports to pick up in near future.

As on 15th March 2020, 136 mills have stopped crushing and only 321 sugar mills in the country were crushing. As compared to that 173 mills had stopped operations last year as on 15th March 2019 and 354 mills were operating then.

The Indian Sugar Industry and Uttar Pradesh province, in particular, has seen significant B Heavy molasses diversion in pursuit of producing more ethanol at the cost of sugar, the economics being in favor of ethanol production through B Heavy route. Reports are available only from few factories taking up diversion of syrup for ethanol production. The Indian Sugar Industry, however, has to draw different permutations and combinations of operation adopting various modes of sugar sacrifice for balancing sugar demand-supply and boosting ethanol production. National Sugar Institute, Kanpur is providing required technical advice for operating the sugar factory and integrated distillery on various feed stocks. Partial diversion of syrup in accordance with the capacity of attached distillery with B Heavy molasses diversion for use during off-season appears to be another viable option under the present circumstances.

(Narendra Mohan)
Director

OUR PROVISIONS:

SIGNING OF MEMORANDUM OF UNDERSTANDING:

1. A MoU was signed with National Sugar Development Council, Nigeria at Indian High Commission, Abuja, Nigeria on 29th January 2020, by Professor Narendra Mohan, Director, NSI, Kanpur and Dr. Latif Busari, Executive Secretary NSDC, Nigeria. As per the MoU, Institute besides advising NSDC, Nigeria on setting up of a Sugar Institute at Nigeria and shall also conduct training programmes for their faculty.



Few of the would be faculty shall also seek admission in the regular courses conducted by National Sugar Institute, Kanpur. The institute faculty shall also deliver expert lectures at the proposed sugar institute in Nigeria from time to time.

2. Memorandum of Understanding between National Sugar Institute, Kanpur and Indian Institute of Millets Research, Hyderabad, was signed on 11th February, 2020 for conducting trials on cultivation of various varieties of "Sweet Sorghum" for assessing the potential of ethanol production in the institute's Nano-Distillery.



The trials of various varieties including intercropping of sweet sorghum with sugarcane has been taken up in the institute farm for which the required seed material has been provided by Indian Institute of Millets Research, Hyderabad.

TRAINING PROGRAMME ORGANIZED:

Sponsored by the CPCB, five days training programme on "**Cleaner Technologies for Effluent Management**" was organized from 20th to 24th January, 2020 at the institute. Officers of various Pollution Control Board's and other organizations participated in the programme which was inaugurated by Smt. Neelima Katiyar, Hon'ble Minister of State, Higher Education, Science & Technology, Government of Uttar Pradesh.



Theoretical as well as practical exposure on the subject matter was provided to the participants. Hon'ble Minister stressed upon following the principle of 4 R's, i.e. Reduce, Reuse, Recycle & Replenish to minimize waste generation and conserve environment. She also released an analysis manual on this occasion.

MEETING WITH BRAZILIAN DELEGATION:

Indian delegation headed by Hon'ble Minister of Consumer Affairs, Food & Public Distribution, Government of India, Shri Ram Vilas Paswan had a meeting with delegation from Brazil headed by Ms. Tereza Cristina, Hon'ble Minister of Agriculture, Livestock and Supply.



Fruitful discussions on bio-energy from sugar factories and on innovative technologies for exploiting its potential were held during the meeting. Prof. Narendra Mohan, Director also participated in the meeting.

SEMINARS & CONFERENCES:

1. Director, NSI, attended a national seminar on **"Recent Advanced Technologies in Analytical Chemistry"** at DG Collage, Kanpur on 17th January, 2020 as Chief Guest & highlighted the importance of instruments in achieving higher degree of accuracy and precise analysis. He stressed upon use of modern analytical instruments in precise analysis during R & D work and validation of data subsequently.



2. Director, NSI, attended a seminar on **"Waste Management- Role of Chemistry"** on 22nd January, 2020 at DAV College, Kanpur & delivered a lecture on Waste Minimization & Value Addition. He touched upon all areas of waste generation i.e. municipal, agricultural and industrial.



He called upon the students to equip themselves with the required knowledge in the matter and work for creating awareness in the society to mitigate the problem of waste generation. He also stressed upon following the defined processes of waste management from different sources i.e. medical waste, industrial waste and e-waste etc.

OUR RESEARCH AREAS:

RESEARCH:

1. Studies on isolation of Lignin from sugar industry based biomass and development of the process for the conversion of derived lignin and fermentable sugar to value-added product -

Vanillin is a primary compound of vanilla extracts. It is essential in lots of various applications in food flavors formulations, chocolate, confectionery, baking, beverage, dairy and fresh products, perfumes and fragrance, odors masking, formulation for home and personal care, toiletries, detergency, feed applications, pharmaceutical and agrochemicals intermediated. Instead of natural production from vanilla orchid bean, vanillin can be chemically derived via controlled oxidation of lignin. With objective to enable full valorization of sugarcane bagasse to access values added products, institute has extended its research activities towards exploring an efficient method to access vanillin from sugarcane bagasse based lignin. The authentic/standard sample has been procured and some experimental work related to its characterization via FTIR and TLC experiments has been performed. The work is being carried out in order to establish a protocol towards identification and characterization of target compound that is to be derived from sugarcane bagasse.

2. Studies on access of bio-plastic as polyethylene substitute from sugarcane bagasse –This study has been undertaken with a view to replace petroleum based raw material for production of plastic by using constituents of sugar cane bagasse as a substitute. The literature survey has been completed. Organic Chemistry division has made a work plan for future work and compilation of list of required materials is under progress.

3. Studies on Production/Isolation of C5-Sugar Alcohol/Sugar using by-product resources of sugar industry– Sugar alcohols (Polyols) are a class of alternative sweeteners. They are characterized by a lower caloric value and glycemic index than sugars and exhibit prebiotic and anticaries effects. The studies aim basically towards developing new method for deriving a low-calorie sweetener-xylitol from bagasse as well as trash. The experiments related to implement the Ru – C/ iPrOH based catalytic system to access a sugar alcohol (xylitol) from bagasse derived xylose syrup have been completed. Results are not encouraging and optimization reactions are under progress. Furthermore, in collaboration with BC Div., we are also aiming to implement fermentative conditions to access the target compound. Experiments are under progress towards evaluating the xylitol yield from pure xylose and bagasse hydrolysate.

4. Studies on pot-efficient synthesis of alkyl levulinates (Als) using sugarcane bagasse derived cellulose – With aim to convert sugarcane bagasse to value added platform molecule implementing bio-refinery concept, we have been devoted to develop a method for the conversions of bagasse based cellulose to alkyl levulinates. Targeted alkyl levulinates are a kind of short fatty acid esters which can be used as plasticizing agents, solvents, or as a blending fuel additive. Apart from that, their reactive ester and carbonyl groups enable them to be used for the synthesis of several downstream chemicals or drugs. Initially, we carried out several experiments to establish an optimum condition for synthesizing methyl levulinate from bagasse (@ 5gm scale dry bagasse) utilizing various metal catalysts under parr auto

clave reactor condition. Out of various catalyst tested, a copper salt was found to be efficient to facilitate such reactions, albeit lower yield. The synthesized compounds were analyzed by recording NMR spectra and mass spectrometry towards determination of its structure. As per plan, the work related to enhancing the product yield had to be started.

5. Mechanical Clarification of Juice – This study was undertaken with a view to clarify the cane juice to remove most of suspended impurities like dirt, fine particle of bagasse, turbidity and finally reduce ICUMSA colour of cane juice by using centrifuge technique before processing the juice further. To validate the data generated during the experiments conducted at 6000 rpm during crushing season 2018-19, various set of experiments were conducted at laboratory and Experimental Sugar Factory.

A paper was also published in 4th Annual Convention of North Indian Sugarcane & Sugar Technologists' Association (NISSTA) held on 29-30th May, 2019 at NSI, Kanpur. During the paper presentation suggestions were given to conduct trials on lower rpm. During crushing season 2019-2020 experiments were conducted on lower rpm i.e. at 1500 and rpm. The results obtained during experiments indicated colour and turbidity removal around 15% and 75% respectively. Further studies are in progress.

6. Role of Hydroxyapatite (HAp) in cane juice clarification – This work has been started to establish an alternate to the conventional clarification of cane juice with application of lime & SO₂. During literature survey, adsorption of non-sugars from sugar factory juices by natural phosphate with apatite structure leading to de-colorization have been found which is still under study on the topic. An action plan is being prepared for laboratory trials.

7. Development of Super Short Retention Time Clarifier – Based on the experience gathered earlier, modifications in the design of the Clarifier were carried out and trials were conducted during the present crushing season at ESF. Results obtained from the trial are under compilation.

8. Boiler RO/DM water heating by Concentrated Solar Thermal (CST) system - Keeping in view boosting of renewable energy sources which also replace carbon intensive energy sources and significantly reduce global warming emission, efforts have been initiated to utilize solar thermal based solar energy for heating the boiler make-up water (RO/DM water) in the Experimental Sugar Factory (ESF) of the institute. Solar energy is not only carbon negative, but also a freely available source. Use of this energy for heating of boiler make-up feed water will save the fuel, which otherwise was being used for the same.

Surplus power shall be generated from this saved bagasse. The ROI of the proposed system comes within 10-11 years. Apart from being green & clean source of energy, the system is maintenance free and durable. Its implementation in sugar factories all over India may add about 260 million units to the national grid. In order to access the suitability and sustainability of the system for the purpose, it has been proposed to install a small prototype unit in ESF.

9. To study the impact on performance of mechanically coupled twin induction motor drives for Shredder/ Fibrizer having unequal sharing of load and to design & develop dedicated drive for the application - In case of twin motor drive in cane preparation, problems that exist with the system such as issues of load balancing, inefficient use of drives and lowering of the speed of the motor during peak load conditions have been addressed. In case AC VFD is used, the two drives use individual 6-pulse/12-pulse rectifier circuit because of its simple and low cost structure followed by a 2-level inverter. This leads to injection of harmonics in the input current and rise of problems such as “motor bearing failure” and “motor winding insulation breakdown” because of circulating currents and dielectric stresses and at the same time loss of power.

The department is carrying out a study to assess the effects of differently rated mechanically coupled induction motors for cane preparation and to design and develop a prototype to validate the study practically through the prototype. The prototype shall be Multilevel (3 or 4 level) inverter based Open End Winding Induction Motor type drive resulting in the main advantages like saving of power to the tune of 10-15% of the power used for cane preparation, smooth operation of electrical installation due to reduced harmonics, reduction in Common Mode Voltage (CMV) problems and improvement in power factor.

10. Studies on deterioration patterns on different sugars –

The Physical Chemistry division has started to study the deterioration patterns of various sugar samples- raw, plantation white and refined sugars on storage and to find out its cause. These sugar samples have been collected, packed and stored at appropriate conditions. On regular intervals, the analysis of parameters such as colour, ash, pol, pH, RS, SO₂, turbidity as per plan of work is being carried out.

RESEARCH PAPERS:

1. A research paper on “**Direct Use of Sugarcane Bagasse Derived Hemicellulose Hydrolysate for the Synthesis of C- glycosyl Derivatives by the Lubineau Reaction**” by V.P. Srivastava has presented at the 26th ISCB International Conference (ISCBC-2020) @ Nirma University, Ahmedabad on 24th January, 2020.
2. A research paper on “**Bio-refinery Process for Valorization of Sugarcane Biomass: from Constituents Sugars and Lignols to Value Added Products**” by V.P. Srivastava, Tushar Mishra & N. Mohan published in the proceeding of 2nd International Conference and Exhibition on “Sustainability – Innovation and Diversification in Sugar and Allied Industry” held on 31st January to 2nd February, 2020 at Vasantdada Sugar Institute, Pune, Maharashtra.
3. A research paper on “**New Ventures of Value-Addition in Jaggery Processing for a Dynamic Sugar Industry**” by Narendra Mohan & Anushak Agarwal published in International Journal of Engineering Research & Technology (IJERT) volume-9, January, 2020.

4. A research paper on “**Innovative Technique for Effluent Treatment in Sugar Industry**” by Vanistha Shukla, Amresh Pratap Singh & Narendra Mohan published in the proceedings of National Seminar on Waste Management: Role of Chemistry on 22nd January, 2020 at DAV College, Kanpur.
5. A research paper on “**Recent Trends & Market Status for Sugar Alcohols (Polyols) – A Revolution in Sweetener Sector**” by Narendra Mohan published in International Journal of Science Research January, 2020.
6. A research paper on “**Quality Control in Sugar Industry – A Need of Hour**” by Narendra Mohan & Anushka Agarwal was presented in All India Seminar on “Advances in Sugar Grading and Food Safety Standards to Produce Quality Sugar” held on 22nd February, 2020 at Belgavi, Karnataka.
7. A research paper on “**Bioenergy from Filter cake in Indian Sugar Industry**” by Narendra Mohan & Sanjay Awasthi published in International Journal for Scientific Research and Development Vol. – VII, issue 12, February, 2020.

BUREAU OF SUGAR STANDARDS:

The Institute on behalf of Bureau of Indian Standards prepares and issues Sugar Standard Grades to the entire Sugar Industry of the country for every sugar season. These Sugar Standard Grades are issued to facilitate quality control and to protect the interest of the common consumers. On the basis of these grades, sugar factories mark their produce accordingly. Meeting of Expert Committee on sugar standards was held at NSI, Kanpur on 25th September 2019, wherein seven grades and their sale price were approved for the sugar season 2019-20.

On the basis of the approved Standards, Bureau of Sugar Standards Grades distribution commenced from 1st October, 2019.

Price schedule for the sugar season 2019-20:

1	Sugar Standard Grades to be issued	L-31, L-30, M31, M-30, S-31,S-30 & SS-31
2	Set of New Sugar Standard Grades containing 7 grades +3 empty glass bottles + 3 Velvet Cork in packing case	Rs.19000/= each set
3	Single Sugar Standard Grade	Rs.2500/= each
4	Empty Sugar Standard Glass Bottle	Rs.400/= each
5	Packing case	Rs.600/= each
6	Velvet Cork	Rs.100/= each
7	Postal expenses, forwarding charges, if any	Extra as applicable
8	Payment	For Indian Sugar Standards 2019-20, payment shall be acceptable only through BHARAT KOSH . In any circumstances, no Demand Draft / Cheque / Cash amount shall be accepted.
9	Delivery of Sugar Standard Grades	Monday to Friday (10.00 AM to 5.00 PM)
10	Taxes	GST extra as applicable @18%.

The institute has taken up revision of various existing BIS standards viz. molasses tanks, raw, plantation white, refined and icing sugar etc. on behalf of Bureau of Indian Standards. BIS standards for some other sugars viz. organic sugar, brown sugar & low sulphur sugar are being drafted in consultation with various stake holders.

PREPARATION AND SALE OF SUGAR STANDARDS:

Sale of sugar standards for the sugar season 2019-20 commenced from 1st October, 2019. Bureau of Sugar Standards issued 133 Sugar Standard Grades to 27 sugar factories during January-March, 2020.

OUR ADVISORY:

Besides conducting teaching and training programmes, carrying out research in relevant field, another main function of the institute is:

1. To function as a “Think-tank” to sugar and allied industry for proposing modernization and trouble free functioning of the process on advisory basis / through Extension Services.
2. To formulate strategies and promotes measures for expansion of capacities, energy conservation, co-product utilization etc. for sugar and allied industries.
3. To assist Govt. of India through technical contribution in policy formulation and control of Sugar Industry.

CONSULTANCY SERVICES:

During January-March, 2020 consultancy services were provided to the following:

1	M/s Magadh Sugar & Energy Ltd., Unit – Hasanpur Sugar Mills, Distt – Samistipur, Bihar.
2	M/s Bajaj Hindustan Sugar Ltd., Unit – Palia Kalan, Distt – Lakhimpur-Kheri, U.P.
3	M/s Triveni Engineering & Industries Ltd., Unit – Milak Narayanpur, Distt – Rampur, U.P.
4	M/s Oswal Overseas Ltd., Distt – Bareilly, U.P.
5	M/s Treveni Engineering & Industries Ltd., Unit – Chandanpur, Distt – Amroha, U.P.
6	M/s Mawana Sugar Works Ltd., Mawana, Distt – Meerut, U.P.
7	M/s Dalmia Bharat Sugar & Industries Ltd., Sugar Unit – Nigohi, Distt – Shahjahanpur, U.P.
8	M/s Bajaj Hindustan Sugar Ltd., Unit – Barkhera, Distt – Lakhimpur-Kheri, U.P.
9	M/s Bajaj Hindustan Sugar Ltd., Unit – Maqsudpur, Distt – Shahjahanpur, U.P.
10	M/s Dalmia Bharat Sugar & Industries Ltd., Unit – Ninaidevi Sakhar Karkhana, Distt – Sangli, Maharashtra.
11	M/s Wave Sugar Industries Pvt. Ltd., Distt – Bijnor, U.P.
12	M/s National Industrial Corporation Pvt. Ltd., Distt – Moradabad, U.P.’
13	M/s Dalmia Bharat Sugar & Industries Ltd., Shree Datta Sakhar Karkhana, Asurle Purle, Distt – Kolhapur, Maharashtra.

14	M/s Magadh Sugar & Energy Ltd., Unit – New Swadeshi Sugar Mills Ltd., Narkatiganj, Distt – West Champaran, Bihar.
15	M/s The Karnal Co-operative Sugar Mills Ltd., Distt – Karnal, Haryana.
16	M/s Wave Sugar & Industries Ltd., Unit – Bulandshahar, Distt – Bulandshar, U.P.
17	M/s The Seksaria Biswan Sugar Factory Limited, Distt – Sitapur, U.P.
18	M/s Wave Sugar & Industries Ltd., Dhanaura Mandi, Distt – Amroha, U.P.
19	M/s Kisan Sahakari Chini Mills Ltd., Sitarganj, U.S. Nagar, Uttarakhand.
20	M/s Uttarakhand Sahakari Chini Mills Sangh Ltd., Dehradun, Uttarakhand.
21	M/s Avadh Sugar & Energy Ltd., Unit – Hargaon, Distt – Sitapur, U.P.
22	M/s Shamnur Sugars Limited, Davangere, Karnataka.
23	M/s Triveni Engineering & Industries Ltd., Unit – Muzaffaranagar, U.P.
24	M/s Triveni Engineering & Industries Ltd., Unit – Sabitgarh, Distt – Bulandshahr, U.P.
25	M/s Avadh Sugar & Energy Ltd., Seohara, Distt – Bijnor, U.P.
26	M/s Dhampur Sugar Mills Ltd., Unit – Rajpura, Distt – Sambhal, U.P.
27	M/s Triveni Engineering & Industries Ltd., Unit – Raninangal, Distt – Moradabad, U.P.
28	M/s Dhampur Sugar Mills Ltd., Unit – Dhampur, Distt – Bijnor, U.P.
29	M/s Shree Halasidhanath SSK Ltd., Chikodi, Belgavi, Karnataka.
30	M/s Daurala Sugar Works Distillery Division, Daurala, Meerut, U.P.
31	M/s Naglamal Sugar Complex, Naglamal, Meerut, U.P.
32	M/s Dalmia Chini Mills, Jawaharpur, Sitapur, U.P.
33	M/s EID Parry Ltd., Sankili, Srikakulam, Andhra Pradesh.
34	M/s DCM Shriram Ltd., Unit – Loni, Harodi, U.P.
35	M/s Akbarpur Chini Mills Ltd., Bhati, Ambedkarnagar, U.P.
36	M/s Balrampur Chini Mills Ltd., Unit – Babhnan, Distt – Gonda, U.P.
37	M/s Balrampur Chini Mills Ltd., Unit – Balrampur, Distt – Gonda, U.P.
38	M/s DSM Sugar Mansurpur, Muzaffarnagar, U.P.
39	M/ DSM Sugar Meerganj, Distt – Bareilly, U.P.
40	M/s Balrampur Chini Mills Ltd., Unit – Mankapur, Distt – Gonda, U.P.
41	M/s Kumbhi Chini Mills, Gola-Gokarannath, Lakhimpur-Kheri, U.P.
42	M/s Gularia Chini Mills, Gola-Gokarannath, Lakhimpur-Kheri, U.P.
43	M/s Rauzagaon Chini Mills, Rauzagaon, Faizabad, U.P.
44	M/s Haidergarh Chini Mills, Haidergarh, Barabanki, U.P.

45	M/s Shankara Sharkara Sankul, Captainganj, Kushinagar, U.P.
46	M/s Tulsipur Sugar Company, Tulsipur, Balrampur, U.P.
47	M/s Kisan Sahakari Chini Mills Ltd., Sathiaon, Azamgarh, U.P.
48	M/s Doiwala Sugar Co. Ltd., Doiwala, Dehradun, Uttarakhand.

ANALYTICAL SERVICES:

The institute now has a Centralized NABL Accredited Analytical Laboratory to carryout analysis of sugar, molasses, alcohol and other related products as ICUMSA and other standards protocol. During the period, analytical services were rendered to following:

The samples of sugar, molasses, ethanol, waste waters & condensates etc. were analyzed for the desired parameters in the NSI-Analytical Laboratory (NABL Accredited).

1	M/s Daurala Sugar Works Ltd., Daurala, Distt – Meerut, U.P.
2	M/s Anamika Sugar Mills Pvt. Ltd., Distt – Bulandshahr, U.P.
3	M/s Dhampur Sugar Mills Ltd., Dhampur
4	M/s Kesar Enterprises Ltd., Baheri, Distt – Bareilly, U.P.
5	M/s Dalmia Bharat Sugar & Industries Ltd., Shree Datta Sakhar Karkhana, Asurle Purle, Distt – Kolhapur, Maharashtra.
6	M/s Balrampur Sugar Mills Ltd., Unit – Babnan, Distt – Basti, U.P.
7	M/s U.P. State Sugar Corporation Ltd., Unit – Mohiuddinpur, Distt – Meerut, U.P.
8	M/s Nanglamal Sugar Complex (Distillery Division), Distt – Meerut, U.P.
9	M/s Dalmia Bharat Sugar Industries Ltd., Unit – Ramgarh, Distt – Sitapur, U.P.
10	M/s Dalmia Bharat Sugar Industries Ltd., Unit – Nigothi, Distt – Shahjahanpur, U.P.
11	M/s The Kisan Sahkari Chini Mills Ltd., Distillery Division, Unit – Sathiaon, Distt – Azamgarh, U.P.
12	M/s Magadh Sugar Energy Ltd., Unit – New Swadeshi Sugar Mills, Distt – West Champaran, Bihar.
13	M/s The Seksaria Biswan Sugar Factory Ltd., Distt – Sitapur, U.P.
14	M/s Balrampur Chini Mills Ltd., Unit – Balrampur, U.P.
15	M/s K.M. Sugar Mills Ltd., Moti Nagar, Faizabad, U.P.
16	M/s The Kisan Sahkari Chini Mills Ltd., Badaun, U.P.
17	M/s Balrampur Chini Mills Ltd., Unit – Mankapur, Distt – Gonda, U.P.

18	M/s Kisan Sahkari Chini Mills Ltd., Distillery Unit, Najibabad, Distt – Bijnor, U.P.
19	M/s Shree Madhi Vibhag Khand Udyog Sahakari Mandali Ltd., Madhi, Gujarat.
20	M/s UY Trienviro Pvt. Ltd., Kanpur, U.P.
21	M/s Bajaj Hindustan Sugar, Unit-Bilai, Distt-Bijnor, U.P.
22	M/s Seksaria Biswan Sugar Factory Ltd., Biswan, Distt.-Sitapur, U.P.
23	M/s Maa Mahamaya Sahakari Shakar Karkhana Maryadit, Ambikapur, Chhattisgarh.
24	M/s Palwal Co-operative Sugar Mills Ltd., Distt.-Palwal, Haryana.

OUR OTHER ACTIVITIES:

1. Institute is actively involved in the Swachhta activities in and around the campus. As a part of such activity, distribution of cloth bags was made in and around the institute in view of eradicating "**Single Use Plastic**" from our life was made on 2nd January 2020.



2. Boiler & Cane Carrier Pooja was organized at Experimental Sugar Factory at the institute on 24th January 2020 and thereafter crushing operations of the factory commenced to impart practical training to the students of various courses.



During the year, trials on bagasse drying using flue gases of boiler, waste water treatment through electro-coagulation technique were also conducted.

3. The Institute celebrated 71st Republic Day on 26th January, 2020. On this occasion, Shri Narendra Mohan, Director hoisted the National Flag and took the salute from the security guards. Awards were also given to the winners of various competitions organized during Swachhta and Satarkata Pakhwadas.

4. "**KRISHAK SAMVAAD**" was organized on 24th January 2020 at the institute for providing platform to create awareness among farmers about new sugarcane varieties, planting methods from bud chip to trench planting, methods of irrigation including micro-irrigation and on inter-cropping. Students of Diploma course in Sugarcane Productivity & Maturity Management also participated with great enthusiasm.



5. Mini Sugar Refinery (10 TPD) inaugurated on 7th February, 2020 at National Sugar Institute, Kanpur. Melt clarification system include ion-exchange and active carbon + membrane filter for secondary de-colorization have been installed to give better exposure to students on working of Sugar Refinery. Sugar of below 20 ICUMSA was successfully produced during the trial run.



6. Patent on **“A Process of Sugarcane Juice Clarification to obtain Sulphurless Sugar”** has been granted by Indian Patent Office on 12th February, 2020. The patent is about an innovative technique of clarifying the sugarcane juice using carbon di-oxide from the fermenters of distilleries.



7. Swachhta oath was administered to staff and students during the **“Swachhta Pakhwada”** which was organized at the institute from 16th February 2020 onwards. Besides, tree plantation, organizing essay & painting competitions, a Nukkad Natak on swachhta was also organized involving staff & students.



The institute also conducted a cleanliness drive in the nearby primary school & students were taught about the importance of cleanliness. Soaps and other sanitary material was also distributed among the students a staff.

8. Students of Sheiling House School visited the institute on their educational tour and took keen interest to learn process of flavored sugar production and sugar quality standardization on 6th March, 2020. They also went around the institute to see the plantation white sugar, flavoured sugar, ethanol and beer production facilities available at the institute.



The students also showed their keen interest in learning about “Electro-Coagulation” based water purification system installed in the institute.

9. “**International Women’s Day**” was celebrated at the institute on 9th March, 2020. Various competitions were organized for the lady officials of the institute and prizes were distributed. On this occasion a documentary on empowerment of women was also shown.



10. सरकारी कामकाज में राजभाषा के रूप में हिन्दी के प्रति जागरूकता लाने तथा उसके उत्तरोत्तर विकास हेतु संस्थान में 19 मार्च, 2020 को हिन्दी कार्यशाला का आयोजन किया गया। कार्यशाला में अधिकतम कार्य राजभाषा में करने का संकल्प लिया गया। साथ ही संस्थान कर्मियों को टिप्पणी एवं पत्र लेखन के औपचारिक तौर तरीके से भी अवगत कराया गया।



11. National Sugar Institute called upon the sugar industry to come forward for production of alcohol based sanitizers required to fight against Covid-19. Leading from the front, it was prepared at the institute itself as per the WHO guidelines for distributions among institute staff and the corona warriors.



FELICITATIONS:

1. "Innovative Academic Leader of the Year 2020" award was given to Prof. Narendra Mohan, Director, NSI, Kanpur by Ms Meenakshi Lekhi, Member of Parliament and National Spokesperson of

BJP during the 2nd National Education Excellence Conclave organized by Integrated Chambers of Commerce & Industry at New Delhi, on 24th February, 2020.



2. Director attended National Conference on **"Technological Approaches for Enhancement of Employment and Income in Agriculture"** at Rama University, Kanpur and was conferred with "Honorary Fellowship Award 2020" during the conference on 3rd March, 2020.



3. **"Bio-refinery process for valorization of sugarcane biomass: from constituent sugars and lignols to value added product"** by Prof. Narendra Mohan, Dr. V.P. Srivastava and Mr. Tushar Mishra was conferred first prize in poster presentation during the 2nd International Conference & Exhibition at VSI, Pune.

HAPPENING IN THE SUGAR INDUSTRY:

USA – Ethanol demand destruction from COVID-19 forcing plants to idle.

COVID-19 related impact on the staggering rise in unemployment (3.3 million people filing for benefits in the 4th week in March) plus the attendant restrictions on movement is invariably resulting in people driving much less than before, thereby reducing demand for transportation fuels – both gasoline and ethanol – according to the study published by economists of the University of Illinois on March 26, 2020.

Recycling concrete with woody waste creates stronger, flexible material.

Concrete is a problematic material when it comes to disposal at the end of the useful life of a building or other structure. However, researchers at the University of Tokyo's Institute of Industrial Science have found that the waste material can be effectively recycled with the addition of wood-fibres.

Thailand – 2019/20 campaign ends with sugar output falling 43% to 8.27 million tonnes.

The 2019/20 campaign ended recently, according to the Thai Sugar Millers Corporation. Both sugarcane production and cane sugar production fell by 43% – cane output from 130.97 million tonnes in the previous year to 74.89 million tonnes and sugar output from 14.58 million tonnes to 8.27 million.

US increases sugar imports from Mexico to 1.65 million tonnes.

The United States will increase its sugar imports from Mexico to 1.65 million tonnes in the 2019-2020 cycles, according to the Secretary of Economy, Graciela Márquez at the Ministry of Economy.

Japan – Mitsui Sugar to merge with Dainippon Meiji Sugar and Nippon Sugar.

Driven by declining consumption in the country, the top sugar company Mitsui Sugar and Dainippon Meiji Sugar announced on 25th March that they will be merging. Once the merger is completed by April 2021, the new company will merge with Nippon Sugar, according to local press reports.

WACKER launches polymeric binders produced from biobased acetic acid.

The Munich-based chemical group WACKER is expanding its new product line of polymeric binders produced from bio-based acetic acid.

Brazil – Analysts forecast 2020-21 sugar output to increase by 10 million tonnes.

With the 2020-21 scheduled to commence in April, mills are expected to make a sharp switch from ethanol to sugar production as falling gasoline prices and a weak currency reduce the biofuel's appeal, reported Reuters.

Indonesia issues permit to import 2.4 million tonnes sugar.

Amidst the turbulence caused by the Covid-19 outbreak various food items prices have risen. This includes sugar. To bring prices down, the trade ministry has issued permits to import 2.4 million tonnes of raw sugar.

India – Covid-19 adversely impacts cane harvesting in Maharashtra.

The coronavirus COVID-19 is impacting sugar industry stakeholders in various ways. Following social distancing measures to contain the spread of coronavirus, farmers are facing problems in getting labourers to harvest their cane from the fields. In Maharashtra 56 out of 146 sugar mills have stopped crushing activity.

China – Sugar industry impacted by coronavirus outbreak.

The cane industry has been impacted on a variety of fronts by the Covid-19 virus according to local press reports.

Amyris launches cane-based low-calorie sweetener Purecane.

The biotech start-up Amyris recently launched a second product through its Purecane™ low-calorie sweetener- the Purecane Baking Sweetener.

Brazil – Fall in oil price to boost 2020/21 sugar output by 3 million to 6 million tonnes.

The sharp fall in global oil prices should result in higher sugar production in Brazil in the new crop that starts in April, Ricardo Mussa, the incoming Chief Executive Officer of the world's largest sugar producing company, Raízen, said on 9th March, reports Reuters.

Turkey diverts fuel ethanol for use in the production of sanitizers.

Turkey has temporarily scrapped the requirement to include ethanol in gasoline in a bid to boost disinfectant production in the country to help stem the coronavirus outbreak, the country's industry and technology minister said on 13th March.

Malaysia's sugar imports from India peak to over 300,000 tonnes.

India's exports of sugar to Malaysia so far in 2020 have nearly tripled over the figure for all of last year, in a quid-pro-quo initiative to end the trade dispute that halted its palm oil exports to India.

Coronavirus crisis – a perfect storm for ethanol producers as demand rockets.

Some ethanol producers worldwide said demand is up for their products due to customers stockpiling hand sanitizer – which can be made using the industrial ethanol – as the coronavirus outbreak worsens, reports Reuters.

Mitr Phol acquires the remaining 50% stake in Olam's sugar interest in Indonesia.

The agribusiness Olam International has agreed to sell its remaining 50% stake in Indonesian sugar joint-venture Far East Agri to Mitr Phol Sugar Corporation for between US \$ 82.5 million and US \$ 85 million.

Fiji – Cane growers diversifying to remain competitive.

Due to declining competitiveness of cane production amidst the loss of preferential access to the profitable EU market, in particular, cane growers are diversifying to maintain some level of profitability, according to doctoral research by Amar Singh.

Sudan – Kenana’s 2019/20 sugar output on target at 315,000 tonnes.

Sudan’s key sugar producer Kenana recently announced that its 2019/20 sugar is on target to produce 315,000 tonnes as set out in the five-year plan to drive expansion through modernization of its sugar factory.

Kenya – Five state-owned sugar factories to be privatized.

On 24th of February, President Uhuru Kenyatta’s office announced plans to privatize the five state-owned sugar factories and impose additional taxes in order to revive the ailing industry.

Thailand – Cane growers defy the ban on burning crop prior to harvesting.

Sugarcane growers in eastern and central Thailand have been burning their fields at night despite authorities’ ban on the practice to curb air pollution.

Uganda – Kakira Sugar loses US \$ 955,000 worth of cane following fire by arsonists.

Arsonists have burnt 750 acres (303.5 ha) of sugarcane belonging to Kakira Sugar Limited. The fire has destroyed some 26,000 tonnes of raw cane worth UGX3.5 billion (US \$ 955,000), according to local press reports.

India to Miss Sugar Export Target As Lockdown Roils Ports, Mills.

Sugar mills in India, the world’s third-biggest shipper, will probably miss their export target this year as a nationwide lockdown to prevent the spread of the coronavirus disrupts logistics at ports.

Trending stocks: Balrampur Chini Mills shares jump 10%.

Shares of Balrampur Chini Mills traded 10 per cent up in Friday 's trade at 10:27 am. Around 98064 shares changed hands on the counter. The stock opened at Rs. 90.2 and touched an intraday high and low of Rs. 90.2 and Rs. 89.05, respectively, in the session so far.

Source says Government may set April sugar sale quota for mills at 1.8 million ton .

The Centre may set April sugar sale quota for mills at 1.8 million ton, lower than 2.1 million ton set for March, a senior government official said today. "We have set a lower quota this month because demand for sugar is less due to coronavirus as parties, weddings and all other social functions.

Shamli sugar mill seeks nod to make alcohol-based disinfectant to sanitize 75 villages.

A private sugar mill in Shamli district of Uttar Pradesh has sought permission from the local administration to develop an alcohol-based disinfectant which could be used for sanitizing 75 villages in the district.

National Federation of Cooperative Sugar Factories urges Centre to ensure uninterrupted mill operations.

The National Federation of Cooperative Sugar Factories (NFCFSF) has urged the Centre to intervene for an uninterrupted operation of mills and distilleries during the nationwide lockdown. In a representation to Joint Secretary, (Sugar), NFCFSF, Managing Director, Mr. Prakash Naiknavare said the coronavirus pandemic is spreading rapidly.

Maharashtra: Sugar mills continue operations, concerns over cane cutters.

Most sugar mills have shut for the crushing season but some continue to operate after the administration exempted them from the lockdown. However, many cane cutters have returned to their native villages in Beed and parts of Marathwada, those who are still in western Maharashtra are reluctant to work amid COVID-19.

Karnataka: Sweetener for sugar factories: Govt may call for tenders in a month.

The government may call for tenders within a month to revive three state-run sugar factories in Mandya and Mysuru districts, bringing relief to cane growers who are now forced to delay harvesting and transport their produce to private factories in the state, and to Tamil Nadu.

Industry asks govt to allow mills to sell March sugar quota till April 15.

The sugar industry has asked the government to allow mills to sell their March sales quota till Apr 15 as demand has been hit due to the spread of novel coronavirus, two industry sources said. The government had fixed March sugar sales quota for mills at 2.1 million ton.

Tanzania - India's Purandare Industries to launch sugar mill.

Indian sugar miller Purandare Industries Ltd plans to establish a sugar mill in Tanzania's capital, Dodoma, according to local press reports. According to the company's Managing Director, Mr. Satish Purandare, construction of the plant is expected to commence.

UP ethanol production hits 1.4 bn litres, more capacity in the pipeline.

Uttar Pradesh sugar mills have ramped up total ethanol production of more than 1.4 billion litres (BL) per annum even as more capacities are in the pipeline. According to the State Sugar Industry and Sugarcane Development Department, at least 25 sugar mills in UP had already started ethanol production from 'B- Heavy' molasses.

Sugar exports from India will again pick up soon, says ISMA.

Industry body Indian Sugar Mills Association (ISMA) has said that despite COVID-19 impacting global sugar prices, increased demand for Indian sugar from Indonesia will help the sugar exports to pick up again. In a release issued today, ISMA said, "As per reports available, sugar mills have dispatched almost 30 lac tons of sugar.

Maharashtra: Cane crushing dips, 1/3 mills stop manufacturing.

Sugarcane crunch in the state has seriously affected the crushing activity with more than one third sugar mills have stopped manufacturing of sugar. Just four months into the cane crushing season as 56 out of 146 sugar mills have stopped crushing cane.

Domestic and export prices of sugar fall due to COVID-19 scare.

Sugar industry is afraid of a significant fall in sugar consumption due to COVID-19 as there is curb on social gatherings, weddings and celebrations have been on forced by govt. and people are staying away from ice creams and cold drinks to avoid falling sick leading to fall of domestic as well as international sugar prices.

India's sugar production down 21% as crushing season nears its end.

India is set to record its steepest decline in sugar production in a year in well over a decade this year with production of the commodity registering a 21 per cent dip by March 15. The sugar harvesting season typically begins in October, peaks in January.

UP government orders first ever interim survey for procurement of additional sugarcane crop.

State cane commissioner Sanjay R Bhoosreddy has issued orders to all district cane officers and sugar mills to carry out an interim survey of standing sugarcane crop that is in excess over the quantity that is bonded, following orders of the UP Cane Development Minister Shri Suresh Rana.

ISMA revises India's sugar output upward by 2% to 26.5 million tonnes for 2019-20.

Industry body ISMA on Tuesday revised the country's sugar production upward by two per cent to 26.5 million tonnes for the ongoing 2019-20 marketing year, much lower than last year but enough to meet the local demand.

Food min may reallocate about 650,000 tonnes sugar export quota soon.

The Food Ministry is likely to reallocate about 650,000 tn from the export quota for sugar to mills that signed contracts for at least 75% of the quota by Dec 31, a senior government official said today on the sidelines of Sustainable Mobility: Ethanol Talks India.

Book sugar mill for not paying FRP: HC.

The Bombay high court bench at Aurangabad has directed the police to register a case against the management of a sugar factory from Majalgaon in Beed for alleged non-payment of fair and remunerative price (FRP) to growers within the stipulated 14 days of supply.

Shree Renuka Sugars falls 7% as it posts Q3 loss of Rs 208 cr.

Shares of the sugar refiner and ethanol producer Shree Renuka Sugars tanked over 7 percent intraday on February 14 after the company reported a consolidated net loss of Rs 208.6 crore in the quarter ending December 2019 against a net profit of Rs 311.1 crore in the year-ago period.

Maharashtra sugar millers aim to capitalise on global prices.

Mills in Maharashtra had complained of non-payment of a previous subsidy of about Rs 900 crore, as well as liquidity crunch for them not taking to export their stock. Sugar export from Maharashtra, which has been lagging since the start of the season, is expected to pick up the pace as international sugar.

Closure of Pondhicherry Cooperative Sugar Mill leaves staff, farmers in a spot.

The closure of Pondhicherry Cooperative Sugar Mill has put a question mark over the future of around 300 workers. With accumulated losses running to around ₹ 150 crore, the management shut down the operations in March 2017. The workers have been without salary for the last 37 months.

Riga Sugar Company reports standalone net loss of Rs 12.54 crore in the December 2019 quarter.

Sales decline 17.75% to Rs 36.04 crore Net Loss of Riga Sugar Company reported to Rs 12.54 crore in the quarter ended December 2019 as against net loss of Rs 14.63 crore during the previous quarter ended December 2018.

Sugar mills produce 141 lakh tonnes till January.

Maharashtra sugar output down by more than half Sugar production in the country as on January 31, it was around 141 lakh tonnes nearly 24 % lower than the corresponding period last year.

Uttar Pradesh: Pending stock, fresh sugar to lower prices.

The price of sugar may fall in Uttar Pradesh in coming days not just because of the impact of Union Budget, but due to sugar mills having recorded a carry forward stock of 5 million tonnes for the year 2018-19, which is almost equivalent to the annual sugar consumption for eight months.

Stock market update: Sugar stocks slip; Kesar Enterprises falls 6 %.

Dhampur Sugar Mills posted a 38 per cent drop in its consolidated net profit at Rs 51.02 crore for the third quarter of the 2019-20 on sluggish revenues. The company had reported a net profit of Rs 82.04 crore for the October-December quarter of the 2018-19, according to the BSE filing.

NSI signs MoU to set up sugar institute in Nigeria.

National Sugar Institute, Kanpur and National Sugar Development Council of Nigeria signed a Memorandum of Understanding at Abuja, Nigeria in the presence of Indian High Commissioner, Abhai Thakur. The MoU was signed by Professor Narendra Mohan, Director, NSI, Kanpur and Dr. Latif Busari, Executive Secretary NSDC, Nigeria.

➤ **RESEARCH ARTICLE:**

“BIO-ETHANOL FROM SUGAR INDUSTRY-OUR OPTIONS”

by
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ABSTRACT:

With government impetus on pushing the ethanol blending programme and many policy interventions been made to encourage ethanol production, the Indian Sugar Industry as it appears is trying to take advantage of it for its economic sustainability. Even with the introduction of monthly sugar release mechanism and minimum selling price by the Government of India, at times, due to various internal and external reasons, the price of sugar doesn't remain comfortable enough to attain economic sustainability. Under these conditions, bio-energy from sugar industry and bio-ethanol in particular, has provided the breathing space to the Indian Sugar Industry. The government of India has declared differential pricing policy for ethanol made from different feed stocks. The authors have examined the relative economics of various modes of ethanol production in a sugar factory.

Key words: bio-ethanol, bio-energy, sustainability, environment

INTRODUCTION:

Sugar industry in India has at-least now realized the importance of diversification for sustainability. There is a growing concept for having “Integrated Energy Complexes” comprising sugar, power & ethanol units rather than having only standalone sugar factories. The bagasse based co-generation is not all that lucrative due to issues related to signing of power purchase agreements and lower power tariffs offered by state government. The power tariffs from bagasse based co-generation are facing stiff challenges from tariffs offered for power from non-conventional energy resources, which are much lower. Thus, for many reasons the bio-ethanol production in sugar factories in limelight from last few years:

1. As a tool for value addition and economic sustainability for the sugar factories
2. Providing a better environment through clean and green form of energy in place of fossil fuels
3. For providing energy security and reducing drain of foreign exchange
4. Development of feed stocks to cope up with the growing requirement of ethanol for EBP10 programme
5. Growing environment concerns due to liquid waste generated from the molasses based distilleries and requirement of achieving “Zero Liquid Discharge” as per CPCB/SPCB norms. Also to convert waste to resource by developing innovative technologies.

However, in spite of all time high sugar production (33.2 MMT) during the crushing season 2018-19 and incentives offered by the Government, for the corresponding alcohol year, while oil marketing companies floated tender to purchase 3.29 billion liters of ethanol but sugar mills supplied only 1.88 billion liters and thus blending level achieved was 4.92% only.

Thus, a holistic approach is required to address the issue which will impact the economic and environmental sustainability of the sugar industry. With the differential pricing policy for ethanol based on type of feed stock used, considering the relative economics of bio-ethanol: sugar production, the diversion of intermediate process stream from the sugar factory may be chosen. It is essential to keep larger interest in mind as any sacrifice of sugar will facilitate balancing the demand-supply position of sugar and hence stable and higher price of sugar. Further, it would be essential to identify the potential feed stocks which can be used for bio-ethanol production considering ever rising demand.

BIOETHANOL & ENVIRONMENTAL SUSTAINABILITY:

Increasing energy demand, depleting natural resources and the need to reduce carbon dioxide emission has greatly increased interest for the use of biomass as alternative energy source. Bio-ethanol is most abundant bio-fuel for automobile transportation. The table no. 1 given below speaks for growing population of vehicles been added in the country over the years and hence the possible increase in emission.

Table no. 1- Automobile Domestic Sales Trends

Category	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Passenger Vehicles	25,03,509	26,01,236	27,89,208	30,47,582	32,88,581	33,77,436
Commercial Vehicles	6,32,851	6,14,948	6,85,704	7,14,082	8,56,916	10,07,319
Three Wheelers	4,80,085	5,32,626	5,38,208	5,11,879	6,35,698	7,01,011
Two Wheelers	1,48,06,778	1,59,75,561	1,64,55,851	1,75,89,738	2,02,00,117	2,11,81,390
Quadricycle #			0	0	0	627
Grand Total	1,84,23,223	1,97,24,371	2,04,68,971	2,18,63,281	2,49,81,312	2,62,67,783

#Only Aug 18 -March 2019 data is available for 2018-19

Although there are many factors which contribute to air pollution, but the quantum of vehicular emission cannot be ignored or underestimated. Unfortunately, out of the 50 most polluted cities of the world, 25 cities are in India as reflected from their poor air quality index (AQI).

BIOETHANOL & ENERGY SECURITY

The present requirement of ethanol (2020-21) for EBP 10 is estimated to be about 3800 million liters Fuel Ethanol per annum (Table no. 2) which is expected to grow further and further due to increase in vehicular population in the country as seen in earlier table no. 1.

Table no. 2- Ethanol requirement

ETHANOL DEMAND & SUPPLY SCENARIO IN INDIA

Particulars	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
	* All Figures in million liters					
Petrol Sale Projection (8.38 % CAGR)	27596	29909	32415	35131	38075	41266
Ethanol Requirement						
(@ 5% blending)	1380	1495	1621	1757	1904	2063
(@ 10% blending)	2760	2991	3241	3513	3808	4127
(@ 20% blending)	5519	5982	6483	7026	7615	8253

In-spite of consistent efforts being made to achieve the blending targets the same has not been possible till now. During the alcohol year 2018-19 (December – November) oil marketing companies floated tender to purchase 3.29 billion liters of ethanol but sugar mills supplied only 1.88 billion liters and thus blending level achieved was 4.92% only. During the current year also against the tender for 2.53 billion liters floated by OMC's in January 2020, sugar factories have offered to supply meagre 315 million liters mainly because of lower sugarcane availability in Maharashtra and Karnataka.

The Indian government's fuel import bill continues to rise resulting in 83 per cent of its crude oil requirement being imported and significant amount of foreign exchange being drained. With the political and other uncertainties looming large on oil producing countries on and off, it not only creates apprehension about the quantities of crude oil which can be imported but also about the procurement price.

BIOETHANOL & FEED STOCKS

There is greater need to convert the conventional distilleries into "SMART DISTILLERIES" working on multiple feed stocks (sugar process intermediaries) and thus the potential of using other feed stocks is to be harnessed to have required quantities of bioethanol not only to provide clean and green form of energy replacing fossil fuels but to reduce dependency on imported crude and also

preserve foreign exchange. It would not be out of place to mention that balancing of sugar production as per the domestic need may be articulated by sacrificing sugar and producing ethanol instead. It will do two good, first it would balance the demand –supply position of the sugar in the country thus stabilizing sugar prices and second it will help in boosting ethanol production in the country. Diversion of different streams e.g. cane juice, syrup, sugar or B-heavy molasses shall however be possible only if the relative economics of diversion is favourable. While this shall require careful study in various states keeping in view the sugarcane price fixation mechanism and other controls, it shall also require reasonably long term policy assurance in cane juice diversion, in particular.

DIFFERENT CONFIGURATIONS & THEIR RELATIVE ECONOMICS:

Relative economics of ethanol production using different feed stocks (sugar process intermediaries) like C-Heavy Molasses, B-Heavy Molasses, Sugar Syrup, Sugar Syrup during season and C-Heavy during off season, Sugar Syrup during season and B-Heavy during off season is given below in Fig1 to Fig5 respectively. The basis for all the cases is taken as:

1. Capacity of the sugar unit is 5000 TCD.
2. Capacity of the Distillery is 60 KLPD
3. Sugarcane Price is FRP for Sugar Season 2019-20
4. Sugar Price is MSP prevailing as on date.
5. Distilleries are attached with the sugar factories.
6. Raw material quantity for ethanol production is taken just to meet the requirement of the capacity of the distillery.

Fig1: Economics of ethanol production using C-Heavy Molasses as feed stock.



Fig2: Economics of ethanol production using B-Heavy Molasses as feed stock.

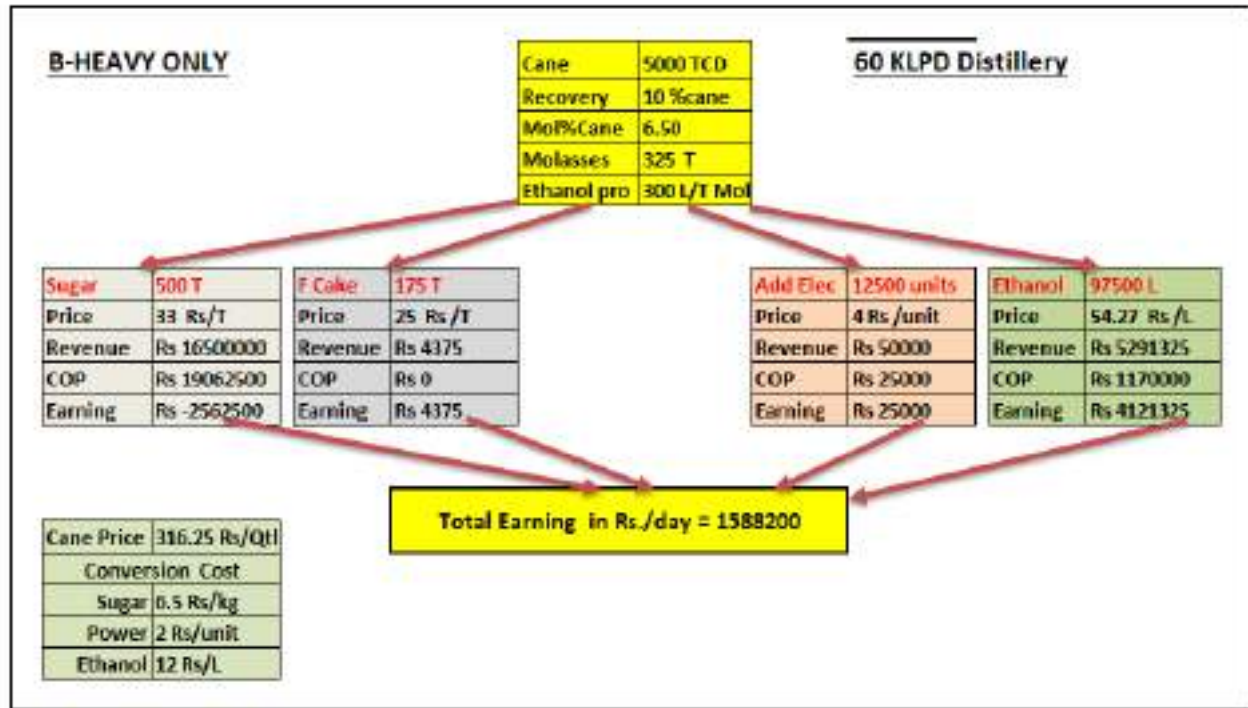


Fig3: Economics of ethanol production using Sugar Syrup as feed stock.

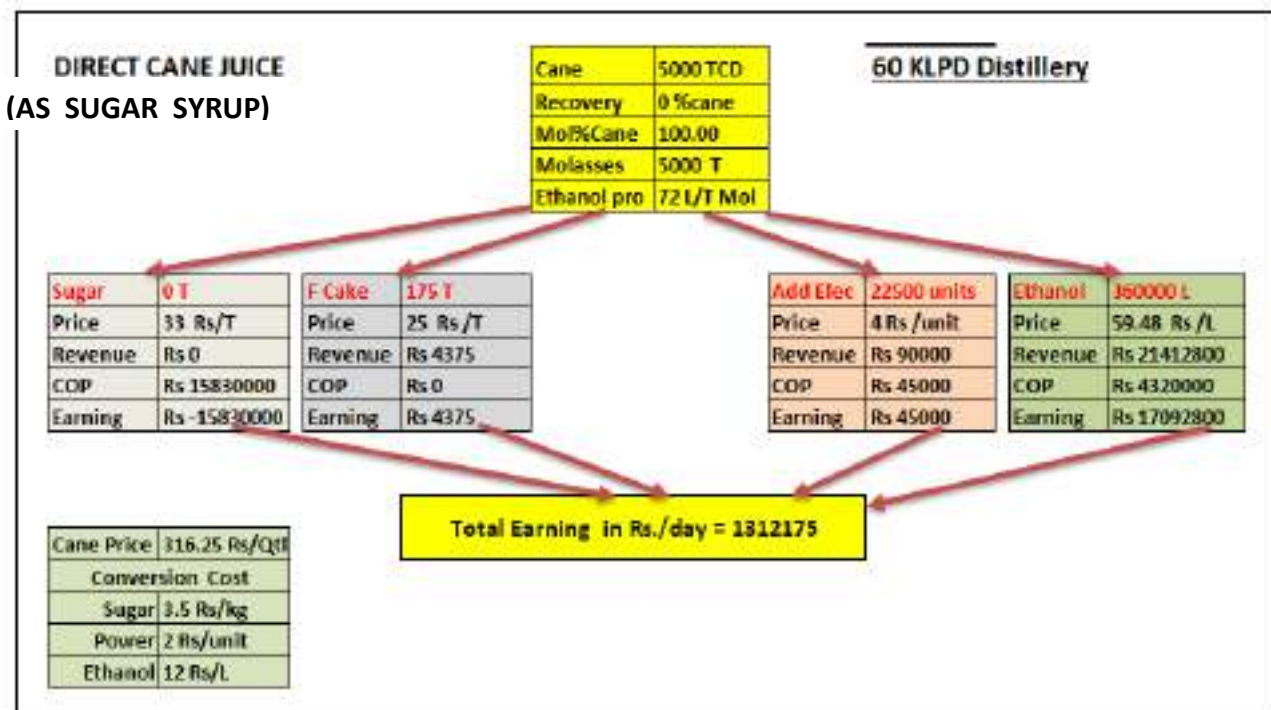


Fig4: Economics of ethanol production using Sugar Syrup during season and C-Heavy Molasses during Off-season as feed stock.

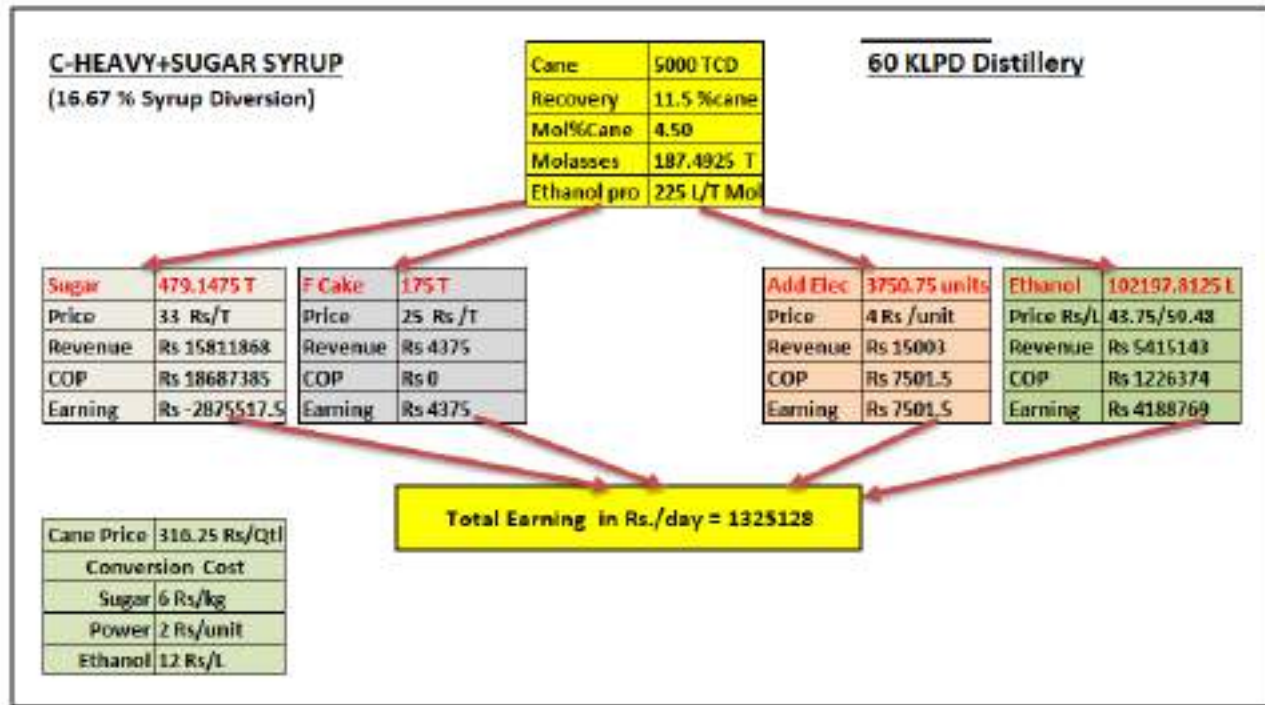
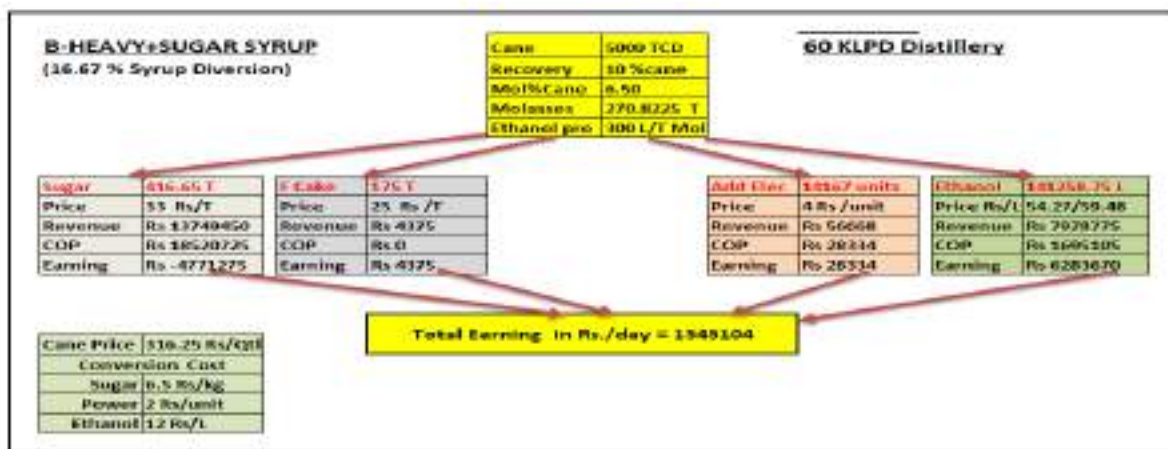


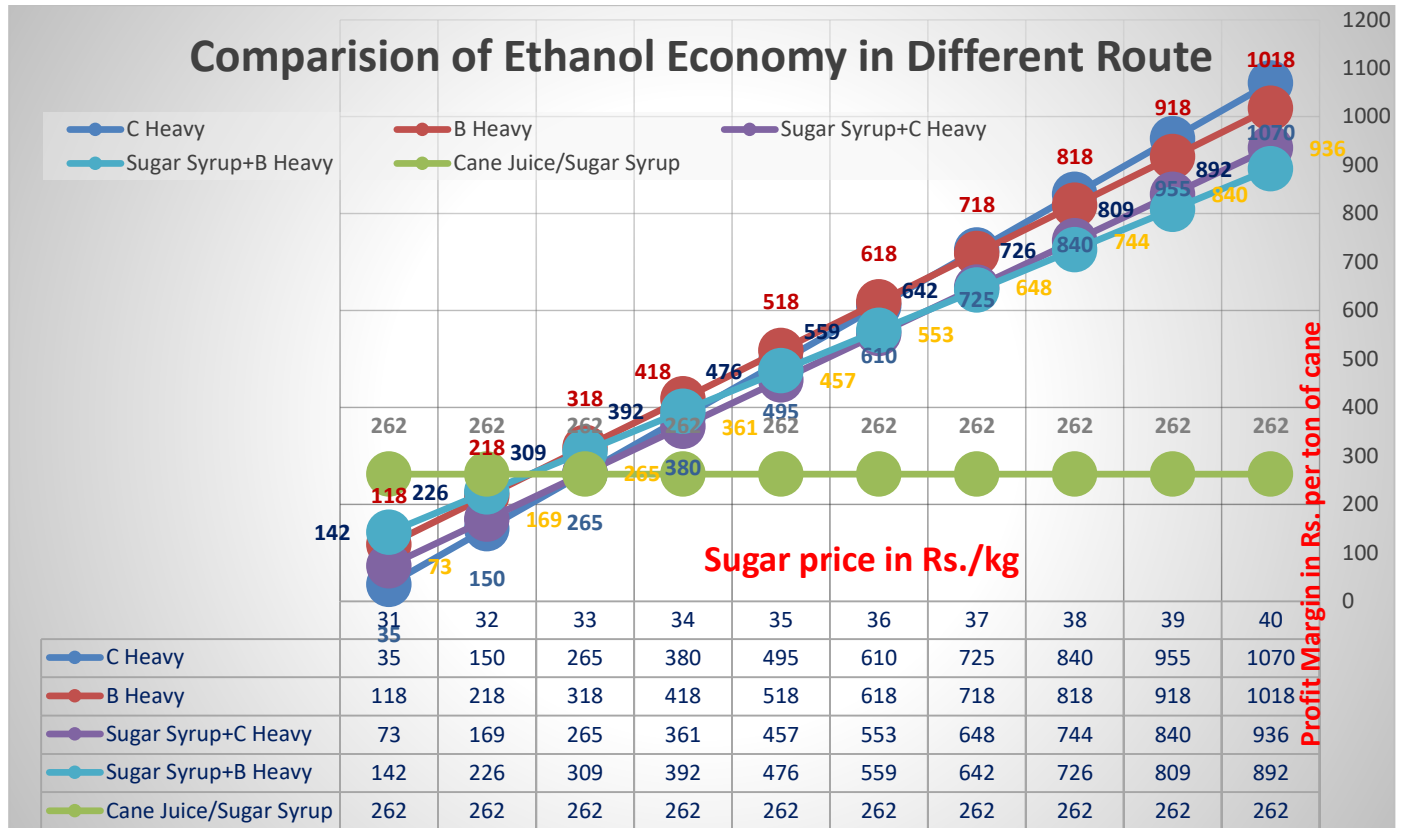
Fig5: Economics of ethanol production using Sugar Syrup during season and B-Heavy Molasses during Off-season as feed stock.



It is seen from the above configurations that B-Heavy as feed stock provides best economy. However, it is seen that with a 5000 TCD and 60KLPD configuration, B-Heavy produced is not sufficient to run the distillery plant throughout the year. Running the distillery with sugar syrup and storing B-Heavy during season and then running with B-Heavy during rest of the year, though provides profit margin less by about 2-3 % but enables the plant to run throughout the year.

Fig6 shows the graphical representation of profitability of ethanol production in various routes at varied sugar price.

Fig: profitability of ethanol production in various routes at varied sugar price.



Another configuration of feed stock for ethanol production may be sugar mixed with C-Heavy or B-Heavy. However, this configuration shall be economical once the right price of ethanol is fixed or necessary subsidy for such configuration in substitution to the export subsidy is provided.

CONCLUSION:

The production of bioethanol has been a saviour of the Indian Sugar Industry under depressed sugar price regime. The production of bio-ethanol is not only in the interest of the sugar industry but the country as whole and in particular in clearing the cane payment to the farmers. There is greater need for developing various business models for operating the distilleries with different feed stocks keeping in view the availability of feed stock, bioethanol potential i.e. yields and economics of production. Waste management to remain high on the agenda.

ABSTRACTS:

The occurrence of *Chilo sacchariphagus* and its egg parasitoid wasps in sugarcane plantations in Guangxi China by Xue-hong Pan, Ji-li Wei, Xian-kun Shang, Cheng-hua Huang, Amin Nikpay & Francois-Regis Goebel published in International Sugar Journal, January, 2020.

The moth stalk borer *Chilo sacchariphagus* is the most destructive insect pests limiting the production of sugarcane in Guangxi province, China. Current control strategies are mainly focused to the application of chemical insecticides. During 2016-18, the occurrence of the overwintering generation of *C. sacchariphagus* and its egg parasitic wasps *Trichogramma chilonis* and *Telenomus dignus* were investigated. Findings showed that the overwintering generation of *C. sacchariphagus* began to emerge in early March and the peak of adult emergence was from the mid-March to early April. At the beginning of peak period, fewer egg masses were laid by *C. sacchariphagus*.

Effect of sugarcane residue retention and fertiliser application on soil microbial abundance and community structure by S Mthimkhulu, LW Titshall, T Z Lerch, P Podwojewski & R. Van Antwerpen published in International Sugar Journal, January, 2020.

This study, carried out in a long-term sugarcane trial, investigated changes in selected soil microbiological properties induced by continuous crop residue burning or mulching, with and without fertiliser application. The sugarcane residue treatments are: a) burned with tops removed (Bto); b) burned with tops scattered (Bt); and c) green harvested and mulched (M). These treatments

were either fertilised (F) or unfertilised (Fo). The amount of double stranded deoxyribonucleic acid (dsDNA), used in this study as an indicator of soil microbial biomass, increased with increasing crop residue levels (Bto: 10.4 $\mu\text{g g}^{-1}$, Bt: 12.2 $\mu\text{g g}^{-1}$, M: 14.4 $\mu\text{g g}^{-1}$).

Monitoring mud consistency at sugarcane factories to improve mud filtration by JoseManuel Henriquez, Gillian Eggleston , Peter Gaston, Harold Birkett , Young Hwan Moon & Giovanna Aita published in International Sugar Journal, January, 2020.

The clarification and filter stations of the raw sugar factory are some of the last remaining sections that have not been automated. Mud conditioning parameters and characteristics, however, have not been clearly defined or measured, causing supervisors and even experienced operators to rely heavily on visual assessment of the quality of the mud. Moreover, mud "flowability" cannot always be predicted by viscosity (resistance to applied torque) due to surface tension and density effects. This study was undertaken to find a simple instrument which could be used at the stations to produce a reliable quantitative value on mud "flow ability,"

Conversion of cane starch to fermentable sugars in cane molasses fermentation by M. Saska, S. Zossi, M. Coronel & M. Ruiz published in International Sugar Journal, January, 2020.

The corn-ethanol industry's two-step enzymatic process converting corn starch to fermentable sugars, can as well be applied to the starch entering with cane the standard sugar-ethanol process. Starch is converted to low molecular weight dextrans in the juice clarifiers with high-temperature α -amylase,

providing the well-known benefits in sugar recovery, while the dextrans are hydrolyzed with glucoamylase to fermentable sugars and converted to ethanol downstream in molasse fermentation. In a series of laboratory tests, commercial enzymes were found effective on purified cane starch as well as on the residual starch in industrial vinasse samples.

Bagasse as a source for fumaric acid production by Giovanna M. Aita & Fang Deng published in International Sugar Journal, January, 2020.

Powdered activated carbon treated lignocellulosic syrup prepared from energy cane bagasse was evaluated as a potential carbon source in the production of fumaric acid by *Rhizopus oryzae* ATCC® 20344TM. Fumaric acid has been identified by the U.S. Department of Energy as one of the “top 12” building block chemicals that can be potentially manufactured using renewable lignocellulosic biomass. Fumaric acid can serve as an acidulant in food and animal feeds, and as the raw material in the production of polymers and esters. Energy cane bagasse was pretreated with dilute ammonia and enzymatically hydrolysed with commercially available enzymes.

Targeting soft rot of tuber crops with soil-dwelling phagocytic predators of bacteria by Ryan Kessens & Marcin Filutowicz published in International Sugar Journal, February, 2020.

Each year, approximately 20% of the total potato crop is lost to potato soft rot (1-3). Currently, there is no effective treatment for the disease once soft rot bacteria have infected plant tissue. Potato bacterial soft rot occurs worldwide and causes a greater total loss of

produce than any other bacterial disease. In fact, according to data from the United States Department of Agriculture (USDA), the cost of potato loss in the U.S. alone likely exceeded \$225 million in 2017 (4). AmebaGone is developing proprietary technologies to prevent crop losses due to potato soft rot and other major bacterial diseases of crops.

Phased-array ultrasonic testing (PAUT) in lieu of radiography (RT) on small-bore boiler tubes by Chris Charlesworth published in International Sugar Journal, February, 2020.

Radiography of convection bank tube welds and other pressure part welds has been the industry go-to method for many years. However, production rates are slow and there are many occupational health and safety issues to be managed, often requiring temporary evacuation of the site during radiography events or restricting radiography to out of normal hours. Fabrication codes and standards across the world have recognised other non-destructive testing methods to quantify the integrity and soundness of weldments, especially ultrasonic techniques when looking for internal imperfections or defects in materials and weld configurations.

Tank integrity - a better way by Keith Langdon & John Everton published in International Sugar Journal, February, 2020.

There is no Standard or Code specifically for tank integrity management in the sugar industry. This has led to fragmentation, inconsistencies and inefficiency in tank inspection and engineering assessment. The ultimate purpose of the tank management program is to define the management process, inspections required, and maintenance tasks needed to control, and where possible, mitigate risk of failure. The integrity of tanks

should be well managed. They can contain a large inventory of hazardous materials that usually have significant consequence of failure. The other significant issue is the cost of preparation and downtime for inspection.

Does rotating cultivars with intermediate resistance influence pachymetra root rot of sugarcane? by AS Jensen , BJ Croft, RC Parfitt & PH Brown published in International Sugar Journal, February, 2020.

Concerns have been raised by industry members over lower than expected cane yields associated with high oospore levels in sugarcane cultivars rated to have intermediate resistance to pachymetra root rot. This is a significant issue; as intermediate cultivars represent more than 70% of the sugarcane grown in Australia. It is possible that planting the same intermediate cultivar in successive crop cycles could lead to increased yield losses due to pachymetra root rot. This paper examines the residual soil-borne effect of the current major sugarcane cultivars on the following sugarcane crop in three field trials, located in the Herbert.

Factors affecting recent trends in sugar beet yields and implications for sugarcane productivity by Keith Jaggard & Trish Rosbrook published in International Sugar Journal, February, 2020.

Yields of sugar beet have risen steadily for almost the last four decades, whereas yields of sugarcane have not. This study uses the literature to examine some of the reasons for this difference. Beet has benefitted from climate change (warmer springs and autumns and increased CO₂ concentration in the atmosphere) to a much greater extent than cane. Because beet is raised from seed that is always produced under the direct control of

the plant breeder, improvements in cultivars are taken up very rapidly, whereas the ratoon production of cane means that improvements are inevitably transferred to commercial practice more.

Targeted dextranase application for problem mitigation during sucrose crystallisation by K. Abraham, H. Brykczynski, E.S.J. Rudolph-Flöter & E. Flöter published in International Sugar Journal, March, 2020.

The dextran-related effects depending on its molecular mass distributions during sucrose crystallisation were key to this study. Size exclusion chromatography combined with evaporative crystallisation experiments were used to relate the effects to certain molecular mass dextran fractions. In this study, it could be confirmed once again that mainly high molecular mass dextran is responsible for a viscosity increase in sugar syrups. In view of sucrose crystal modifications, three different shapes could generally be related to the presence of dextran, namely cube-shaped crystals, elongated needle-shaped crystals and agglomerates.

Sugar and ethanol business segment in Brazil: Indebtedness and main impacts of Renovabio program by Antonio Carlos Christiano & Carolina Christiano published in International Sugar Journal, March, 2020.

This paper describes and discusses the current economic and financial status of Brazilian producers of sugar and ethanol, and evaluates the major impacts provoked by RenovaBio, the largest and most ambitious program for renewable biofuels in the world, to be in full force from December 26th, 2019. In order to describe the impacts of RenovaBio, the

authors classify the sugar-ethanol producers in 3 major groups, taking into consideration, mainly, the level of indebtedness per ton of crushing capacity, the payment ability and the main features of the mill companies, including their capacity to sell surplus cogenerated power to national.

A global view of bio-products: the sugarcane perspective by MRLV Leal & JC Teodoro published in International Sugar Journal, March, 2020.

The sugar industry has been traditionally subjected to frequent and strong volatility in sugar prices, driven by many causes, but mostly by surpluses in global production. The recent end of the EU Sugar Regime in 2017 created conditions for increased production of beet sugar with the termination of the quota system. Many mills are aware of these changes, and the possible impacts, and are starting to consider alternatives for diversification of production. These include a range of products beyond the traditional and obvious options of ethanol, biomass and electricity.

Remote digital visual inspection and the creation of a digital twin in support of inspection strategies by A Van Daele published in International Sugar Journal, March, 2020.

Visual inspection of tanks, pressure vessels, towers, stacks, piping and other infrastructure can be a lengthy and costly exercise. Along with this are the dangers and risks associated with putting humans into confined spaces and operating at elevated heights. High-resolution cameras attached to drones have become a safe and reliable alternative to inspecting objects at height, while mounting cameras

with suitable lighting onto magnetic crawlers [remotely operated vehicles (ROV)] has avoided the need for people to enter confined spaces.

Application of remote sensing and GIS for age differentiation of sugarcane crop classes in Argentina by Carmina Fandos, Federico José Soria, Pablo Scandaliaris, Javier Ignacio Carreras Baldrés, Eduardo Raul Romero & Jorge Scandaliaris published in International Sugar Journal, March, 2020.

As sugarcane yield generally decreases with increasing ratoon number, "crop class" is one of the most important factors influencing sugarcane productivity. Sugarcane is often replanted every 4-5 years to maintain economic production, but this period may be longer or shorter depending on crop performance. Information about the crop classes of sugarcane on a regional scale is scarce, and sugarcane monoculture makes it difficult to identify where cane is re-established using satellite images. However, when sugarcane crops are rotated with other crops or interspersed with fallow periods, it facilitates the identification of renewals or new cane fields.

A way forward to achieve more revenues from sugar plant 'Concept of Bio-refinery' by Sanjay Awasthi published in Indian Sugar, December, 2019.

Sugar is an essential part of our life in terms of taste and nutrition but the manufacturer of sugar has always been in trouble and has never been able to get as much as profit as many other industries; having similar investments. A bio-refinery is a refinery that has beneficial by-products. The main feedstock of sugar plants i.e. Sugarcane; a

biomass, has high potential to produce sugar & electricity along with other by-products which can help to achieve more revenues from sugar plants. The escalating prices of sugar cane, lack of proper relation between cane & sugar prices, higher stock of sugar produces and low tariffs offered from state electricity board are dragging attraction towards the concept of bio-refinery by utilizing maximum potential of biomass in order to get more revenues from sugar as well as power, bio-ethanol, bio-gas, bio-fertilizer etc. Government policies also boosting up to go for such Bio-refineries.

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