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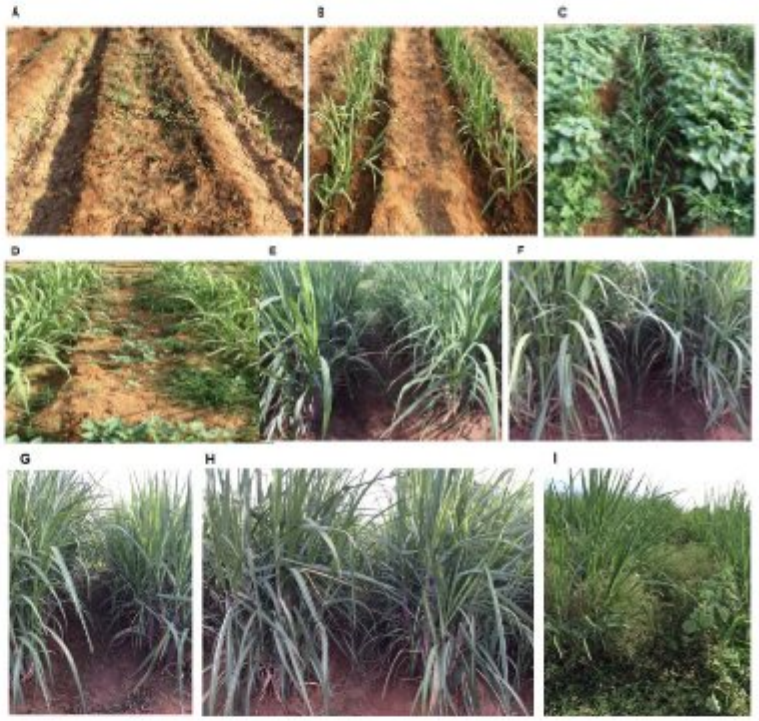
Research Highlights

Integrated Weed Management in Widely Spaced Sugarcane: Experiments reveal efficacy of Sequential and Combined Herbicide Applications

Weeds are among the most serious biotic constraints in sugarcane cultivation, especially during the initial stages of crop growth. The wide row spacing (1.2–1.5 m), slow early growth, and long crop duration (10–12 months) create a favourable environment for the establishment and growth of a diverse weed flora. These weeds compete intensely with sugarcane for moisture, nutrients, sunlight, and space, leading to yield losses of 20–60%, depending on the intensity and duration of infestation. Frequent irrigations and heavy fertilizer applications further aggravate weed problems. Apart from yield reduction, weeds hinder field operations, interfere with mechanical harvesting, and act as alternate hosts for insect pests and pathogens, thus indirectly affecting crop health and quality. Therefore, effective and timely weed management is essential to ensure optimum crop growth, resource-use efficiency, and profitability in sugarcane cultivation.

Weed management in Sugarcane

The weed flora in sugarcane fields is highly diverse, consisting of annuals, perennials, and sedges, varying with region, soil type, and management practices. Weeds in sugarcane can be managed through manual, mechanical, or chemical methods. However, mechanical weeding is generally ineffective in controlling weeds that emerge within the sugarcane rows, as the implements cannot reach these areas without damaging the crop. Manual weeding, though considered the most effective and selective method of weed control, is becoming less preferred among farmers due to the high labour requirement, escalating wages, and non-availability of labourers during the critical period of crop–weed competition. Chemical methods, therefore, have gained wider acceptance owing to their timeliness, cost-effectiveness, and broad-spectrum efficacy. Proper selection, dosage, and timing of herbicide application are crucial to achieve effective weed control while avoiding phytotoxic effects on the crop. However, overreliance on herbicides with a single mode of action has led to shifts in weed flora and the emergence of resistant biotypes.



(A) Field view of sugarcane variety Co 86032 at 15 days after planting (DAP), (B) Effect of early post-emergence application of metribuzin at 45 DAP (at the time of partial earthing up) (C) T8 (unweeded control) at 45 DAP, (D) Weed infestation before application of herbicides at 65 DAP, (E) T1 (Topramezone + atrazine) + hand weeding at 160 DAP, (F) T3 (Tembotrione + atrazine) + hand weeding at 160 DAP, (G) T5 (Halosulfuron methyl + metribuzin) + hand weeding at 160 DAP, (H): T7 Three hand weeding at 160 DAP, (I): T8 Unweeded control at 160 DAP

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Integrated Weed Management (IWM)

Weeds emerge in sugarcane at various stages owing to its long duration in the field and physical disturbances to the soil during cultural operations like earthing up. An integrated weed management (IWM) approach that combines cultural, mechanical, and chemical methods provides a more sustainable solution to manage complex weed flora in sugarcane. Sequential herbicide application—combining pre- and post-emergence treatments—has been proven effective in maintaining low weed density throughout the crop cycle in sugarcane. Recent advances have introduced new-generation herbicides such as topramezone and halosulfuron-methyl, which offer selective and efficient control of grasses, broad-leaved weeds, and sedges in sugarcane. Topramezone, when combined with atrazine, exhibits synergistic action, leading to higher efficacy on mixed weed populations. Likewise, halosulfuron-methyl effectively suppresses Cyperus rotundus and other difficult-to-control sedges in sugarcane.

Sequential and Combined Application of Herbicides

Based on consistent results of two years, it was inferred that severe weed infestation in widely spaced sugarcane plant crop can be effectively managed in an integrated manner by sequential application of early post emergence application of metribuzin at 1250 g a.i. ha-1 at 10 days after planting (DAP) followed by post emergence tank mix application of either topramezone at 29.4 g a.i. ha-1 + atrazine 625 g a.i. ha-1 or halosulfuron methyl 67.5 g a.i. ha-1 + metribuzin 525 g a.i. ha-1 at 65 DAP followed by one hand weeding at 120 DAP. These herbicides at the tested dose did not cause phytotoxicity to sugarcane variety Co 86032. In intercropped sugarcane, effective weed control can be achieved through the sequential application of pre-emergence pendimethalin at 1000 g a.i. ha-1 at 3 days after planting, followed by a post-emergence tank mix application of metribuzin at 1250 g a.i. ha-1+ 2,4-D at 2500 g a.i. ha-1, or alternatively, by performing one hand weeding at 120 DAP.

This approach of weed management in sugarcane significantly reduced the yield loss due to crop-weed competition in tropical Indian conditions. This has proved to be cost-effective in widely spaced sugarcane plant crop with higher weed control efficiency, weed control index, broad spectrum weed control, no phytotoxic effect, in turn improving cane growth and yield. It was also cost-effective, recording a benefit–cost (B:C) ratio of 1.56 compared to 1.52 achieved with three hand weedings. Moreover, it resulted in a 64% reduction in labour requirement and a 43% reduction in labour cost.

Therefore, sugarcane growers are advised to adopt these herbicide combinations in rotation, supplemented with one hand weeding, for efficient, sustainable, and economically viable weed management in sugarcane plant crops under tropical conditions.

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Outreach

Participation in Exhibitions

- ICAR - SBI participated in Agri-Intex 2024 (International Agricultural Exhibition) by way of putting up a stall at CODISSIA Trade Fair Complex in Coimbatore during 11-15 July 2024.
- ICAR-SBI participated in the 'State-level Mega Farmers' Day-2024' organized by Tamil Nadu Agricultural University in Coimbatore during 26-29 September 2024 and received the 'Best Stall Award' during the valedictory function held on 29 September 2024.

Best Exhibition stall recognition for ICAR-SBI in State-level Mega Farmers' Day at TNAU

Trainings/Skill building programmes for Farmers

Empowering Tribal Communities

Tribal awareness cum training campaigns in Dharti Aaba Janjatiya Gram Utkarsh Abhiyan (DAJGUA) villages of Salem District

Under the DAPSTC (Development Action Plan for Scheduled Tribe Component) project ICAR-SBI had adopted five tribal hamlets in Chinnakalrayan Hills – Vadakkunadu (Village code: 634230) and Aladipatti villages (Village code: 634167) in Salem district, identified for implementation of **Dharti Aaba Janjatiya Gram Utkarsh Abhiyan** (DAJGUA), by the Government of India. Details of the training programmes conducted in these hamlets are described hereunder.

- The significance of growing vegetables and millets and including them in the daily diet of indigenous communities was highlighted during the ICAR – Sugarcane Breeding Institute (ICAR-SBI), Coimbatore-organized 'Tribal awareness cum training campaign' among the tribals in Thaloor and Valoothu tribal settlements in Aladipatti panchayat of Salem district on *13 August 2024* as part of implementation of DAPSTC (Development Action Plan for Scheduled Tribe Component) project. Scientists from ICAR-SBI, ICAR-CSWRI and TNAU handled the training sessions. During the campaigns, besides the sessions for knowledge empowerment handled by experts, farm tools, household items, seed kits for setting up nutrition garden, battery operated sprayers, radio sets, vermicompost, daincha seeds etc., were distributed among all the tribal households. Pulverizers along with logbooks were handed over to the tribal hamlets

DAPSTC Training Campaign in Thaloor tribal hamlet

- Empowerment of indigenous communities through millet-entrepreneurship was highlighted during the ICAR – Sugarcane Breeding Institute (ICAR-SBI), Coimbatore- organized 'Tribal awareness cum training campaign' among the tribals in Pallikkadu tribal settlement in Aladipatti panchayat of Salem district on *29 August 2024*. The campaign was conducted as part of DAPSTC project being implemented by the Institute, in collaboration with Tamil Nadu State Rural Livelihood Mission (TNSRLM), Salem. Scientists from ICAR-SBI, ICAR-CIAE, TANUVAS and TNAU handled the training sessions.

DAPSTC Training Campaign in Pallikkadu tribal settlement

Academics

During the period, 34 students completed their 15/21/30 days' Internship programme in various sections of the Institute.

Events Organized

- For the first time in the country, ICAR-SBI organised the ISSCT (International Society of Sugar Cane Technologists) **13th Breeding Germplasm and 10th Molecular Biology Workshop** during July 8-12, 2024 . A total of 82 delegates including 39 Scientists from France, Reunion, Barbados, USA, South Africa, Australia, Thailand, Japan, Brazil, Indonesia, Argentine, Zimbabwe and Fiji participated in the workshop. Dr T.R.Sharma, DDG (CS), ICAR inaugurated the workshop on 08 July 2024. Altogether, 35 Scientists from ICAR-SBI attended the Workshop.

DDG (CS), ICAR speaking at the ISSCT Workshop

Release of ISSCT Workshop Abstracts

- Technical seminar on 'Current challenges in sugarcane agriculture and Mechanization & Machine learning for smart agriculture' was organized on 09 July 2024 at the Institute. Dr.Bakshi Ram, Former Director, ICAR-SBI, Dr.Prasanta Kumar Dash, ADG (CC), ICAR, and Shri.Ashok Kumar (General Manager, Sakthi Sugars Ltd) delivered lead lectures.

- A demonstration on DSMS (Digital Soil Moisture Sensor) and Sugarcane Sett Treatment Device (STD) was organized for 20 farmers of Coimbatore district on 15 July 2024.
- A one- day Brain storming session cum training on 'Sustainable sugarcane farming in subtropical India: the seed prosperity from glorious past to challenging future' was organized at ICAR-SBIRC, Karnal on 24 July 2024 under the chairmanship of Dr.T.R.Sharma, DDG (CS), ICAR. 80 progressive sugarcane farmers, cane officials from Haryana, Punjab, Uttarakhand, UP and scientists participated.

Technology commercialization

- An MoU was signed between ICAR-SBI and Cleantek, Coimbatore, India for commercialization of Sett Treatment Device Technology on 31 July 2024.
- An MoU was signed between ICAR- SBI and EcoBugs, Tamil Nadu for commercialization of EPN bio pesticide formulation technology on 12 September 2024
- An MoU was signed between ICAR-SBI & ICAR-CIAE and Greenfield Equipment India(I) Pvt Ltd for commercialization of 'Small tractor operated EPN applicator' for sugarcane white grub management" on 18 September 2024
- An MoU was signed between ICAR- SBI and E.I.D Parry (India) Limited Sugarcane Research and Development Centre for commercialization of "Cotesia flavipes and Telenomus dignus multiplication technology against internode borer" on 20 September 2024.

Awards and Recognitions

- Dr.D.Puthira Prathap, Principal Scientist, received the **'Tamil Nadu Scientist Award' (TANSA)** of Tamil Nadu State Council for Science and Technology (TNSCST), Government of Tamil Nadu for the year 2021 from the Hon'ble Minister for Higher Education, Govt. of Tamil Nadu on 23 September 2024. The award carries a cash prize of ₹50000 and a citation.
- Dr.P.Murali, PS, received the *SSRP Fellowship Award-2024* (by Society for Sugar Research & Promotion) for outstanding contribution for sugarcane improvement and diversification during 8th IAPSIT Conference 2024 held in Vietnam during September 2024.
- Dr.V.P.Sobhakumari, Principal Scientist, received the *'Fellow of Society for Sugarcane Research & Promotion* (FSSRP-2024) at 8th IAPSIT Conference during 16-19 September 2024.
- Dr.T.Rajula Shanthy, Principal Scientist, received *'Sugar Industry Excellence Award 2024'* for outstanding contribution in rural women empowerment and entrepreneurship during 8th IAPSIT conference during 16-19 September 2024.
- Dr.P.Malathi, PS received the *'Pushpavathi Blessing Garapati Gold Medal Award'* for the best research paper entitled 'Mechanized priming of sugarcane planting materials – An efficient and economical way of delivering agroinputs for healthy nursery and main field crop' during the 53rd Annual convention of SISSTA held at Whitefield, Bengaluru during 19-20 September 2024.

Licensed EPN biopesticide technology to Eco Bugs India Private Limited on 12-09-2024

Media efforts/Other activities

- ***Farm School on AIR:*** ICAR-SBI launched a 'Farm School on All India Radio (FSA)' on 'Sugarcane farming for prosperity' *(வளமான வாழ்விற்கு கரும்பு சாகுபடி)* in Tamil for the benefit of the farmers to gain the latest technical knowledge and information on scientific sugarcane cultivation in collaboration with Akashwani, Coimbatore. Altogether, 119 interested farmers have been enrolled in this Farm School. The school had 13 classes in all, and the first Introductory class was broadcast on 24.7.24. The details are given hereunder.

S.No.	Session	Date of Broadcast
1	Sugarcane Production – an overview' by Dr.G.Hemaprabha (Interview mode)	24.07.24
2	Promising Varieties for Tamil Nadu by Dr. P.Govindaraj	31.07.24
3	Micropropagation in sugarcane by Dr. D.Neelamathi	07.08.24
4	Quality seed production in Sugarcane by Dr. A.Annadurai	21.08.24
5	Cane agronomy by Dr.K.Kannan	28.08.24
6	Irrigation and ratoon management in sugarcane by Dr.P.Geetha	04.09.24
7	Nutrient Management in sugarcane by Dr.C.Palaniswami	11.09.24
8	Mechanization in sugarcane by Dr. T. Arumuganathan	18.09.24
9	Value added products from Sugarcane by Dr. K. Hari	25.09.24

Farm School on All India Radio

- Newly constructed 48 Micro-plots with Rainout Shelter at ICAR-SBIRC, Karnal under RKVY project, was inaugurated by Dr. T.R. Sharma, DDG (Crop Science), ICAR, New Delhi on 24 July 2024.
- The 30th meeting of RAC (Research Advisory Committee) of ICAR- SBI, Coimbatore for the year 2023-24 was held at ICAR-SBI, Regional Centre, Karnal on 25 July 2024.
- Sir.T S Venkataraman *Sumadhuram* Hall with a seating capacity of 250 persons was inaugurated by Dr. Himanshu Pathak, Secretary, DARE and Director General of ICAR at the institute on 11 July 2024.

DG, ICAR inaugurating the Sir T S Venkataraman Sumadhuram hall

Sir T S Venkataraman Sumadhuram Hall

- A feature on the success/impact of DAPSTC project was published by Dinamalar, a popular Tamil daily on 23.9.2024 (https://www.dinamalar.com/news/premium-news/mountain-residence-without-electricity--pudupolivu-now-by-central-government-scheme-/3739671)


DINAMALAR
National Tamil Daily
மின்சாரமே பார்க்காத மலைவாழ் குடியிருப்பு!

Impact of DAPSTC project carried by Dinamalar daily

- A video feature on DAPSTC 'Impact evaluation' was published in Dinamalar YouTube channel (https://www.youtube.com/watch?v=mmEtodjl_mo)
- A video feature on DAPSTC project was published in News18 news channel (https://tamil.news18.com/coimbatore/sugarcane-breeding-institute-providing-basic-needs-to-malasar-tribe-people-living-in-forest-rkj-mkn-local18-1619382.html)
- The country's 78th Independence Day was celebrated on 15 August 2024.

Director, ICAR-SBI addressing the staff during the Independence Day celebrations

- An online lecture on "Applying Copyright for Publications" was delivered by Dr. Anupam Barh, Scientist, ICAR-IISWC on 29 August 2024 at the Institute.
- ICAR-SBI participated (11 scientists and four progressive farmers) in the Online Stakeholder's Consultation Meet with the theme" Transforming Agriculture Research (TAR)-Enhancing role of private sector" on 03 September 2024
- On the occasion of World Environment Day 2024, all staff of the Institute participated in the Global Campaign #Plant4Mother and planted trees on 11 September 2024.
- ICAR-SBI observed *'Swachhta Hi Sewa'* campaign from the second fortnight of September 2024 to 02 October 2024. As a part of the campaign, 'Swachhta Walk by the Lake' was conducted for all staff of the institute on 16 September 2024 and a drawing competition on the theme 'Clean India Green India' was organized for the children of the staff on 18 September 2024.
- Impact evaluation of 'DAPSTC' project and an awareness campaign was conducted at Nagaroothu-1 tribal hamlet of Anamalai Tiger Reserve on 20.09.2024.

Promotion/Transfer/Retirement

- Smt.V.P.Rabisha, Senior Technical Assistant relieved on her transfer to ICAR-Indian Institute of Spices Research, Kozhikode on 02.07.2024 (AN)
- Smt. Kratika Sharma, Assistant Promoted as Assistant Finance and Accounts Officer w.e.f 22.08.2024(FN)
- Smt.R.Lakshmi, Skilled Support Staff, retired on Superannuation on 31.07.2024 (AN).
- Smt.R.Easwari, Skilled Support Staff, retired on Superannuation on 30.09.2024 (AN).
- Sh.R.Jogappan, Skilled Support Staff retired on superannuation on 30.06.2024.

Visit of Dignitaries

- Dr.Himanshu Pathak, Secretary – DARE & Director General-ICAR, New Delhi, visited the Institute on 11 July 2024.
- Dr.T.R.Sharma, DDG (CS), ICAR, New Delhi visited ICAR-SBIRC, Karnal on 24 July 2024.
- Shri.Jagganath Sami, Fiji High Commissioner of India visited the Institute on 12 August 2024.

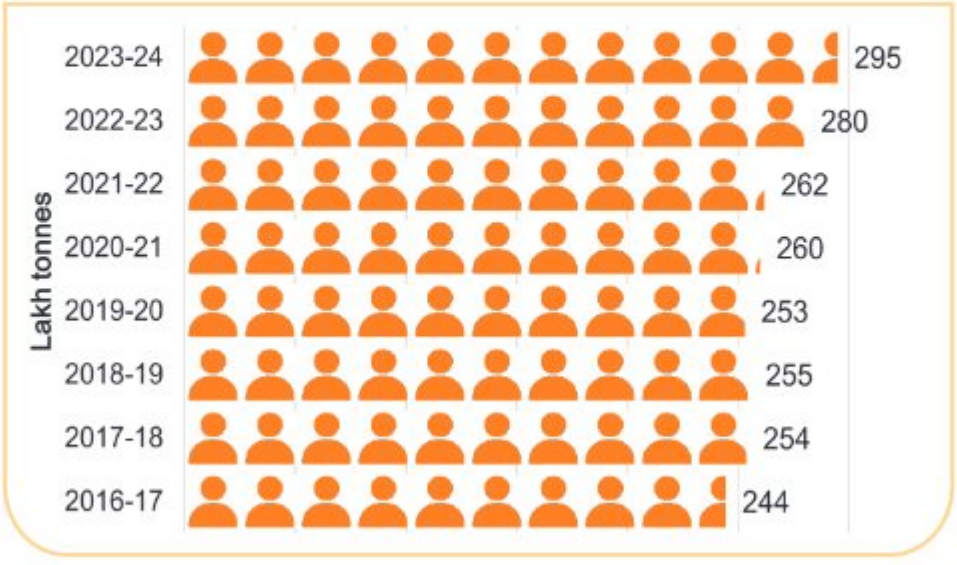
Fiji High Commissioner of India at ICAR-SBI

- Dr. Trilochan Mohapatra, Chairman, PPVFRA (Protection of Plant Varieties and Farmers' Rights Authority), Govt. of India, New Delhi visited ICAR-SBI on 09 September 2024

Sugar Consumption and Export Scenario

Consumption

Traditionally, India has been a consumer of gur (jaggery) and khandasari sugar. However, it was changed during later years due to availability of white sugar and its derivatives at cheaper prices. Despite the fluctuations in production, the consumption of sugar in India has shown a consistent and upward trend. Consumption has been steadily growing from 244.48 lakh tonnes in 2016-17 to 295 lakh tonnes in 2023-24, reflecting expanding population and stable demand in food and beverage sector.



Sugar Consumption in India

Export

Export of sugar has varied widely depending on surplus sugar production and Government EXIM policies. Export surged during surplus years such as 2020-21 and 2021-22, transforming India into a major global exporter. However, the export had dip due to domestic demand and production decline. In 2024-25, India is expected to export around 8 lakh tonnes of sugar, mainly to African countries, under a strict quota system.

It is expected that the sugar trade will progress in the coming years mainly depending on excess sugar production over consumption in the domestic markets in India

P. Murali, P. Jagadeshwaran and D Puthira Prathap

Sugar export from India

Heritage Corner

Sugarcane Ground Nursery at ICAR - Sugarcane Breeding Institute - 96 years ago!

First Ground Nursery (Season 1928 with 200,000 seedlings, mostly hybrids at the Imperial Sugarcane Breeding Station (as ICAR-SBI was known then), Coimbatore

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