IAPSIT NEWSLETTER

IS-2017
Durban, South Africa
www.iapsit.net

Vol. 9, No. 1&2, Summer, Winter 2015

Serving the World of Sugar





Organic Sugarcane

Yang-Rui Li
President, IAPSIT

According to IFOAM "Organic Agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved."

Organic farming is basically a holistic management system which promotes and improves the health of agro-ecosystem related to biodiversity, nutrient bio-cycles, soil microbial and bio-chemical activities. It emphasizes management practices involving substantial use of organic manures, green manuring and management of pests and diseases through the use of non-synthetic pesticides and practices. Thus, organic farming prohibits the use of harmful chemicals and promotes the use of renewable organic resources and bio-based products to maintain the soil productivity and to control the crop diseases and pests. Organic agriculture adheres to globally accepted principles, which are implemented within local social-economic, climatic and cultural settings. Although organic farming is gaining importance in recent years, increasing agricultural production is a vital national concern. At one end, high input- intensive agriculture is perceived as detrimental to sustainability of agriculture and environment while at the other, concerns are raised about the viability of alternative farming system such as organic farming. Currently around 2.3 million certified organic farmers grow organic produce on 43.7 million hectares in 172 countries.

Sugarcane draws heavily from soil and requires corresponding replenishment of nutrients and therefore a huge quantity of inorganic fertilizers & nutrients, weedicides, pesticides etc. are used in raising a healthy crop. The amounts of nutrients removed by sugar cane plants per ton of cane yield are: 0.7 – 1.2 kg N, 0.4 – 0.8 kg P_2O_5, 1.8 – 2.5 kg K_2O. Many reports have indicated that the long-term use of inorganic fertilizers and pesticides to enhance the productivity of sugarcane results in deterioration of soil quality and the decline in productivity. It also contributes to the accumulation of heavy metals in soil and raising concern about crop production and potential impact on human health. Progressive reductions of yield in successive ratoon crops, is a major constraint on productivity and profitability of the sugarcane industry due to poor soil aeration, drainage, weed competition and Pythium root rot. To facilitate sugarcane cultivation on a sustainable basis, and at the same time obtain product more acceptable in international market, it is necessary to apply bio-based products (biofertilizers and bioagents) and promote organic farming. Application of different biofertilizers such as Azotobacter, Pseudomonas, Azospirillum, Trichoderma, Gliocladium sp. AM fungi and Seaweeds has shown significant improvement in sugarcane yield. Biofertilizers improve soil physical properties, such as porosity, aeration and water infiltration by forming and stabilizing soil aggregates. Composted organic materials have been utilized with varying success for suppression of root rot in sugarcane that would result in increased production and productivity. The farm produce like cane juice, sugar and jaggery or panela will not contain hazardous substances and will be accepted across the globe as a premium organic product.

Yangrui Li

Towards a Sweeter and Prosperous Tomorrow

FOCUS

IFOAM – PRINCIPLES OF ORGANIC AGRICULTURE

Agriculture is one of humankind's most basic activities because all people need to nourish themselves daily. History, culture and community values are embedded in agriculture. The principles apply to agriculture in the broadest sense, including the way people tend soils, water, plants and animals in order to produce, prepare and distribute food and other goods. They concern the way people interact with living landscapes, relate to one another and shape the legacy of future generations. The IFOAM's Principles of Organic Agriculture serve to inspire the organic movement in its full diversity.

Principle of Health

This principle points out that the health of individuals and communities cannot be separated from the health of ecosystems - healthy soils produce healthy crops that foster the health of animals and people. Health is the wholeness and integrity of living systems. It is not simply the absence of illness, but the maintenance of physical, mental, social and ecological well-being. Immunity, resilience and regeneration are key characteristics of health. The role of organic agriculture, whether in farming, processing, distribution, or consumption, is to sustain and enhance the health of ecosystems and organisms from the smallest in the soil to human beings. In particular, organic agriculture is intended to produce high quality, nutritious food that contributes to preventive health care and well-being. In view of this it should avoid the use of fertilizers, pesticides, animal drugs and food additives that may have adverse health effects.

Principle of Ecology

This principle roots organic agriculture within living ecological systems. It states that production is to be based on ecological processes, and recycling. Nourishment and well-being are achieved through the ecology of the specific production environment. For example, in the case of crops this is the living soil; for animals it is the farm ecosystem; for fish and marine organisms, the aquatic environment. Organic farming, pastoral and wild harvest systems should fit the cycles and ecological balances in nature. These cycles are universal but their operation is site-specific. Organic management must be adapted to local conditions, ecology, culture and scale. Inputs should be reduced by reuse, recycling and efficient management of materials and energy in order to maintain and improve environmental quality and conserve resources. Organic agriculture should attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Those who produce, process, trade, or consume organic products should protect and benefit the common environment including landscapes, climate, habitats, biodiversity, air and water.

Principle of Fairness

This principle emphasizes that those involved in organic agriculture should conduct human relationships in a manner that ensures fairness at all levels and to all parties – farmers, workers, processors, distributors, traders and consumers. Organic agriculture should provide everyone involved with a good quality of life, and contribute to food sovereignty and reduction of poverty. It aims to produce a sufficient supply of good quality food and other products. This principle insists that animals should be provided with the conditions and opportunities of life that accord with their physiology, natural behavior and well-being. Natural and environmental resources that are used for production and consumption should be managed in a way that is socially and ecologically just and should be held in trust for future generations. Fairness requires systems of production, distribution and trade that are open and equitable and account for real environmental and social costs.

Principle of Care

Organic agriculture is a living and dynamic system that responds to internal and external demands and conditions. Practitioners of organic agriculture can enhance efficiency and increase productivity, but this should not be at the risk ofjeopardizing health and well-being. Consequently, new technologies need to be assessed and existing methods reviewed. Given the incomplete understanding of ecosystems and agriculture, care must be taken. This principle states that precaution and responsibility are the key concerns in management, development and technology choices in organic agriculture. Science is necessary to ensure that organic agriculture is healthy, safe and ecologically sound. However, scientific knowledge alone is not sufficient. Practical experience, accumulated wisdom and traditional and indigenous knowledge offer valid solutions, tested by time. Organic agriculture should prevent significant risks by adopting appropriate technologies and rejecting unpredictable ones, such as genetic engineering. Decisions should reflect the values and needs of all who might be affected, through transparent and participatory processes.

(Excerpts from IFOAM Organic International)

The Millennium Development Goals and Organic Agriculture

In 1996, world leaders gathered at the World Food Summit and committed to reduce by half the number of hungry people by the year 2015. After a series of international meetings during the 1990s, major goals were identified within the same time horizon. These commitments were brought together in the Declaration adopted by the UN Millennium meeting in September 2000 and were later restated in the form of eight Millennium Development Goals (MDGs). The Declaration was endorsed by 189 countries. Of course, longer term commitments (>10 years period) for agricultural productivity, physical and institutional infrastructure development, and capacity building are necessary for efforts to achieve scale and impact.

After the formulation of the MDGs and their reaffirmation at the Monterrey Summit in 2002, some encouraging signs to resolve the fight against hunger have emerged. There has been some progress in East Asia and the Pacific, especially in China, since 1990. In South Asia, Central America, the Middle East, North Africa, and West Africa, however, figures indicate that the number of hungry people has actually increased. Sub-Saharan Africa (SSA) is facing the largest and fastest increase in food insecurity worldwide. In fact, around 40% of people in SSA are undernourished, among the highest rates in the world.

The organic agriculture plays an important role in achieving individual MDGs, and therefore, its impact is far greater when considered holistically due to the interrelationships among the MDGs. In many cases, the positive impact of organic agriculture in achieving one MDG in turn has a positive impact on achieving other MDGs. Thus, the old adage "the whole is greater than the sum of its individual parts" has much relevance to the topic of organic agriculture's contribution to achieving the MDGs.

The contributions of organic agriculture to achieving the MDGs are both direct and indirect, and cover social, economic, human and environmental dimensions. For small poor farmers, organic is an effective risk management tool that reduces input costs, diversifies production, and improves local food security (MDG 1). For rural communities, it provides improved incomes, better resource management (MDG 7), and more labor opportunities, thus reducing the number of possible slum dwellers in the city suburbs. Organic agriculture also reduces environmental contamination (MDG 7) in communities through the elimination of chemical inputs, and minimizes the public health costs of pesticide poisoning thus allowing medical attention to be diverted to other health issues (MDG 6).

Eradicate extreme poverty and hunger : Increased yields (productivity increase) in low-input areas, higher incomes (premium prices), diverse and nutritious diets from organic products, food insecurity problems reduced, hunger pressure reduced, lower costs (for inputs)

Achieve universal primary education : Better livelihoods, more self-confidence, extra income used to school children (especially girls), increases in attendance and levels of education, organic agricultural practices foster knowledge of local environment, learning-by-doing processes, and farmer-to-farmer knowledge exchange

Promote gender equality and empower women: Active and diversified role of women, increased responsibilities and decision- making for women, more self-confidence in women, community participation and rural development promoted, marginalized groups favored (also reducing migration to cities and the number of slum dwellers in city suburbs)

Reduce child mortality : Healthier and safer food (elimination or less exposure to toxic pesticides), improved livelihoods, diversified diets, quality of community health improved

Improve maternal health : Healthier and safer food, care of children improved, quality of community health improved, health problems reduced (reduced exposure to chemicals and pesticides)

Combat HIV/AIDS, malaria and other diseases : Healthier and safer food, strengthening of the immune system, increase in protection of human health

Ensure environmental sustainability: Increases in biodiversity and genetic diversity, improved sustainability and resilience of the system, build-up of soil fertility, decrease in soil degradation (erosion), natural resource management improved, water-use demand optimized, water run-off and soil erosion reduced, positive externalities and ecosystem services enhanced (PES), water contamination reduced, farmers as guardians of unique breeds, traditional and indigenous knowledge preserved.

Develop a global partnership for development: Fostering collaboration between government and organic agriculture agencies and institutions, effectiveness of stakeholders involvement, participatory guarantee systems (IFOAM), capacity-building at the farmer level, reliable institutional support systems, business and marketing skills developed, responsible and fair trade, increased awareness about organic produce in farmers and consumers (PGS)

ORGANIC 3.0 - THE NEXT PHASE OF ORGANIC DEVELOPMENT

The Organic 3.0 aims at sustainable farming systems and markets based on organic principles and imbued with a culture of innovation, of progressive improvement towards best practice, of transparent integrity, of inclusive collaboration, of holistic systems, and of true value pricing. The concept of Organic 3.0 seeks to adress the previously outlined challenges by positioning organic as a modern, innovative system which puts the results and impacts of farming in the foreground. Diverse priorities and challenges like for example climate change resilience and adaptation, access to capital and adequate income, animal welfare, availability of land, water, seed, healthy diets, and avoidance of waste in food and farming systems cannot possibly all be folded into an ever-expanding set of standards and rules. Thus, a more holistic and dynamic model is needed. At its heart, Organic 3.0 is not prescriptive but descriptive: instead of enforcing a set of minimum rules to achieve a final static result, this model is outcome-based and continuously adaptive to the local context. Organic 3.0 is still grounded upon clearly defined minimum requirements such as the ones maintained by many government regulations and private schemes around the world. But it also expands outward from these base requirements: it calls for a culture of continuous improvement through private- and stakeholder-driven initiatives towards best practices based on local priorities (as described in the IFOAM Best Practices Guidelines).

ORGANIC 3.0: STRATEGY

The strategy for Organic 3.0 includes six main features, consistently promoting the diversity that lies at the heart of organic and recognizing there is no 'one-size-fits-all' approach:

1. A culture of innovation, to attract greater farmer conversion, adoption of best practices, and to increase overall productivity and quality;
2. Continuous improvement toward best practice, at a localized and regionalized level;
3. Diverse ways to ensure transparent integrity, to broaden the uptake of organic agriculture beyond third-party assurance and certification;
4. Inclusiveness of wider sustainability interests, through alliances with the many movements and organizations that have complementary approaches to truly sustainable food systems and farming;
5. Holistic empowerment from the farm to the final product, to acknowledge the interdependence and real partnerships along value chains and also at the territorial level; and
6. True value and fair pricing, to internalize costs, encourage transparency for consumers and policymakers and to empower farmers as full partners.

HIGHLIGHTS : International Conference-IS 2014

Green Technologies for Susutainable Growth of Sugar & Integrated Industries
Nanning, P.R. China, 25-28 November, 2014

The importance of sugar crops as a source of sugar, sustainable energy and other value added products has led to an enhanced interest in these crops at the global level in recent years. The diversion to other sugar crops and also to various other end-products like bio-fuel and bio-ethanol, bio-plastics etc., is bound to have an impact on the socio-economic canvas of the sugar producing countries. Innovative technologies and practices including Green Technologies and exchange of these technologies and ideas need to be in place to meet the increasing demands and to exploit these exciting opportunities. Keeping these in view, the International Association of Professionals in Sugar and Integrated Technologies (IAPSIT) organized IS 2014 at Nanning in the Guangxi province in China. The occasion also marked ten decades of remarkable service of IAPSIT towards the development of sugar and integrated industries in the developing countries through its various activities. More than 220 delegates from 22 countries participated in this scientific gathering.

The venue of the International Conference was the Xiangsihu International Hotel at Nanning, situated adjacent the Guangxi University of Nationalities and nearby the Guangxi Academy of Agricultural Sciences. The picturesque surroundings of the Hotel were a treat to the eyes with the Xiangsi lake at a stone-throw away from the hotel. The tastefully decorated interiors offered the right ambience for a comfortable stay for the delegates, with the well equipped halls of the venue providing an ideal environment for the scientific deliberations.

The Conference got to a start on 25 November 2014 after a Group Photograph Session of the delegates. Dr. S. Solomon Secretary of the Conference, welcomed the delegates and gave a brief account of the IAPSIT and the Conference. Dr Yang-Rui Li, President, IAPSIT and Organizing Chairman of IS 2014 briefed about programmes during the Conference. The Chief Guest, the Hon'ble Governor of Guangxi Province apprised the gathering about the main concerns of Chinese sugar industry and hoped that the Conference would chalk out ways and means to address the issues.

This was followed by the Plenary Session chaired by Mr. Jai S Gawander from Fiji. There were lectures on the status of sugar and integrated industries in China, bio-fertilizers in sugarcane agriculture in Brazil and its impact on crop productivity, the Brazilian Bioethanol Programme, impact of climate change on sugarcane production in developing countries, sequencing strategies like Next Generation Sequencing Technologies, transgenic research in sugarcane improvement, nutrient management with respect to N fertilizers, disease management in sugarcane, selection methods for effective sugarcane improvement etc.

Technical Sessions

The Technical Sessions were held on 26 November and 28 November 2014. Three Technical Sessions were held concurrently. Technical Session I was on Sugar Crops Production Technologies and Mechanization, Technical Session II was on Sugar Crops Improvement and Protection and Technical Session III was on Sugar Crops Processing, Value Addition and Sugar Energy Matrix in Developing Countries.

The Technical Session I was chaired by Dr Yang-Rui Li from China and co-chaired by Dr Rafaella Rossetto from Brazil and Dr Prakash Lakshmanan from Australia. The five invited lectures covered topics on climate variability trends on sugarcane production in Fiji, innovation and technology transfer for production and sustainability, agro-technologies like water management and site-specific fertilizer application in sugarcane based cropping systems etc. The short presentations covered wide ranging topics like drip irrigation and fertigation, soil nutrient management strategies for improved sugarcane production, bio-manured multi-ratooning for enhanced productivity in plant-ratoon systems, post-harvest trash management for weed control, role of invertases and bacteria in staling of juice and strategies to control staling etc.

The Technical Session II was chaired by Dr. Isabella Guinet-Brial from France and co-chaired by Dr. Robert Margarey from Australia and Dr. Yong-Bao Pan from USA. A total of five invited lectures and twenty five short presentations were delivered. The use of molecular markers in sugarcane and sugarbeet breeding programmes, phylogenetic and association studies in these crops, expression analysis with respect to economic attributes like sugar content, management of post-harvest losses through molecular techniques, cytomorphological studies in sugarcane, sugarcane genome sequencing programme by China for *Saccharum spontaneum* etc. were highlighted. The crop protection aspects centred on the emerging sugarcane diseases in the developing countries and their management, management of diseases and pests using conventional and molecular techniques and through bio-control. Visacane, the CIRAD Quarantine Tool for pest and disease-free sugarcane germplasm exchange was also presented.

The Technical Session III was chaired by Dr. Tseng Sheng Gerald Lee from Brazil and co-chaired by Prof. Vo Tong Xuan from Vietnam and Dr. Hassan Hamdi from Iran. This Session dealt with the status of sugar industry in South East Asia as a whole and in various countries. The challenges in the South East Asian Sugar industry and strategies to overcome these challenges, status of sugar industry in other countries like Sri

Lanka, Indonesia and China were outlined by the speakers. Challenges in commercialization of sweet sorghum in India and Philippines were also presented in the session.

The Poster Interactive Session was held on 27th November 2014 from 10 AM -11.30 AM. The posters were presented in three sections corresponding to the Technical Sessions. Dr. S. Solomon from India was the Chairman and Dr. M. Swapna from India co-ordinated the Session. In the first section, eight posters were presented on sugarcane, sugarbeet and sweet sorghum. The topics ranged from agro-techniques for water, nutrient and other resource management to development of a web-based expert-disorder diagnostic system for sugarcane agriculture etc. The second section had 14 posters with the topics on conventional and modern tools for sugar crops improvement for sugar as well as biomass, bio-intensive crop protection strategies through integrated approaches like bio-control, use of sugarcane based intercropping systems etc. The posters in section III talked about the efforts towards mechanization in sugarcane agriculture esp., small scale harvesters and also Outgrower Model for cane development to transform sugar crops farmers and sugar industry economy.

A visit to the laboratories and research fields of Guangxi Academy of Agricultural Sciences was arranged on November 27, 2014 at 8.30 AM. The delegates visited the bio-control laboratories and also the Key Laboratory for Sugarcane Biotechnology and Genetic Improvement. The varietal demonstration fields had the latest improved varieties developed by the Institute. Diseases free *in vitro* seedling nursery of sugarcane plantlets and the germplasm collection and maintenance area were also visited by the delegates. A visit to the Changli Sugar Mill in Shangsi county on 27 November 2014 was also a part of the conference activities. The freshly harvested clean canes which were brought to the mill for crushing, with no trash or other impurities, were a treat to the eyes. The delegates also visited the sugarcane fields in the sugar mill area. The sugarcane grown in an undulating topography with self detrashing clean canes standing in the field was an attractive sight.

The Valedictory Session of IS 2014 was held on 28 November 2014 at 11 AM in the Multifunctional Hall. Dr. S. Solomon, Secretary, IAPSIT welcomed the dignitaries and delegates and gave a quick brief about the Conference. This was followed by presentation of reports and the recommendations by the Chairmen/Co-ordinators of the various sessions. The posters by Dr M. Nouri from Iran and Dr S.S. Hasan from India in Session I, those b.y Dr Huang from China and Dr Sunethra Wanasinghe from Sri Lanka Session II and the posters by Dr A.K. Singh and Dr A.K. Sah from India in Session III were adjudged as the Best Posters. Award for distinguished contribution in sugarcane research and significant contribution for academic exchange was conferred on Dr Yang-Rui Li from China. Distinguished contribution awards were also given to other sugar crops researchers. Dr. Yang-Rui Li, the Founder President of IAPSIT, and Dr. S. Solomon, the Founder Secretary of IAPSIT, and the Secretary for IS 2014 were presented with the IAPSIT Life Time Achievement Award 2014 for their outstanding contributions towards the general upliftment of sugar industry in the developing countries through his various activities. Some of the participants gave their feedback about the Conference. Dr Yang-Rui Li, President of IAPSIT and the Organizing Secretary of IS 2014 gave the concluding remarks and Mr. Jai Gawander, Vice-President, IAPSIT proposed a Vote of Thanks. The President, IAPSIT formally declared the Conference closed with the announcement of IS 2017 at Durban, South Africa.

It was not all work and no play for the delegates at the Conference. There was a breathtaking cultural extravaganza “Brocade Banquet” at the Nanning International Convention and Expo Centre on November 27, 2014 for the delegates. The dancers gave a mesmerizing performance leaving the audience spell-bound in a dream world. There was also a visit to the Guangxi Museum of Nationalities and to the Confucius Temple in Nanning on the afternoon of November 28, 2014. The delegates took maximum advantage of the opportunity to visit the market places and “to shop till they drop” for their favourite items. The shopping spree continued on all the days with the participants getting a taste of the various traditions and culture of the area.

The main recommendations of IS-2014

- Agro-techniques favouring soil carbon enhancement, water and nutrient management need to be adapted along with steps for mitigation of climate change.
- Sugarbeet can be an attractive alternative for sugarcane under limited water availability.
- Post-harvest management to reduce sugar losses need to strengthened for enhanced sugar recovery.
- Application of molecular markers should go hand-in-hand with the conventional breeding strategies for enhanced breeding efficiency.
- Biotechnological interventions need to be taken up for sugarbeet improvement.
- Techniques like transcriptome analysis and genome sequencing needs to be strengthened especially in developing countries.
- Concerted and continuous efforts are needed for proper monitoring and reporting newly emerging diseases.
- The novel molecular tools for disease diagnosis need to be shared among the developing countries for effective utilization.
- The South-East Asian countries are faced with common problems like low productivity and sugar recovery. India and China along with IAPSIT need to play a greater role in the upliftment of sugar industry in this region.

Organic Sources for Sustainable Sugarcane Production

In the world, sugarcane is grown in an area of 26.088 m ha with a production of 1832.56 million tonnes and the productivity level of 70.24 t/ha. Asia has 41.87% area in sugarcane with a production of 39.83% and productivity of 66.82 t /ha. India, a home for 18% of the world's population and over 15% of the world's livestock has only 2% of land resource to meet country's basic requirements. The burgeoning population necessitates significant increase in the production of other agricultural products including sugar. With the increase in crop productivity, nutrient removal from soil has also increased. This continuous mining of soil nutrients has to be replenished to sustain crop productivity. Decline in total as well as partial factor productivity of inputs in the highly productive regions of the world suggests that basic resources are getting fatigued and sustainability through integrated use of inputs is called upon. Sugarcane being a long duration and huge biomass-accumulating crop removes substantial amount of plant nutrients from the soil. Sugarcane crop of 100 t/ha exhausts 205 kg N, 55 kg P and 275 kg K besides 3.5 kg Fe, 1.2 kg Mn, 0.6 kg Zn, 0.2 kg Cu and 30 kg S. There exists a huge regional disparity in fertilizer use and the consumption of plant nutrients. All these point out to greater opportunity for using balanced nutrition for enhancing cane productivity, produce quality and maintaining system sustainability.

Poor tilth due to compaction of soil in the root zone of the crop restricts the vigour of root system. As a result, sugarcane experiences inadequate soil aeration. This condition decreases intake of water and uptake of nutrients by roots. The crop suffers most due to restricted stubble roots. Application of FYM and biofertilizer improves soil organic carbon and increases carbon helps in sustaining soil health for longer period. Enrichment of organic (humus) nitrogen in the soil after application of bio waste compost has been observed. Organics improve soil structure by enhancing aggregate stability, which results in greater water holding capacity and aeration. Similarly, the beneficial effects of organics have been attributed to suppression of soil borne diseases and to improve soil physical properties and nutrient availability. Organics increase the nutrient use efficiency and brings an economy in fertilizer use. The fertilizer and manurial schedules in the system help in correcting the emerging deficiencies of nutrients other than, N, P and K particularly the micronutrients. Bio-resource management strategies include:

(i) Bio-manuring and integrating biofertilizers with organic

Addition of bulky organic manures improves the physical properties of the soil and creates ideal rhizospheric environment. This in turn provides congenial soil-water relations for better release and availability of nutrients. Importance of organic amendments in increasing water holding capacity, improving soil structure and quality, maintaining favourable ecological conditions and conducive to crop growth and yield of sugarcane has been recognized. The increased yield of sugarcane crop and improved soil quality can be obtained with proper management of available farm bioresource. Application of FYM and/or green manure in sugarcane established its beneficial effect in improving the production efficiency of fertilizer N and more so at its optimal level. Periodic soil organic carbon increases with the application of FYM amended with *Trichoderma* and *Gluconacetobacter* (Table 1).

Application of farm yard manure enriched with *Gluconacetobacter* and *Trichoderma* improves soil organic carbon helps in sustaining soil health for a longer period. FYM provides organic carbon to enhance multiplication of inoculated microbial agents and provides a suitable niche for plant-microbe interaction. *Gluconacetobacter diazotrophicus* and *Trichoderma viride* owing to their plant growth promotion ability produces synergistic effect with FYM unlike NPK

Table 1: Effect of different treatments on soil organic carbon (Mg ha^{-1}) and rate of change during crop growth

Treatment	Apr.	Aug.	Dec.	*Rate of change in soil organic carbon (Mg ha^{-1} year^{-1})
N (200 kg N /ha)	13.58	13.51	14.78	0.28
NPK (200, 60, 60)	13.48	16.32	17.29	2.79
FYM (15 t/ ha)	15.24	15.10	19.13	4.63
FYM+ *Trichoderma* + *Gluconacetobacter*	15.82	15.51	19.44	4.94
S. E. m+	0.24	0.28	0.32	
C.D (P<0.05)	0.73	0.85	0.94	

Initial soil organic carbon (14.5 Mg ha^{-1}), Rate of change in soil organic carbon = dcs /dt where dcs= change in SOC and dt is time period. *Trichoderma viride* culture @ 20 kg/ ha; *Gluconacetobacter* culture @ 15 kg /ha 1.8 x 10^{8} cfu/g cell

application. Thus enhanced organic carbon in soil not only sustains crop growth but also accumulates more N in rhizosphere due to its immobilization by microbial population. This also has relevance for minimizing N leaching losses and making nutrient available for crop growth for a longer period. Thus efficiency of organics increases by enriching with the bioagents. Growth promoting substances released by application of *Trichoderma* and N fixation by *Gluconacetobacter* enhances uptake of nutrients and yield. Application of *Azotobacter also* economises dose of nitrogen.

(ii) Nutrient management through legumes including green manuring

Nutrients applied to crop are often partially utilized and enough residual and cumulative effects are carried over to second or third crops in the sequence. The current transfer of nitrogen from legume to non-legume during the same season and the carry over effects to the subsequent crop has occupied a prime place. At Indian Institute of sugarcane Research, Lucknow, the highest cane production efficiency (418 kg cane/kg N applied) was obtained at 150 kg N/ ha with green manuring along and FYM. In general, the removal of plant nutrients is more in cereal based cropping systems than in legume based ones. Therefore, legumes are preferred to be included in cropping systems to sustain soil productivity. Legumes in sugarcane based cropping systems are accommodated as dual purpose intercropped grain legumes with incorporation of green plants in soil or as an intercropped green manure to supplement chemical fertilizers. The legume offers the following avenues for its residues recycling in sugarcane based cropping systems.

Response of sugarcane to green manuring varies greatly depending upon the environments in which it is practiced. Before chemical fertilizers came in use in sugarcane farming, green manuring was considered as an indispensable practice. The principal leguminous crops used for green manuring include *Crotolaria juncea*, *Sesbania aculeata*, *Melilotus alba* etc. Green manure legumes preceding sugarcane give a benefit of 27-43 per cent increase in spring sugarcane yield and contribute 41-71 kg N/ha through biological nitrogen fixation. Green manuring of *Sesbania*, green gram and cow pea increases soil microbial biomass carbon and soil microbial biomass nitrogen after decomposition indicating the key role in sustaining soil fertility and crop productivity. Legumes are known to fix atmospheric nitrogen and benefit the crops grown in succession. In a study, intercropping of lentil in autumn planted sugarcane increased the number of millable canes and yield of successive ratoon as compared to ratoon initiated from sole sugarcane.

(iii) Crop residue recycling with an accent on input economy

World over sugarcane is grown under diversified edaphic and/ or climatic conditions involving different sequential and/ or intercrops. This provides an ample opportunity to recycle the residues of these crops to the benefit of long duration crop like sugarcane. The incorporation of crop residues in sugarcane based production system improves the physico-chemical properties of soil and also provides sustainability to sugarcane productivity, which has been fluctuating with *time* and *space*.

Crop residues are renewable and readily available but are scattered organic resources. Intensive sugarcane based production system besides adding huge quantities of biomass of sugarcane *perse* has the enormous potential of cereals, pulses and oilseeds crop residues in succession and/or association. Being a long duration crop of 10-12 months and with the possibility of taking one or more ratoons, sugarcane occupies the fields for majority of the time in sugarcane based cropping system. During crop growth cycle, sugarcane leaves a large amount of recyclable residues in field in the form of root biomass and stubbles (6-8%) and dry leaves called trash (7-10%) apart from rhizo-deposition year long, which have a key role in maintaining soil organic carbon. Cane trash which accounts for nearly 12-20% of the cane produced contains 0.42 per cent N, 0.15 per cent P and 0.57 per cent K apart from 2045, 236.4, 25.7 and 16.8 ppm Fe, Mn, Zn and Cu, respectively. Since nutrients absorbed by cane plants from soil do not form the constituents of its marketable commercial product 'sugar', there is good opportunity of organic recycling in this crop. The recycling of roots/trash directly in the soil through vermiculture, green tops/molasses through ruminants in the form of cattle dung/urine, press-mud from juice as soil amendment/sulphur source and spent wash from distilleries as irrigation source after dilution can return multi-nutrients to soil from sugarcane crop itself.

The potential of crop residues of major cereals, pulses, oilseeds and commercial crops for recycling of valuable plant nutrients for sustained production is enormous.

(iv) Utilization of sugarcane and sugar factory by-products to supply plant nutrients

The sugar factory by-products like press-mud from sugar industry and spent wash from distillery continue to be of economic importance. In the sulphitation factories it amounts to about 3% and in carbonation factories about 7%. Press-mud cake (PMC) has a great potential to supply plant nutrients (1-2% N, 2-4% P_2O_5 0.5-1.5% K_2O, 0.83-1.98% Ca, 0.05-0.25% Mg, 0.31- 0.92% Na, 0.22-0.31% S, 22.5-95 ppm Fe, 163-625 ppm Mn, 47-215 ppm Zn), besides having beneficial effects on physico-chemical and biological properties of soil. These in turn influence the availability and uptake of nutrients, cane yield and juice quality. Utilization of sulphitation press-mud (SPM) cake along with inorganic fertilizer gave significantly higher yield of sugarcane as compared to farmyard manure and cane trash compost. It recorded higher cane and sugar yield and proved superior over inorganic amendment like pyrites on calcareous saline- sodic soils. Distillery effluent (spent wash) is another important organic waste that contains appreciable amount of plant nutrients.

a. Sugarcane dry leaves-Trash

Recycling of cane trash is an important renewable source of plant nutrients, which can supplement crop need, besides conserving the soil moisture and controlling the weeds. At the rate of 10 percent of cane produced in India, about 35 mt of cane trash per year is available for recycling. This much of trash has the potential to supply 0.14, 0.05 and 0.20 mt of N, P and K respectively besides 71.6, 8.3, 0.90 and 0.59 thousand tonnes of Fe, Mn, Zn and Cu, respectively. Burying trash in the soil brings out an improvement in soil moisture status, organic matter content of the soil, nitrogen status of the soil, overcomes the ill effect of soil compaction, and allows optimal air and water relationship in the rhizosphere. The practice of trash mulching increases water holding capacity and permits the crop roots to extract water and nutrients from deeper horizons of soils.

b. Straw/husk/foliage recycling

The straw and husk of the cereals/legumes are very good source of renewable inputs to augment the nutrient demand and bring improvement in soil health. Wheat/paddy straw and paddy/legume husk could be used in sugarcane based cropping systems. At IISR, Lucknow increase in organic carbon content and N, P, K status was observed by incubation of soil with paddy straw and legume husk. An improvement in the yield and quality of ratoon cane was observed by the application of paddy straw in non- saline sodic soils. Paddy husk was found effective in increasing the yield of sugarcane in tropical conditions also. It was observed at IISR, Lucknow that potato foliage which contained nearly 2.60% N contributed 31 kg N/ha when used as a green manure and increased the yield of sugarcane by 5.1 t/ha and saved 46 kg N/ha.

c. Cane stubble/roots

The studies on the cane roots and stubble showed that sugarcane ratoon inherits stubble and root mass from the preceding plant crop accounting to 4.5% and 12.7%, respectively of the cane produced. Thus these together constitute 17.2% of the cane produced and serve as a source of organic matter and soil nutrients. The recommendation on application of extra 20-25% nitrogen in ratoon is needed to overcome microbial tied-up nitrogen and exhaustion of soil nitrogen by the plant crop, synchronous re-growth with low nitrogen absorbing capacity of ratoon roots.

d. Filter mud/Press Mud

Press mud is a useful sugar factory residue for returning to the fields. It contains most of the phosphoric acid and some of the nitrogen contained in the cane. Press mud cake (PMC) is used to improve soil fertility and crop productivity, as a source of organic phosphorus and sulphur, as soil conditioner or as an ameliorating agent. Press mud cake is rich in organic carbon as well as P, and when applied as organic manure increases the status of these constituents in the soil. The infiltration rate of the soils was much better when soils were treated with factory waste than treated with gypsum. Press mud is applied in the field, about 6 weeks before planting. It can also be converted in to compost. It contains about 1% phosphate and therefore, it could also be used as phosphatic fertilizer.

Conclusions

Sugarcane industry worldwide should encourage modern agronomic management practices to enhance productivity and protect the environment. There is a need for bio-intensive sugarcane cultivation encompassing minimum tillage, crop rotation, green manuring and judicious use of bioagents and biofertilizers. The role and requirement of essential plant nutrients in **'Produce to Product Chain'** govern two biological systems, 'Soil-Cane' and 'Cane-Sugar' around which the success of sugar factories revolves. The diverse edaphic, environmental and cropping situations viz., water logging, late planting and ratooning under which sugarcane is grown are characteristically known to reduce nutrient use efficiency and decrease factor productivity.

Thus, the management of plant nutrients for high sugarcane production with improved quality traits demands integration of chemical fertilizers with organics, green manures/legumes-N, crop residues, bio-manures and sugar factory by-products/ wastes to enhance over all nutrient use efficiency and reduce production cost. The plant nutrient management strategies should, therefore, be in tune with large nutritional requirement ensuring full replenishment of the nutrients depleted through intensive sugarcane plant- ratoon based production systems. In addition, bioresource management for controlling major insect-pest in sugarcane holds great promise in economizing the cost of production, increasing net profit and maintaining ecological balance.

S K Shukla and S Solomon

Indian Institute of Sugarcane Research, P.O. Dilkusha,
Lucknow. 226002,U.P, India
E mail: sudhirshukla151@gmail.com

Organic Sugar

In recent times, demand for organic sugar has increased, with the consumers becoming more concerned with the potential health hazards of having too much of processed food. The term organic sugar does not mean that it is raw unprocessed sugar. It undergoes processing to some extent using organic materials. It essentially involves the practice of growing sugar crops in an organic farming mode, with minimal use of chemical fertilizers and plant protection chemicals.

While growing sugarcane in an organic manner, the specified standards will have to be followed at each stage. While switching from the conventional cultivation practices to an organic one, there has to be a transition period of 2-3 years. There must be a gap of 24-36 months between the last use of any non-permitted material, before initiating the organic farming practices. If a new land is used the cultivation may start straight away. The source of nutrients will necessarily have to be organic including biofertilizers. Herbicide application for weed control is replaced by manual hoeing / interculture with machines. Biocontrol practices will replace the chemical pesticides/fungicides in organic sugarcane cultivation.

The processing of organically grown cane will have to be carried out in a separate processing unit for producing organic sugar. Ideally the cane for organic sugar production can be processed at the beginning of the season before crushing of the conventional cane or at the end of the season. The second option will again necessitate a thorough cleaning of the entire processing line, right from the unloading bay to the sugar bin. At the processing stage, use of vegetable/organic clarificants will be used. Some examples are seeds of drumstick (*Moringa oleifera*) and the edible fruit of *Cordia myxa*. Since lime alone (without any chemical clarificant) is used, the settling time may be longer. The process will have to be standardized for different organic clarificants that may be used along with lime. The proportion of sugar that is recovered in this organic process may be slightly lower than that in conventional sugar production.

Strictly speaking, there does not seem to be any significant difference between the organic and non-organic sugar with respect to the nutritional value. Natural molasses may not be processed out of sugar in the case of organic sugar. Organic raw or natural sugar, however, may have a distinctive flavor, due to the natural molasses content in each sugar crystal. Organic sugar labeled "turbinado" has the highest natural molasses content and may sometimes even have a slight aroma (www.livestrong.com). In United States there is a large niche market for organic sweeteners. In Japan the organic sugar produced complies with the Japanese Agricultural Standards for organic foods. Currently, organic sugarcane is grown dominantly in Brazil and other countries in Latin America. Several countries like Paraguay, Cuba, Columbia, Brazil etc., had initiated organic sugar production at a commercial level.

The challenges faced in organic sugar production can be many, both at the farm level and mill level. The extent of organic sugar production in many countries will also be largely influenced by the global sugar prices and the fluctuations. The fast deteriorating soil health and its maintenance, the problem of pests and diseases, the problems faced during processing of the cane etc., need to be tackled before the organic sugar production can be successful, in the true sense.

(Courtesy Dr. Swapna M, IISR, Lucknow)

The ISSCT Congress, Chiang Mai, Thailand, 5-8 December, 2016

The ISSCT Congress 2016 in Chiang Mai, Thailand during 5-8 December 2016, aims to gather academics, specialists, and researchers from all over the world to discuss all aspects of sugar cane production and processing over the course of four days. The technical session topics are open to researchers for oral and/or poster presentations to discuss challenges in sugar cane production by small and large farmers, in processing, and from local to global scales.

Important Dates

The important deadlines for presenters are given below

- 31 Mar 2016 Deadline for receipt from authors of manuscripts for oral papers, symposium papers and poster papers
- 30 Jul 2016 Finalized manuscript submission deadline (absolute)

Membership Fee

Individual membership (Congress participants)	USD 140
Corporate membership (exhibition participants)	USD 2,000

Please visit the ISSCT website to register at www.issct.org/member.html

Congress Registration Fee

The Congress registration includes access to all sessions, congress material, morning and afternoon coffee breaks, daily lunches, welcome cocktail, cultural evening, banquet farewell dinner, and transfer from official hotels to Congress venue (and vice versa).

Type	Rate (USD)	Deadline
Early Bird Rate	1,350	Until 31 May 2016
Premium Rate	1,500	1 June to 30 September 2016
Standard Rate	1,700	From 1 October 2016
Onsite Registration	1,900	

Congress registration fee excludes but requires ISSCT Membership

SUGAR INDUSTRY EVENTS AND NEWS

Over 43 million hectares land under organic agriculture worldwide

A total of 43.7 million hectares were organically managed at the end of 2014, representing a growth of almost 0.5 million hectares on the previous survey (2013 data). Australia is the country with the largest organic agricultural area (17.2 million hectares, with 97% of that area used for grazing), followed by Argentina (3.1 million hectares) and the United States of America (2.2 million hectares). 40% of the global organic agricultural land is in Oceania (17.3 million hectares), followed by Europe (27%; 11.6 million hectares) and Latin America (15%; 6.8 million hectares). The market research company Organic Monitor estimates the global market for organic food in 2014 to have reached 80 billion US Dollars (more than 60 billion Euros). The United States is the leading market with 27.1 billion Euros, followed by Germany (7.9 billion Euros), France (4.8 billion Euros), and China (3.7 billion Euros).

Genetically modified sugarcane approved in Indonesia

In 2013 the world's first genetically-modified sugarcane crop was approved for planting. This was a watershed moment in sugarcane biotechnology and appropriately enough it has happened in Indonesia, a region with a distinguished history in developing new cane varieties. Almost a century ago a high-yielding cane called POJ 2878 was released (named after the Proefstatien Oost Java breeding centre) and was soon taken up by the island's planters, dramatically boosting Javanese sugar production.

The variety approved in Indonesia has been developed for drought-resistance, but this trait does not mean that plants can be grown with less water. Assessments of drought-resistant corn in the US showed that it does not offer improvements in water-use efficiency and only provided "modest protection against modest drought". Traditional crop breeding techniques have been much more effective in maintaining yields during dry periods.

Syngenta introduces five new Hilleshög® brand sugar beet varieties

Syngenta will introduce five new Hilleshog® brand sugar beet seed varieties tailored to combat regional pest issues and deliver top genetic performance for the 2016 season. Drawn from a robust genetic portfolio, the new varieties feature improved yield, disease and pest tolerance traits and help enhance stand establishment. New *Rhizoctonia*-tolerant varieties will be offered to growers within the cooperatives of Minn-Dak Farmers Cooperative, and Western Sugar's Northern and Southern regions, where *Rhizoctonia* continues to pose a threat to sugar beet crops. New nematode-tolerant varieties will be offered to growers within the cooperatives of Michigan Sugar Company, and Western Sugar's northern and southern region, where nematodes remain a threat to sugar beet crops.

While Rhizoctonia tolerant varieties are helpful, genetic tolerance generally does not express in young seedlings, so protection during germination and stand establishment is key. Top performing sugar beet varieties need a strong, healthy start to optimize performance. Choosing the right seed treatment is another key to preventing *Rhizoctonia* and other major pests.

UNICA joins global renewable fuels alliance

The Brazilian Sugarcane Industry Association (UNICA) is the largest organization in Brazil representing sugar, ethanol and bioelectricity producers. It was created in 1997, following a consolidation process involving regional organizations in the State of São Paulo after government deregulation of the sugar and ethanol sectors. UNICA members answer for more than 50% of all ethanol produced in Brazil and 60% of overall sugar production. UNICA will work with the other members of GRFA over 44 biofuel producing countries to collectively promote the expanded use of renewable fuels throughout the world and advocate for sound public policy and responsible research.

The Global Renewable Fuels Alliance is a non-profit organization dedicated to promoting biofuel friendly policies internationally. Alliance members now represent over 90% of the global biofuels production from 45 countries. Through the development of new technologies and best practices, Alliance members are committed to producing renewable fuels with the smallest possible footprint.

Transgenic sugarcane resistant to Sorghum mosaic virus based on coat protein gene silencing by RNA interference

As one of the critical diseases of sugarcane, sugarcane mosaic disease can lead to serious decline in stalk yield and sucrose content. It is mainly caused by Potyvirus sugarcane mosaic virus (SCMV) and/or Sorghum mosaic virus (SrMV), with additional differences in viral strains. RNA interference (RNAi) is a novel strategy for producing viral resistant plants. In this study, based on multiple sequence alignment conducted on genomic sequences of different strains and isolates of SrMV, the conserved region of coat protein (CP) genes was selected as the target gene and the interference sequence with size of 423 bp in length was obtained through PCR amplification. The RNAi vector pGII00-HACP with an expression cassette containing both hairpin interference sequence and cp4-epsps herbicide-tolerant gene was transferred to sugarcane cultivar ROC22 via Agrobacterium-mediated transformation. After herbicide screening, PCR molecular identification, and artificial inoculation challenge, anti-SrMV positive transgenic lines were successfully obtained. SrMV resistance rate of the transgenic lines with the interference sequence was 87.5% based on SrMV challenge by artificial inoculation. The genetically modified SrMV-resistant lines of cultivar ROC22 provide resistant germplasm for breeding lines and can also serve as resistant lines having the same genetic background for study of resistance mechanisms.

Quantitative ceiling on organic sugar exports lifted in India

In a move expected to help the cash-starved industry, the Government of India has removed the quantitative ceiling on exports of organic sugar. Earlier, the government had kept a ceiling of 10,000 tonnes on organic sugar exports. The quantity ceiling for export of organic sugar has been removed till the time export of sugar is permitted freely, according to Directorate General of Foreign Trade (DGFT) office. However, it said the export of organic sugar would be permitted subject to registration of quantity with the DGFT and certification by the Agricultural and Processed Food Products Export Development Authority (APEDA).

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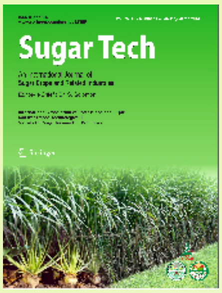

1. **Sugar Tech** - An International Journal of Sugar Crops and related industries, Published bimonthly by Springer.
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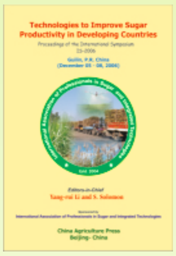
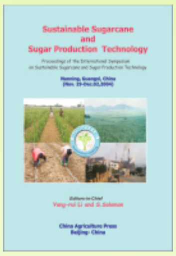
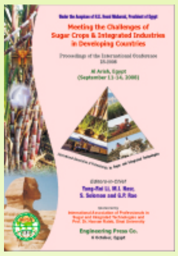


3. **Technologies to Improve Sugar Productivity in Developing Countries** (Eds. : Yang-Rui Li and S. Solomon) China Agriculture Press, Beijing, China, 2006, Price US $ 80.
4. **Meeting the Challenges of Sugar Crops and Integrated Industries in Developing Countries** (Eds. : Yang-Rui Li, M.I. Nasr, S.Solomon and G.P. Rao) Engineering Press Co., Cairo, Egypt. 2008, Price US $ 100.
5. **Balancing Sugar and Energy Production in Developing Countries: Sustainable Technologies and Marketing Strategies** (Eds. Yang-Rui Li, M.K. Srivastava, G.P. Rao, Priyanka Singh, S. Solomon, Army Printing Press, India. Price US $ 125.

BOOKS ON SUGARCANE AND SUGAR INDUSTRY

1. **Sugarcane : Production Management & Agro-Industrial Imperatives:** Eds. S.Solomon, S.S. Grewal, Yang-Rui Li, R.C. Magarey & G.P. Rao. International Book Distribution Co., India, Price US $ 200.00
2. **Sugarcane Crop Production & Improvement:** Eds: S.B. Singh, G.P. Rao, S. Solomon & P. Gopalasundaram, Studium Press LLC, USA 2009 Price US $ 125.00
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Contact :
Dr. S. Solomon
E-mail: presidentis2011@gmail.com; drsolomonsushil1952@gmail.com; secretaryiapsit@gmail.com

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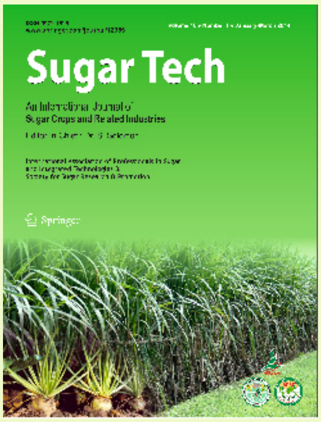

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Editor-in-Chief
Dr. S. Solomon
Indian Institute of Sugarcane Research
Lucknow, India
E-mail: drsolomonsushil1952@gmail.com

Editor-in-Chief
Dr. G.P. Rao
Indian Agricultural Research Institute
New Delhi, India
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Published by : Dr. Yang-Rui Li, President, IAPSIT, Guangxi Academy of Agricultural Sciences, 174 East Daxue Road, Nanning, 530007, P.R.China. **Editor-in-Chief**: Dr. G.P. Rao, India. **Executive Editor**: Dr. S. Solomon, India. **Managing Editor** : Dr. Qi-zhan Tang, China. **Composed at** : Panacea Computers, India. **Printed at** : Nanning, P.R. China.