



Managing the sugar industry in turbulent times: The way forward

Indian sugar industry contributes significantly to the economy of India, and to the socio-economic development of the rural population in the country. With an average cane yield of ~70 t/ha and a sugar production of 25 MT, the country is self sufficient in terms of meeting its internal demands for sugar and sweeteners. Even with its largest sugar consumption base in the world, we have been able to produce exportable sugar surplus.

Yet, all is not well in the industry which is facing turbulent times due to various factors. The inherent cyclic nature of sugarcane and sugar production in the country is an important impediment for India to be a consistent player in the global sugar market. A major challenge is the high cost of sugarcane cultivation and sugar production. Sugar production in India is an extremely costly affair with the unit production cost of sugar touching Rs 37/kg, compared to the ex-mill cost of sugar production per unit in other major sugar producing countries like Brazil, USA, Thailand etc. which is in the range of Rs 24-29/kg. The farmers are offered a price of Rs 280-285 / quintal of cane which, according to them, is low considering the high cost of cultivation. The sugar mills are unable to pay not more

than Rs 240/quintal citing higher production costs and trends in sugar prices in the global and domestic markets. In India the prices of sugar has fallen by almost 8% during the last year. Thus neither the industry nor the farmer is getting benefitted.

Due to the stand-off, the sugar mills are reluctant to start crushing operations. During 2013-14 crushing season, there was a delay of almost one month in the start of the cane crushing by sugar mills, in the major sugar producing states. This year also, the sugar mills of Uttar Pradesh have refused to start crushing by the beginning of November, unless the cane prices are not lowered and a proper cane linkage formula is not put in place. Since the farmers need to vacate their fields for other crops, they are set to sell their produce to local markets and crushers for gur and khandsari production. Thus there is a diversion of cane for uses other than sugar production, with a probable impact on the total sugar production. The situation is aggravated by a low cane yield and low/stagnant sugar recovery prevalent throughout the country, thereby forcing the farmers to shift to more remunerative crops. This in turn, will result in a reduced acreage, lower cane production and thereby, a lower sugar output. Thus the stage is set for another round of "infamous sugar cycle".

Even though diversification opportunities are plenty, especially with respect to biofuel / ethanol, currently India does not have a clear-cut ethanol policy. Government of India has a mandate of 5% blending of ethanol (with a revised mandate of 20% blending by 2020) with automobile fuel, through its Ethanol Blending Programme. But the cyclic nature of sugarcane production has resulted in the blending programme being made optional. Thus, the ethanol blending programmes are yet to gain momentum in the country.

These issues need to be addressed urgently for the sugarcane cultivation to be profitable and sustainable, both for the farmer as well as the industry. This calls for a quantum jump in cane productivity and sugar recovery, with more sugar output per area per unit time. From the present level of 6 tons sugar/ha/year we need to aim for 9-10 tons sugar/ha/year. A comprehensive production and management strategy, including bio-intensive sugarcane cultivation is the need of the hour. Improved varieties for normal and specific situations, quality seeds, proper varietal planning, precision farming and soil health management, bio-intensive disease and pest management, post harvest management, mechanization including development of precision machinery to suit the local needs, use of information technology, diversification-both at crop and product level, etc. will have to be our priority areas.

An effective integration of research institutions, developmental agencies, entrepreneurs and sugarcane farmers needs to be conceptualized and practiced for a profitable and sustainable sugarcane agriculture. IISR has set its research priorities, keeping in mind the challenges faced by the industry at various levels, to ensure the strengthening of sugarcane and sugar sector in the country, thereby making it an indispensable player in the global sugar market.

- भारत में चीनी उत्पादन लागत औसतन ₹ 30-37 प्रति किलोग्राम है जो कि विश्व के प्रमुख चीनी उत्पादक देशों में चीनी उत्पादन लागत ₹ 24-29 प्रति किलोग्राम की तुलना में काफी अधिक है।
- घरेलू बाजार में चीनी का मूल्य लगातार घट रहा है तथा पिछले वर्ष 8% गिरावट दर्ज किया गया।
- गन्ना खरीद मूल्य में लगातार बढ़ोत्तरी तथा चीनी उत्पादन लागत अनुसार बाजार में चीनी का मूल्य नहीं होने के कारण उत्तर प्रदेश के निजी चीनी मिलों द्वारा पेरार्ई सत्र 2014-15 में मिल बन्द रखने का कठोर निर्णय चीनी उद्योग में व्याप्त समस्याओं को दर्शाता है।
- गन्ना उत्पादकता तथा चीनी परता में वृद्धि समस्या समाधान की दिशा में एक सार्थक कदम हो सकता है।
- गन्ना उत्पादन तथा चीनी उद्योग को आर्थिक रूप से समृद्ध तथा टिकाऊ बनाने के लिए शोध संस्थानों, विकास विभागों, उद्यमियों तथा किसानों को मिलकर सम्मिलित प्रयास करने की आवश्यकता है।

International Conclave on Sugar Crops and National SugarFest-2014

A three day International Conclave on Sugar Crops (SUGARCON) and National SugarFest was organised at IISR from February 15-17, 2014. The SUGARCON and SugarFest were inaugurated by Dr. S. K. Dutta, Deputy Director General (Crop Sciences), ICAR, New Delhi on February 15, 2014. The SUGARCON was jointly organised by Society for Sugar Research and Promotion (SSRP) and Indian Institute of Sugarcane Research (IISR), Lucknow. The spectacular beginning of the SUGARCON impressed participating Foreign and Indian Delegates. Dr. S. Solomon, Director, IISR and President SSRP welcomed the Chief Guest and delegates. In his inaugural address, Dr. S. K. Dutta remarked that India and Brazil jointly contribute more than 60% of the world sugarcane and sugar production. During last few decades Brazil has emerged as number one country in ethanol production and bio-energy sources. India can utilize Brazilian experiences and technology for harnessing the untapped bio-energy potential of sugar crops specially sugarcane. Dr. Solomon emphasised on the need to transform sugar mills into sugarcane processing complexes to produce sugar, ethanol, baggase, electric-cogeneration (green energy), bio-fertilizer, bio-plastics etc. There is need to intensify research efforts for technological advancement in the areas of green energy production from sugar crops like sugarcane, sugarbeet, palm, sweet corn etc.

Professor Raffaella Rossetto from Brazil presented Brazilian Program of Ethanol Production. She highlighted that 40% energy requirement of Brazil comes from renewable sources and in this, sugarcane contributes about 19%. In 2012 about 80% cars in Brazil used petrol blended with 40% ethanol. Brazil is planning to introduce world's first transgenic cane variety in 2015 to enhance cane productivity by 25% with added advantage of borers and drought tolerance. Mr Robert Quirk of Australia presented a paper on Best Management Practices for Increasing Productivity and Profitability of Sugarcane in Developing Countries. About 124 papers on different aspects of sugarcane cultivation, processing, post harvest and value addition were presented during interactive sessions in addition to invited lectures by distinguished delegates. Twenty four foreign delegates from Brazil, China, Australia, Spain, South Africa, Vietnam, Sri Lanka and Uganda and about 150 Indian delegates



participated in the SUGARCON.

To celebrate the 62nd Foundation Day of the Institute on 16 February, National SugarFest 2014 was organized on February 15-17, 2014. The event was targeted to showcase the technological advancements in sugarcane and sugar sector along with the technologies developed at the Institute. Various competitions for children, students, working women, and housewives were organised in which more than 3000 children, students and ladies have participated. A cultural evening based on the fusion of classical and popular music was also arranged. The visitors enjoyed the camel, horse cart and bullock cart rides under Agro-tourism on all three days of SugarFest.

In the National SugarFest 2014, exhibitions, business meets, topical lectures and demonstrations were organised. More than 8,000 farmers, development workers, students, children, housewives, rural & urban citizens visited the Fest. Agricultural input manufactures like UPL, Dupont, Jain Irrigation, Parijat Chemicals, Finetrap, Mahindra Tractors, KRIBHCO, Rallies India and others showcased their products through exhibition stalls.

- संस्थान के 62वें स्थापना दिवस के अवसर पर राष्ट्रीय शर्करा महोत्सव 2014 का आयोजन दिनांक 15-17 फरवरी, 2014 को संस्थान परिसर में किया गया।
- इस आयोजन का मुख्य उद्देश्य संस्थान द्वारा विकसित गन्ना उत्पादन तकनीकों तथा चीनी उद्योग से संबंधित जानकारी एवं सूचनाओं को आकर्षक विधि से जन-सामान्य तक पहुँचाना।
- बच्चों, विद्यार्थियों तथा महिलाओं के लिए विभिन्न रोचक कार्यक्रमों का आयोजन महोत्सव में आकर्षण का केन्द्र रहा।
- कृषि प्रदर्शनी का आयोजन भी हुआ जिसमें लगभग 8000 किसानों, विकास कार्यकर्ताओं, ग्रामीण तथा शहरी नागरिकों ने भाग लिया।

SECTORAL NEWS: SUGARCANE AND SUGAR INDUSTRY

IISR conducted first Online Examination

Inception of Information & Communications Technology (ICT) in our society has changed the working culture of organizations. This was observed at Indian Institute of Sugarcane Research, Lucknow with successful completion of first Online Examination. Agricultural Scientist Recruitment Board (ASRB), New Delhi regularly conducts examinations for ARS/Administrative Services, UG/PG admission and NET certification under various disciplines on behalf of ICAR, New Delhi. These examinations are conducted all over India at more than 30 centres and requires a lot of resources in terms of money, manpower and time. To minimize the resources in traditional system of examination, the concept of online examination system was launched under the project "Developing commissioning, operating and managing an online system for NET/ARS-Prelim examination in ASRB, ICAR" of NAIP. Twenty three Online Examination Centres were developed all over India with capacity ranging from 20 to 120 in one sitting. Indian Institute of Sugarcane Research, Lucknow was also



selected by ASRB as one of the examination centres and an Online Examination Centre with 100 sitting capacity was established in the Library building.

Dr. S. Ayyappan, Director General-ICAR & Secretary-DARE inaugurated this facility on 25 March, 2014 in online mode from New Delhi to conduct the first online examination of NET-2014. This examination was conducted at all the centres during 26 March to 4 April, 2014 simultaneously. A total of 1211 candidates out of

- संस्थान में दिनांक 26 मार्च से 4 अप्रैल, 2014 को नेट- 2014 का पहला ऑनलाइन परीक्षा आयोजित किया गया।
- कृषि विज्ञान के 55 विभिन्न विषयों में कुल 1585 आमंत्रित आवेदकों में 1211 परीक्षार्थियों ने इस परीक्षा में भाग लिया।
- दिल्ली केन्द्र के बाद देश भर में सबसे अधिक परीक्षार्थियों ने भारतीय गन्ना अनुसंधान संस्थान, लखनऊ केन्द्र में भाग लिया।

1585 allotted candidates attended the examination in 55 subject disciplines of Agriculture at IISR centre. IISR, Lucknow centre had the maximum participation of candidates, after New Delhi Centre, among the 23 centre established in India.

Zonal Breeders and Pathologists Meet

AICRP on Sugarcane organized Zonal Breeders and Pathologists Meet at the Sugarcane Breeding Institute Regional Centre (SBIRC), Karnal on 4th February, 2014. Dr. S.K. Pandey, Head, SBIRC welcomed the participants representing North West, North Central and North East Zones. Dr. O.K. Sinha, Project Coordinator (Sugarcane), in his introductory remarks, highlighted the activities of SBIRC under AICRP programme and introduced the agenda of the meeting. Dr. N. Vijayan Nair, Director, SBI, Coimbatore and P.I. of Crop Improvement discipline remarked that a new project on 'Evaluation and Identification of climate resilient ISH and IGH genetic stocks' has been initiated with multiplication of clones at selected centres of AICRP on Sugarcane. He stressed on the need for participation of scientists in the hybridization programme for making logical decision on cross combinations. He urged that selection programme should be fine-tuned for significant improvement in cane yield and quality parameters.

The important decisions taken were: i) Co 0238 will replace CoPant 84211 in early group trials; ii) Short-listing of IVT entries on the basis of susceptibility to red rot, crop growth performance and sucrose (%); iii) RRS, Uchani centre is identified as an additional seed multiplication centre for North West Zone; iv) The proposing centres of NWZ would supply seed material of new entries to both the centres (RRS, Uchani & SBIRC, Karnal); and v) Kapurthala, Faridkot, Sriganganagar and Lucknow centres will lift seed material from SBIRC, Karnal, while Kota, Pantnagar, Shahjahanpur and Muzaffarnagar from RRS, Uchani centre.

- शीघ्र परिपक्व प्रजाति के मूल्यांकन के लिए कोपन्त 84211 के स्थान पर को0 0238 को लिया जायेगा।
- लाल सड़न रोग क्षमता, फसल की वृद्धि एवं विकास तथा शर्करा की मात्रा के आधार पर IVT प्रजातियों को AVT में परीक्षण के लिए छँटा गया।
- क्षेत्रीय अनुसंधान स्टेशन, उचानी को पश्चिमोत्तर क्षेत्र के लिए अतिरिक्त बीज बहुगुणन केन्द्र के रूप में चिन्हित किया गया।
- पश्चिमोत्तर क्षेत्र के प्रस्तावित केन्द्र अपनी नई प्रविष्टियों को दोनों (उचानी व करनाल) केन्द्रों पर बीज बहुगुणन के लिए भेजेंगे।
- कपूरथला, फरीदकोट, श्रीगंगानगर व लखनऊ केन्द्र प्रविष्टियों के बीज को गन्ना प्रजनन संस्थान क्षेत्रीय केन्द्र, करनाल से परीक्षण हेतु उठायेंगे तथा कोटा, पन्तनगर, शाहजहाँपुर व मुजफ्फरनगर केन्द्र प्रविष्टियों के बीज को क्षेत्रीय अनुसंधान स्टेशन, उचानी से उठायेंगे।

Dr. S. Ayyappan, DG, ICAR inaugurated CaneDES and Bio-control Lab

Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR, Ministry of Agriculture, Government of India inaugurated the bio-control lab and CaneDES expert system on June 29, 2014 at IISR in the presence of scientists, farmers and media personnel. The CaneDES will diagnose disorder/damage caused by various insect-pests, diseases and nutrient deficiency factors in sugarcane. It also serves as a guide for management of various biotic and abiotic stresses of sugarcane. During the occasion Dr. S. Solomon, Director, IISR, Lucknow appreciated the efforts made by the team of scientists comprising Dr. S. S. Hasan, Dr. A. K. Sah, Dr. Arun Baitha, Dr. M. R. Singh and Dr. S. K. Shukla in coming out with such a remarkable achievement. Dr. Ayyappan distributed IISR technology basket to a five cane growers. A newly developed sports complex and a water harvesting structure in the IISR residential complex was also visited and inaugurated by the Hon'ble Director General.

- कम्प्यूटर आधारित विशेषज्ञ प्रणाली "केनडेस" का उद्घाटन डा० एस० अय्यप्पन, महानिदेशक भारतीय कृषि अनुसंधान परिषद् तथा सचिव-डेयर, भारत सरकार के कर-कमलों द्वारा किया गया। इस प्रणाली की सहायता से सही समय पर विकारों की पहचान और निदान करके गन्ना उत्पादकता में होने वाले ह्रास को काफी हद तक कम किया जा सकता है।
- गन्ने के कीटों का प्रबंधन जैविक विधि द्वारा सफलता पूर्वक किया जा सकता है। इस उपलब्ध प्राकृतिक संसाधनों का गन्ना फसल में लगने वाले नाशी कीटों के नियंत्रण में महत्वपूर्ण सम्भावना को देखते हुए संस्थान ने जैव नियंत्रण प्रयोगशाला स्थापित किया जिसको महानिदेशक महोदय ने गन्ना किसानों तथा चीनी उद्योग की सेवा में समर्पित किया।



IISR to revamp research strategy focussing the target of 2030

By the year 2030 India has to produce 600 m tonne sugarcane, 36 m tonne sugar with 11% sugar recovery from 55 to 60 lakh ha sugarcane area to fulfil the demand of sweeteners and bio-energy in terms of co-generation, ethanol, pulp, animal feed etc. This needs a research strategy which clearly spells out the future road map. To address the emerging challenges in sugarcane and sugar sector in the country, technology forecasting and technology fore-sighting is a must, said Dr. A.N. Mukhopadhyay, Ex. Vice-chancellor, Asom Agricultural University while chairing the Research Advisory Committee meeting of IISR, Lucknow held on May 28-29, 2014. A high level committee reviewed the on-going research activities of IISR and suggested future guidelines for revamping the research strategy to achieve the ever growing demand for sweetener and energy in the country. Dr. S. Solomon, Director, IISR apprised the committee members about the research achievement of the Institute during the last 3 years. The cane variety CoLk 94184 developed by IISR few years back is now under cultivation

in about 30000 ha area in North-Central Zone and has become quite popular among farmers and sugar industry due to its high sugar yielding feature. Two more early maturing high sugar varieties i.e. CoLk 9709 and CoLk 07201 recently developed by the Institute are expected to reach the cane growers for commercial cultivation by next planting season (2014-2015). Light-pheromone trap developed and monitoring of white grub and borer pests is being adopted in large scale in western Uttar Pradesh and other parts of the country. A seed programme is being implemented by IISR in Bihar state in 40 ha area for healthy cane seed production of recommended varieties. As a result 20% increase in cane yield has been recorded in the project area in Bihar. To improve the soil fertility status in cane growing belt, IISR established a microbial consortia unit in the campus for the production of bio-fertilizer and its supply to sugar mills and farmers. Tissue culture plantlets of sugarcane have been supplied to sugar mills for rapid multiplication of seed material of newly released cane varieties. However, to achieve the future target, the institute needs have to formulate a research road map for development of

futuristic technology viz., weather based sugar recovery forecasting, solar energy based harvesting machine, soil fertility map, climate resilient cane agriculture, forecasting module for insect-pests and disease, multi ratooning techniques, machinery for small farmers, high bio-mass cane varieties for electric co-generation etc.

Technology developed

IISR developed Expert System to check yield loss in Sugarcane

Indian Institute of Sugarcane Research (IISR), Lucknow has achieved a major landmark in the area of insect-pests, diseases and nutrient deficiency management in sugarcane. A computer based expert system called CaneDES has been developed by the institute for diagnosing disorder/damage caused by various insect-pests, diseases and nutrient deficiency factors in sugarcane crop. It is well known that sugarcane has a vital role in socio-economic development of the rural areas as it is a major source of employment and income generation for rural population. Sugarcane is grown in more than sixteen states of India and is a major input source of the second largest agro-based industry of the country. Over 6 million farmers and 0.5 million rural folks are directly or indirectly dependent on this crop.

Sugarcane being a long duration crop, is infested by more than 200 insect and non-insect pests in our country. Further, more than 30 diseases are found to affect cane crop in India. Every year farmers incur a loss of 10-20% in sugarcane production which accounts for about 35-70 million tones cane. CaneDES may help farmers in minimizing loss to a great extent by helping them to adopt proper control measures well in time against diagnosed disorders in the sugarcane crop. This will result in increased production and productivity of sugarcane which also help sugar industry in terms of increased availability of raw material i.e. sugarcane during crushing period.

CaneDES has been developed in web environment, so that it can reach the remotest farmer of the country using Internet facility. Software can be used in both Hindi and English. Computer with standard web browsers and Internet facility can be used to access the software. All

stakeholders involved in sugarcane research, education, development, extension and farming will be benefited from the CaneDES by diagnosing the sugarcane disorders as well as educating themselves in sugarcane crop protection. Accessibility of CaneDES has been made using a valid user-id and password. Interested people may contact at canedes@gmail.com for membership of the software and to get user-id / password.

- 200 से ज्यादा नाशी कीट और 30 से ज्यादा रोग गन्ना फसल को प्रभावित करते हैं जिससे गन्ना किसानों को प्रतिवर्ष लगभग 7000-10000 करोड़ रूपए का नुकसान होता है। CaneDES की सहायता से सही समय पर विकारों की पहचान और निदान करके इस नुकसान को काफी हद तक कम किया जा सकता है। इससे गन्ने के उत्पादन और उत्पादकता में वृद्धि होगी और चीनी मिलों को ज्यादा मात्रा में गन्ना उपलब्ध होगा।
- CaneDES प्रणाली वेब आधारित है और दूरस्थ ग्रामीण क्षेत्रों में भी इंटरनेट के माध्यम से इस्तेमाल किया जा सकता है। इंग्लिश के अलावा सॉफ्टवेयर की हिन्दी में उपलब्धता हिन्दी क्षेत्र के किसानों के लिए बहुत उपयोगी है।
- गन्ने में शोध, शिक्षा, विकास, विस्तार और उत्पादन से जुड़े सभी लोगों के लिए यह सॉफ्टवेयर अत्यंत उपयोगी है। इसका उपयोग न केवल विकारों को पहचानने बल्कि गन्ना फसल के उत्पादन और सुरक्षा के ज्ञान को बढ़ाने के लिए भी किया जा सकता है।
- इसका उपयोग करने के लिए जरूरी यूजर आई डी / पासवर्ड सॉफ्टवेयर में पंजीकरण करके लिया जा सकता है। इसके लिए ई मेल canedes@gmail.com पर संपर्क किया जा सकता है।

New early maturing variety identified for commercial cultivation

CoLk 07201 an early maturing variety identified for commercial cultivation in north western zone of India comprising of central and western UP, Uttarakhand, Haryana, Punjab and Rajasthan. The features of the variety are as follows:



- CoLk 07201 is the outcome of directed breeding for top borer tolerance under the subtropical agro-climate. It was developed by biparental mating of CoLk 8102 x CoS 96260 in 2000 at the National Hybridization Garden, Sugarcane Breeding Institute, Coimbatore.
- It was rated resistant to moderately resistant to red rot in all the test locations. Red rot resistance is an important trait in the North western Zone.
- It has high CCS (8.72 t/ha) in comparison with checks CoJ 64 and CoPant 84211 (7.98 to 7.94 t/ha) over two plant crops and one ratoon crop across the test locations.
- CoLk 07201 was superior in CCS in different locations ranging from 6.25 percent to 30.99 percent higher at Sriganganagar and Lucknow, respectively, over best check.
- It is a high yielder and gave an average yield of 70-93.6 t/ha yield in first plant, 87.17-97.77 t/ha in second plant and 56-77.5 t/ha in ratoon at different locations of north western zone.
- It recorded 18.96 percent higher over best check in cane yield of two plant and one ratoon performance.

Management of sugarcane insect-pests through bio-agents

Necessity of bio-control of insect-pests of sugarcane was realized with the dawn of biological control in this country particularly due to the tall nature of the crop and concealed habitat of the borer pests rendering insecticidal application not only difficult but also inaccessible besides low profit margin of the ratoon crops. The war against stalk borer and root borer starts with their egg stage when inundated releases of *Trichogramma chilonis* @ 50000 adult wasps per hectare at 10 days interval from July to October and releases of larval parasite, *Cotesia flavipes* @ 500 gravid females/ha at weekly interval from July to November are done. *Cotesia flavipes* is multiplied on laboratory reared larvae of stalk borer which are multiplied on leaf sheath powder and *rajma* based artificial diet. These efforts may lower the incidence of stalk and root borer by 52.9%. For the management of *Pyrilla perpusilla*, collection and redistribution of its nymphal and adult parasite, *Epiricania melanoleuca* @ 5000 cocoon and 4-5 lac eggs/ha from highly abundant areas to low abundant areas is recommended. This was Implemented in Maharashtra around Rahuri area successfully to control *Pyrilla*

- गन्ने में लगने वाले नाशी कीटों जैसे तना, जड़, पोरी व चोटी बेधक तथा पायरिला के प्रबंधन में जैव कारकों का प्रयोग अत्यंत प्रभावी है।
- जैविक नियंत्रण से कीटनाशक रसायनों के प्रयोग में कमी आएगी जिससे पर्यावरण प्रदूषण भी कम होगा।

epidemics and helped in maintaining a satisfactory population of *Epiricania*, thereby doing away with the

aerial spray for *Pyrilla* control, which was a prevalent practice there. Release of 250 adults loaded with spores of an entomopathogenic fungi; *Metarhizium anisopliae* per hectare found to be effective in the management of *Pyrilla*. Thus, application of bio-control technology has led to effective management of major insect-pests of sugarcane all around thereby minimizing the use of insecticides, reducing cost of plant protection and pollution load in the environment. Use of Trichocards and release of *Cotesia* gravid females against borers reduced the pest incidence significantly and gave a cost-benefit ratio of 1:1.97.

Salient research achievements

- CoLk 07201 a high yielding red rot resistant variety has been identified for commercial cultivation in North West Zone.
- Seed priming with ethrel triggered early and higher germination under autumn, spring and late planted conditions. It also improved plant vigour and tiller number.
- Sequential applications of ethrel (100ppm) improved crop establishment and tillers survival.
- Three applications of GA3 at early crop stages led to a maximum of 11 lakhs tillers/ ha along with increased cane length.
- Application of GA3 on late planted cane showed increased internode length and plant height. Based on results findings, a trial has been initiated at Shamli (UP) on farmer's field.
- qRT-PCR showed increased expression of SAI gene in stale cane. However, its expression was low in treated cane (mixtures of anti-bacterial and anti-inversion chemicals).

Sugarcane Machinery Developed

Three equipment viz. Tractor operated trench planter with sub-surface drip lateral laying system, Ratoon management device (RMD) with disc and Plant residue shredder have been developed in the Division of Agricultural Engineering. The trench planter and plant residue shredders have been field tested at IISR farm and were found to work satisfactorily. One unit of RMD with disc has been supplied to Baramati, Maharashtra for field trials.



Plant Residue Shredder

RMD with disc

Trench Planter

ट्रेन्च प्लांटर और प्लांट रजिड्यू शेडर का क्षेत्र परिक्षण किया गया जिसमें इन दोनों मशीनों का कार्य सन्तोषजनक पाया गया। पेड़ी प्रबंधन यंत्र क्षेत्र परिक्षण के लिए बारामती महाराष्ट्र भेजा गया।

STEP FORWARD FOR THE WELL-BEING OF SUGARCANE & SUGAR SECTOR

MoU for sugarcane seed production

Indian Institute of Sugarcane Research (IISR), Lucknow signed a Memorandum of Understanding (MoU)-Phase II with Sugarcane Industries Department, Bihar Government for breeder seed production of improved sugarcane varieties on March 12, 2014 in Patna. According to terms of MoU, every year 5500 Quintals of



breeder seed will be produced under technical guidance and supervision of IISR scientists in farms of Hasanpur Sugar Mill, Samastipur (Bihar) and IISR Regional Centre, Motipur (Bihar). Dr. S. Solomon Director, IISR and Shri Sudhir Kumar, Principal Secretary, Sugarcane Industries Department, Government of Bihar signed the MoU. On this occasion Shri Chitranjan Singh, Cane

- भारतीय गन्ना अनुसंधान संस्थान, लखनऊ के वैज्ञानिकों के मार्गदर्शन में प्रतिवर्ष 5500 कुन्तल उन्नतशील प्रजातियों के प्रजनक बीज का उत्पादन हसनपुर चीनी मिल, समस्तीपुर (बिहार) प्रक्षेत्र व भारतीय गन्ना अनुसंधान संस्थान क्षेत्रीय केन्द्र, मोतीपुर पर किया जायेगा।
- प्रधान सचिव गन्ना उद्योग, बिहार सरकार ने इस अनुबन्ध को बिहार में चीनी उद्योग विकास की दिशा में लिया गया महत्वपूर्ण कदम बताया तथा उन्होंने इस दिशा में भारतीय गन्ना अनुसंधान संस्थान, लखनऊ द्वारा प्रजनक बीज उत्पादन के प्रथम चरण के दौरान विगत दो वर्षों में योगदान को सरहानीय बताया।
- द्वितीय चरण के अनुबन्ध कार्यक्रम के संचालन हेतु प्रथम वर्ष में 75 लाख रुपये बिहार सरकार ने संस्थान को दिया।

Commissioner, Shri Bijay Kumar, Joint Director, Cane Development, Government of Bihar; Dr. A.D. Pathak, Head of Division, Crop Improvement and Nodal Officer, IISR-RC, Dr. S.K. Shukla, In-charge, Business Promotion Development, IISR: and representatives of all 11 working Sugar mills in Bihar were present. The Principal Secretary remarked that this MoU will prove as a mile-stone in development of Sugarcane and Sugar Industry in Bihar State. For Second phase of MoU a total amount of rupees

seventy five lakh (Rs 75 lakh) was given by Govt. of Bihar to IISR, Lucknow.

In the first phase of MoU a total of 12500 quintals breeder seed was produced in Harinagar Sugar Mill command area and IISR Regional Centre, Motipur. Breeder seed produced are being multiplied at sugar mills farms and progressive farmers' fields in Bihar. The healthy seed cane produced will be utilized for commercial cultivation of sugarcane in coming seasons. Shri Kumar informed that during last two years the cane yield and sugar recovery has improved substantially in Bihar. Dr. Solomon reminded the IISR's commitment for gradual development of sugarcane yield (to achieve 75-80 t/ha in near future) and sugar recovery (to achieve 10.0%) in Bihar and he promised that all possible technical help will be extended by IISR in coming years.

IISR-Industry Interface on Enhancing sugar Productivity in Uttarakhand

IISR-Industry Interface on "Enhancing sugar Productivity in Uttarakhand" was organized at Sugarbeet Breeding Outpost, IVRI campus, Mukteshwar on July 03 and 04, 2014. The interface was chaired by Dr. S. Solomon, Director, Indian Institute of Sugarcane Research, Lucknow. At the outset Dr. A.D. Pathak, Head, Division



of Crop Improvement welcomed the delegates and introduced the agenda of the interface. In his presidential remark, Dr. S. Solomon highlighted three points of concern in Uttarakhand, viz., low productivity, low recovery and increasing cost of production. Uttarakhand is contributing a sizable amount of 33-35 lakh tones of sugar to national production of 25 million tonnes. Developmental issues are linked with low productivity. Cultivation of CoS 767 over 50% of area is an alarming situation, and this variety needs to be replaced with new cane varieties by implementing breeder/quality seed production programme in large scale. Varietal planning and replacement will change the productivity scenario in Uttarakhand. Soil organic carbon is low and needs to be improved. The state has sizable water logged area; tolerant varieties are to be grown in these areas. The intensive

plantation of poplar tree has to be checked as it is affecting the productivity of sugarcane and wheat in the state. Emphasis is to be given for ratoon management and bio-control programme may be implemented. A 100 farmers' club with 100 t/ha yield was suggested at factory level. A road map to achieve an average yield of 100 t/ha and 10% recovery in next 10 years need to be formulated and implemented. Shri Y.P. Saini, Joint Cane and Sugar Commissioner, Govt. of Uttarakhand presented the status of Sugarcane and Sugar Mills in Uttarakhand. The concentration of sugarcane in two districts i.e. Udham Singh Nagar and Haridwar was highlighted.

- पुरानी प्रजातियों के अन्तर्गत क्षेत्रफल कम करके नई प्रजातियों का रकवा बढ़ाने की आवश्यकता है।
- कम उत्पादकता, कम चीनी परता तथा बढ़ता उत्पादन लागत उत्तराखंड में गन्ना तथा चीनी क्षेत्र के लिए मुख्य चिंता का विषय है।
- राज्य में पोपलर पेड़ों की बढ़ती खेती को अविलम्ब रोकने की आवश्यकता है।

Commercialization of technology

The Institute has issued a license for an eco-friendly combo trap (light and pheromone) to M/s Fine Traps (India), Yavatmal, Maharashtra for the white grub management of sugarcane for its commercial manufacturing and distribution for a period of six years in public-private partnership mode.

Monitoring of sugarcane machinery for its modification and adoptability

Working, functioning and demonstration of Australian Sugarcane Harvester and Planter (Massey Ferguson Make, Model MF 105, power 132 hp and weight 8 tonnes) was monitored at the Andhra Sugar Mill, Tanaku, Andhra Pradesh. The necessary modifications were suggested,

- Dr.S. Solomon, Director, IISR participated in the "3rd India Sugar Expo & International Conference on Relevant Technologies for South East Asian Countries" held at Indonesia on May 21-22, 2014.
- Dr. S. Solomon Director, IISR and Dr A.D. Pathak, Principal Scientist & Head Division of Crop Improvement participated in the "Group Meeting of Experts on Sugar Crops Production" to promote sugarcane and tropical sugar beet cultivation in Thanh Hoa Province in North Vietnam.
- Dr. Amaresh Chandra, while working at USDA,

incorporated and the machines were retested.

Hon'ble Union Agriculture Minister Reviewed the progress of Motipur Centre

Hon'ble Union Minister of Agriculture Shri Radha Mohan Singh Ji reviewed the progress of Motipur Centre in a meeting held at State guest house Patna on June 21, 2014. Dr. A.D. Pathak, Head, Division of Crop Improvement and Nodal Officer, IISR-RC, Motipur (Bihar) attended the review meeting and presented detailed progress report of the centre. Hon'ble Minister appreciated the IISR efforts.



- माननीय केन्द्रीय कृषि मंत्री श्री राधा मोहन सिंह जी ने दिनांक 21 जून, 2014 को पटना में एक समीक्षा बैठक की।
- माननीय मंत्री जी ने भारतीय गन्ना अनुसंधान संस्थान क्षेत्रीय केन्द्र, मोतीपुर केन्द्र की प्रगति पर संतोष जताया।

Inter-institutional project

An inter-institutional project on Screening and identification of sugarcane lines tolerant to water-logging and their physio-biochemical investigation was developed and initiated involving IISR, UPCS, Shahjahanpur and Sakhti Sugar Ltd., Dhenkenal, Odisha.

INTERNATIONAL COLLABORATION

Sugarcane Research Unit, Houma, Louisiana, USA under DBT CTREST program (May 2013 to Feb 2014) visited canal point and world germplasm center Miami, Florida. He also attended International Conferences at Austin Texas (APS-MSA Joint Meeting) and San Diego, California (Plant and Animal Genome XXII, from January 11-15, 2014), USA He attended ASSCT (Florida and Louisiana) joint Meeting at Panama City, Florida and ASSCT, Louisiana Meeting at Lafayette, Louisiana, USA . Feb 11-12, 2014.



INSTITUTE HIGHLIGHTS

Action Plan formulated for National Concern

An Action Plan was formulated with timeline on points highlighted by DG, ICAR, Finance Minister and Hon'ble President of India which were communicated to ICAR.

UP Kisan Vigyan Sangam-2014

Two days UP Kisan-Vigyan Sangam-2014 was jointly organised by IISR, NBFGR, CISH & CSSRI RS at ICAR-Indian Institute of Sugarcane Research, Lucknow from February 16-17, 2014. The promotion of integrated farming to achieve accelerated agriculture growth in UP was the highlight of the Sangam. Programmes like group



- उत्तर प्रदेश किसान विज्ञान संगम का आयोजन फरवरी 16-17, 2014 को संस्थान परिसर में किया गया।
- समेकित खेती को बढ़ावा देकर उत्तर प्रदेश में कृषि विकास दर को बढ़ाना इस आयोजन में चर्चा का मुख्य विषय रहा।

discussion, demonstration, exhibition, brain storming, demo field visit etc. were organized. Agri input manufacturers, suppliers and service provider agencies showcased their products and information through exhibition stalls organised in the Sangam. About 500 development officials/scientists and 1000 farmers from all over UP participated in the event.

National Meet organised

A National Meet on Tractor and Agricultural Machinery Manufacturers (TAMM-2014) was organized at Indian Institute of Sugarcane Research, Lucknow during February 8-9, 2014.

Consultancy provided

Consultancy was provided to two firms namely M/s Farm Implements India Private Limited, Chennai and M/s Motor & General Sales Ltd., Chinhat, Lucknow for fabrication of machinery designed by the institute.

Meetings/events organized

Republic Day	January 26, 2014
Institute's Foundation Day	February 16, 2014
U.P. Kisan Vigyan Sangam	February 16-17, 2014
World IP Day	April 2, 2014
ICAR's 19th All India Entrance Examination for UG & PG	April 12-13, 2014
Research Advisory Committee Meeting	May 28-29, 2014
Hindi Workshop	June 03, 2014
2nd UP Agricultural Science Congress	June 14-16, 2014.

TRANSFER OF TECHNOLOGY

Technology Demonstrated

Demonstrations on Ratoon Promoter and sugarcane varieties were conducted at farmers' fields in Command area of Biswan Sugar Mill, Biswan, Sitapur (U.P.). Cane seed crop of varieties CoLk 94184, CoPk 05191, Co 5011, CoH 128 and Co 0238 was raised at farmers' fields. Mass production and release of *Trichogramma sp.* was carried out against sugarcane borers in farmers' fields at Pravarnagar, Maharashtra.

Entrepreneurship Training conducted

To develop entrepreneurial ability of cane growers training on "Entrepreneurship for sugarcane seed production and intercropping" was organised on March 12, 2014 in Manpur, Biswan, Sitapur district of Uttar Pradesh.

Showcasing of Sugarcane Technology

Sugarcane production technologies were showcased in the 6th Science Expo organised at Regional Science City, Lucknow, January 30- February 03, 2014. Dr. A. K. Sah participated as panel expert in interactive session organised for senior school students on February 02, 2014.

- पेड़ी सहायक यंत्र का बिसवाँ चीनी मिल क्षेत्र में किसानों के खेतों पर प्रदर्शन किया गया।
- उद्यमिता विकास कार्यक्रम / परियोजना के अन्तर्गत गन्ना बीज उत्पादन तथा सह फसली खेती पर कृषक प्रशिक्षण का आयोजन किया गया।
- गन्ना प्रजातियों जैसे कोलख 94184, को. पीके. 05191, को. 5011, को.ह. 128 तथा को. 0238 का बीज गन्ना फसल का उत्पादन किसानों के खेतों पर कर उन्हें बीज गन्ना उत्पादन में उद्यमिता के लिए प्रेरित किया गया।
- क्षेत्रीय विज्ञान केन्द्र, लखनऊ में आयोजित 6वें साईंस एक्सपो, 30 जनवरी से 03 फरवरी, 2014 में संस्थान के तकनीकों पर प्रदर्शन स्टाल लगाया गया। डा0 ए0के0 साह, प्रधान वैज्ञानिक ने पैनल एक्सपर्ट के रूप में इस एक्सपो में भाग लिया।

Training Organised

Topic	Duration	Sponsoring agency	Participants
Sugarcane Production Technology	January 20-24, 2014	ATMA, Madhubani	30 Farmers
Sugarcane Production Technology	February 14, 2014	Director Agriculture, Sawai Madhopur (Rajasthan)	50 Farmers
Sugarcane Production Technology	March 01-03, 2014	ATMA, Seoni (MP)	25 Farmers
Technique of Jaggery Making- Organised at KVK, Datia (MP)	March 06-07, 2014	IISR, Lucknow	50 Farmers
Entrepreneurship in Sugarcane	April 11, 2014	AC-ABC Training Institute, Lucknow	50 Agricultural Graduates
Advances in Sugarcane Production Technology	June 20-27, 2014	IAS, BHU, Varanasi	12 Students of B.Sc. (Agriculture)
Sugarcane Management and Development	July 1-21, 2014	Sugar Mills	15 Sugarcane development officers



HUMAN RESOURCE DEVELOPMENT

- One month summer training of B. Tech. (Ag. Engg.) students was organized in the Division of Agricultural Engineering w.e.f. June 01-30, 2014 in which 15 students participated.
- Er. Sukhbir Singh was awarded “Distinguished service certificate” for significant contribution in the field of Farm Machinery & Power Engineering by the ISAE, New Delhi during the 48th Annual Convention & Symposium at CTAE, MPUAT, Udaipur on 21-23 February, 2014.
- Dr. Rajendra Gupta, Dr. P R Singh and Er. Sukhbir Singh were awarded “Jain Irrigation Award” for best professional paper on “Adoption of drip irrigation with fertigation to enhance irrigation water and nutrient use efficiency in sugarcane farming” during 48th ISAE Annual Convention & Symposium at CTAE, MPUAT, Udaipur, 21-23 February, 2014.
- Dr. P.R. Singh was invited to deliver a talk on sugarcane mechanization in the Symposium on Farm Mechanization organised at Pune during 22-23 March, 2014.
- Dr. A. K. Sah was nominated Co-Chairman in a committee constituted by UPCAR for organising 2nd UP Agricultural Science Congress held at IISR, Lucknow from June 14-16, 2014.
- The Scientists and Technical officers of the Institute participated in the International Conclave on Sugar Crops held at IISR, Lucknow during February 15-17, 2014 and presented papers in the Interactive Session.
- Eight Scientists of the Institute participated and presented their research papers in “National Seminar on Recent Advances and Challenges in Sugarcane Research” held at Mysore on January 23-24, 2014.
- Five Scientists attended the Symposium on “Bioenergy for sustainable development – The potential role of sugar crops” held at SBI, Coimbatore on June 23–25, 2014.
- Dr. S.N. Singh, Principal Scientist was appointed Nodal Officer, IISR Biological Control Centre, PDVVPSSK, Pravaranaagar (MS).

Capacity building for UG/PG students

- Twelve students of B.Sc. (Ag.) of Banaras Hindu University, Varanasi attended an eight days training on “Advances in Sugarcane Production” at IISR, Lucknow on June 20-27, 2014.
- Twenty nine UG/PG students completed three to six months training in the Institute in Biotechnology and Microbiology discipline as part of their Master's degree programme.

Visit of Dignitaries to the Institute

- Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR visited on February 18, 2014 and June 29, 2014.
- Dr. Gurbachan Singh, Chairman, ASRB, New Delhi visited on February 22, 2014.
- Dr. Swapan Kumar Datta, Deputy Director General (CS), ICAR visited on February 15-16, 2014
- Dr. N. Gopalakrishnan, Asstt. Director General (CC), ICAR visited on February 16, 2014.
- Dr. Bakshi Ram, Director, UPCR, Shahjahanpur visited the Institute on February 16-17, 2014.
- Dr. V.S. Deshmukh, DG, VSI, Pune visited the Institute on February 15-16, 2014.
- Shri S.S. Pattanshethi, IAS, Commissioner of Cane Development and Director of Sugar, Govt. of

Karnataka visited IISR, Lucknow on June 17, 2014.



राजभाषा प्रकोष्ठ

- संस्थान को हिंदी में कार्य करने के लिए नगर राजभाषा कार्यान्वयन समिति द्वारा तृतीय पुरस्कार दिया गया।
- राजभाषा पत्रिका 'इक्षु' वर्ष 2 अंक 2 को नगर राजभाषा कार्यान्वयन समिति द्वारा 'द्वितीय' पुरस्कार दिया गया।
- दिनांक 13 मार्च 2014 एवं 4 जून 2014 को एकदिवसीय हिंदी कार्यशाला का आयोजन किया गया जिसमें संस्थान के कर्मियों ने भाग लिया।



GLIMPSES OF CELEBRATIONS AT IISR



गन्ना किसान मार्गदर्शिका

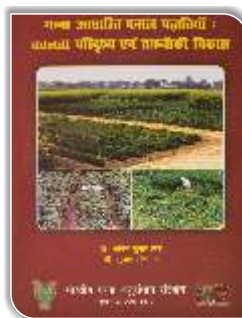
गन्ना खेती द्वारा अधिक लाभ अर्जित करने के लिए यह आवश्यक है कि किसान वैज्ञानिकों द्वारा संस्तुत तकनीकों को अपना कर खेती करें। इस संदर्भ में गन्ना उत्पादन के लिए संस्तुत कृषि तकनीक/कार्य पर जानकारी किसानों को 'आशुपरिकलक' (ready reckoner) के रूप में उपलब्ध होना अत्यन्त आवश्यक है। इन बातों का संज्ञान लेते हुए भारतीय गन्ना अनुसंधान संस्थान, ने "गन्ना किसान मार्ग दर्शिका" (Farmers' Guide to Sugarcane Cultivation) शीर्षक पर द्विभाषीय (हिन्दी एवं इंग्लिश) पुस्तक का प्रकाशन किया है। यह प्रकाशन भारत वर्ष के लाखों-करोड़ों गन्ना किसानों के आर्थिक समृद्धि के लिए संस्थान द्वारा समर्पित प्रयास है।

"गन्ना किसान मार्ग दर्शिका" में वर्ष के प्रत्येक माह में किये जाने वाले गन्ना खेती के कृषि कार्य को बहुत ही सरलता तथा सुगमता से वर्णित किया गया है। वर्णित कृषि कार्यों का फोटोग्राफ द्वारा सचित्र विश्लेषण उद्धृत जानकारी को जीवंत बनाता है साथ ही पाठकों की रुचि में गुणात्मक वृद्धि करने में सहायक है। गन्ना खेती के साथ-साथ अन्य महत्वपूर्ण विषयों जैसे क्षेत्रवार व राज्यवार संस्तुत गन्ना प्रजातियाँ, उन्नत गन्ना उत्पादन तकनीकों, सह-फसल उत्पादन, हरी खाद संबंधित जानकारी, जैव उर्वरक, गन्ने के प्रमुख रोगों एवं नाशी कीटों के लक्षणों का छाया चित्रों द्वारा प्रस्तुति, राज्यवार संस्तुत उर्वरक मात्रा, असली उर्वरकों की पहचान, कीट नाशक प्रयोग संबंधी जानकारी, पोषक तत्वों के कार्य एवं कमी के लक्षण, सूखा की स्थिति में आकस्मिक योजना इत्यादि पर सूचनाओं का वर्णन इस प्रकाशन को समग्र तथा अत्यधिक उपयोगी बनाता है। इस पुस्तक के लेखक डा० अजय कुमार साह, डा० शिव नायक सिंह एवं डा० सुशील सोलोमन हैं।

इस पुस्तक को (मूल्य ₹300) नकद भुगतान कर संस्थान से प्राप्त किया जा सकता है। डाक द्वारा पुस्तक मूल्य का ड्राफ्ट जो कि निदेशक, भारतीय गन्ना अनुसंधान संस्थान, लखनऊ के नाम देय हो, संस्थान के पते पर भेज कर प्राप्त किया जा सकता है।



संस्थान द्वारा किसानोपयोगी प्रकाशन



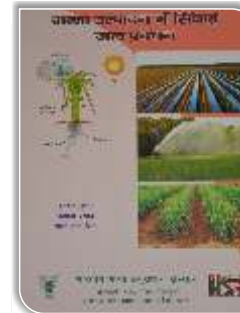
₹ 200



₹ 100



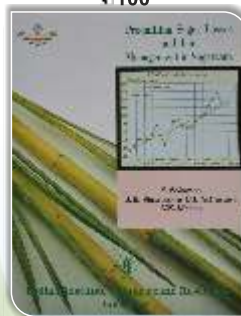
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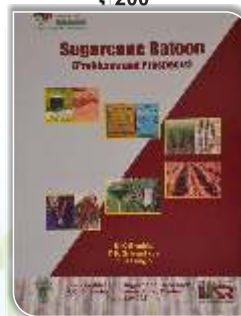
₹ 100



₹ 100



₹ 275



₹ 350



₹ 150

प्रकाशन प्राप्त करने के लिये कुल मूल्य का डी.डी. (डाक खर्च अतिरिक्त), जो निदेशक, भारतीय गन्ना अनुसंधान संस्थान, लखनऊ के नाम देय हो, बनवाकर संस्थान के पते पर भेजें।



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