

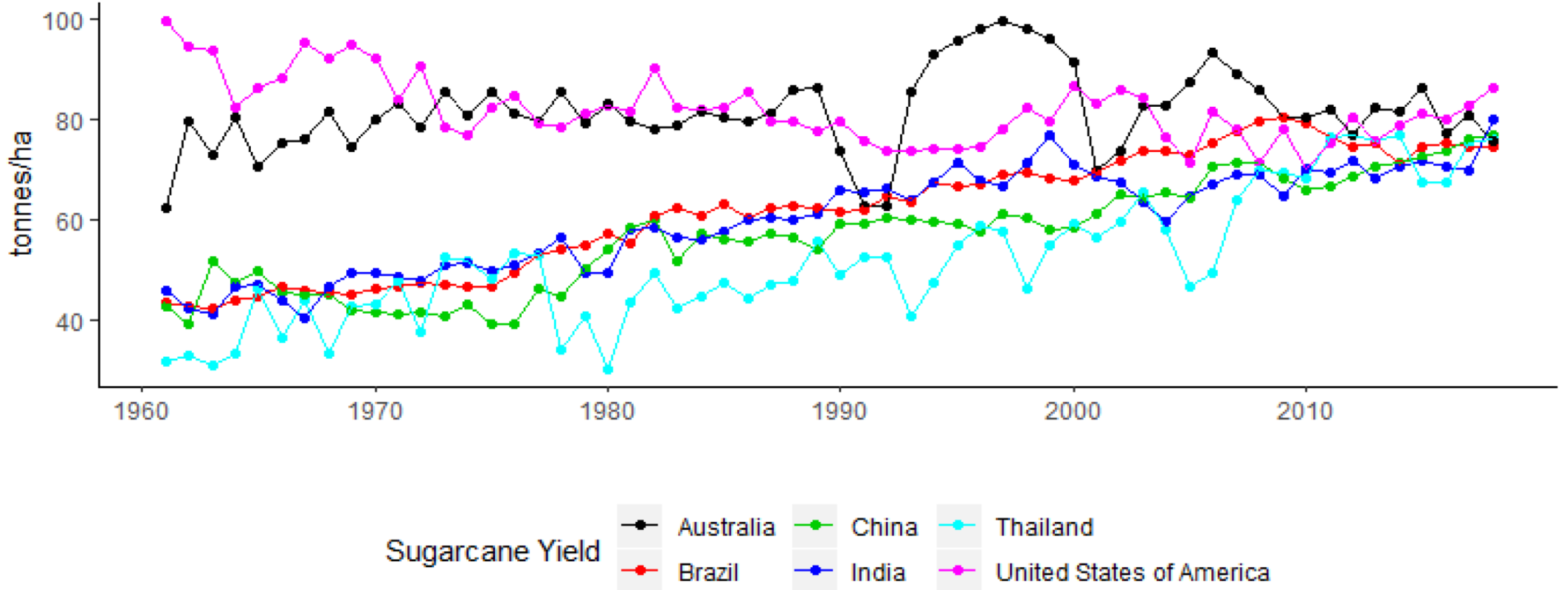
# Scope and prospects of resilient sugarcane farming technologies

G. HEMAPRABHA

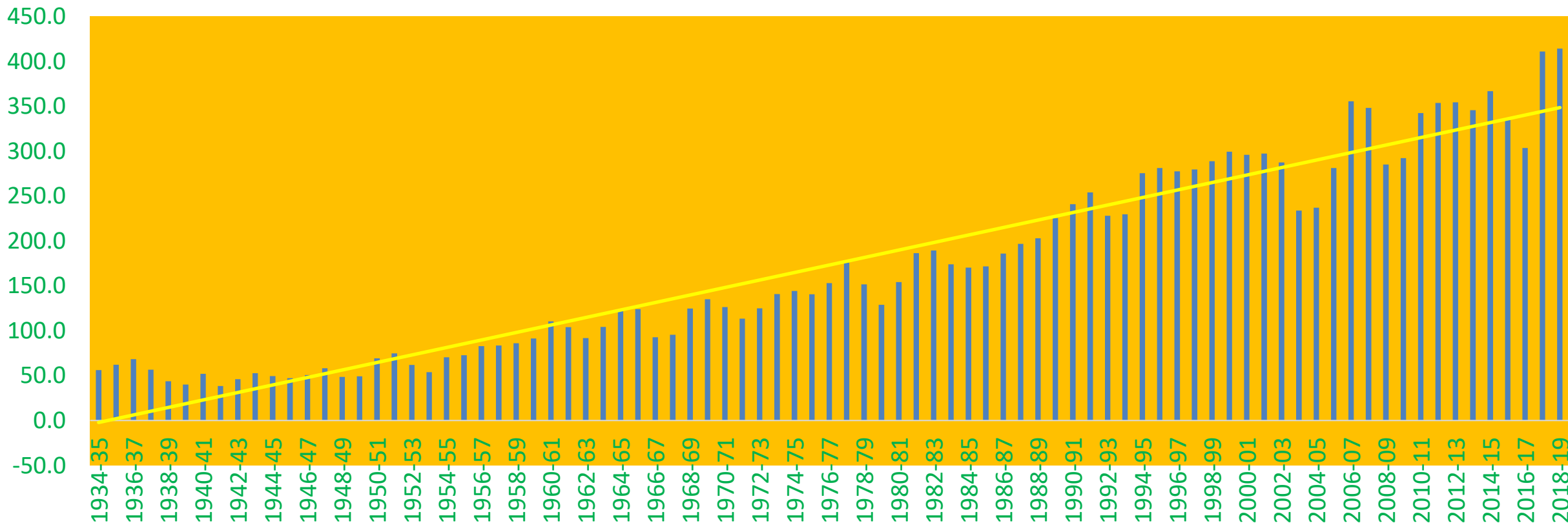
**DIRECTOR (A)**  
**ICAR SUGARCANE BREEDING INSTITUTE,**  
**COIMBATORE**



# Global picture on sugarcane productivity over years



# Trend in sugarcane production in India 1934-35- 2018-19



Source: Indian Sugar, 2020

**Increase during 1934-2019**

- Area : **four times** (1.46 Mha to 5.36 mha)
- Sugarcane production : **seven times** 56.2 m tonnes to 414.2 m tonnes
- Sugarcane productivity : **2 folds** from 37.9 t/ha during 1934-35 to 75.3 t/ha

# ROLE OF ICAR SBI IN NATIONAL AND INTERNATIONAL SUGAR SCENARIO

INDIA: Sugar export (lakh tonnes)

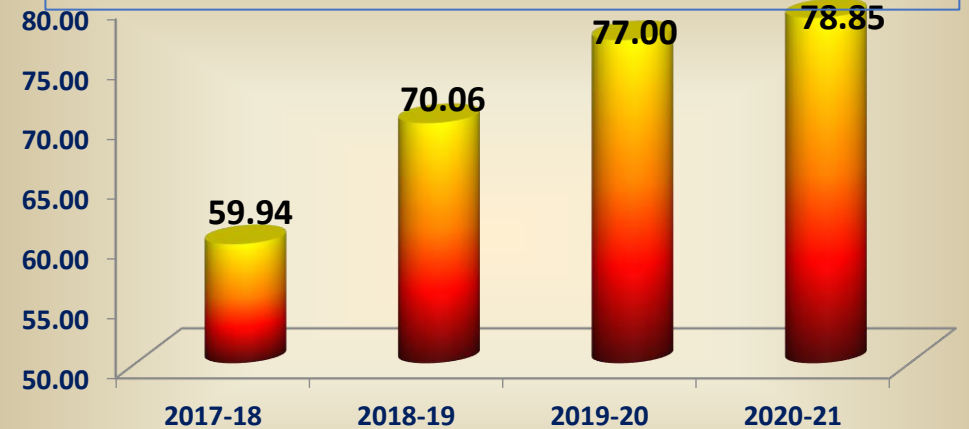
2016-17	0.46
2017-18	6.32
2018-19	38.00
2019-20	59.40 (worth Rs 13,910 cr)
2020-21	75.06

## Fuel Ethanol

India is likely to produce 3300 million liters  
2900 million litres from sugarcane and its byproducts.

© Maksud - stock.adobe.com

## Area Covered by Co Varieties in India



Total Co varieties (%)

Co and Co-allied varieties: >98%

- First variety developed in 1918 brought in a **sugar revolution**
- 3370 Co varieties developed
- About 200 varieties became commercially successful
- 25 varieties cultivated in 28 countries**
- SBI supports National Sugarcane development through facilitating hybridization in the National facility for 24 research stations in the country  
(>99% area with Co and Co allied varieties)

# Co 0238 - The Pride of ICAR SBI



- Cane revolution in India may be synonymized with Co 0238
- Occupies 84.2% of area under sugarcane in the subtropics and 53.4% in the country during 2020-21
- Increased the sugar recovery from 9.18% in 2013-14 to 11.73% in 2019-20 in UP.
- Increased the productivity of sugarcane from just 60 t/ha in 2013-14 to 79.7 t/ha in 2019-20 in the subtropics
- The decade 2011-2020 may be named as the "Decade of sweet Revolution"

Released for North West Zone, Covered subtropical India

## Impact of variety Co 0238 at sub tropical India

Particulars	UP	Ukhand	Bihar	Punjab	Haryana
Additional yield gain (t/ha)	20.3	15.1	9.3	8.6	11.0
Additional sugar recovery improvement (% of cane)	212	217	203	0.71	1.01
Income improvement (Rs./ha)	62,961	45,300	26,040	27,456	34,100

## The pride of ICAR SBI –SUGAR REVOLUTION

Achieved surplus sugar production

Led to a policy decision of GOI, permitting production of Ethanol from sugarcane juice and B Heavy molasses.

For 10% blending in 2022 and

20% blending with petrol by 2025

### Resilient variety

**Drought tolerant, growing well in peak summer**

**Cold tolerant, winter sprouting potential**

**Disease resistance- red rot disease resistance**

**R to major pests and diseases**

**(except top borer)**

**Continuous growth throughout the year**

**Average Yield /productivity increased from 60 t/ha to 81.98 t/ha**

**Lakhs of Farmers doubled their income**



# Co 86032 dominates the tropical region

Region	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Total Area-Tropical (lakh ha)	17.65	18.40	19.46	17.72	18.79	14.31
<b>% Co cane Area Tropical</b>	<b>62.15</b>	<b>49.45</b>	<b>56.95</b>	<b>59.81</b>	<b>55.57</b>	<b>52.50</b>

## Characteristics

- ➔ **High yield**
- ➔ **High quality for a long period**
- ➔ **Responds to normal cultural practices**
- ➔ **Good ratooner**
- ➔ **Suitable for wide row spacing & mechanical harvesting**
- ➔ **Moderately Resistant to smut**
- ➔ **Moderately Resistant to wilt**
- ➔ **Field tolerance to red rot**
- ➔ **Increased recovery by 0.40 to 1.50 %**
- ➔ **Average sugar yield – 17.5 to 25 t/ha**

Predominated By Co 86032: 8.5 lakhs to 12.5 lakh ha



# Varieties notified with climate resilience during the past 5 years

## Peninsular Zone

- Co 09004 (Amritha)
- Co 10026 (Upahar)
- Co 12009 (Sankalp)
- **Co 13013 (Akshaya)**

## TN

- Co 0212
- Co 06022
- **Co 11015**

## NWZ

- Co 06034
- Co 09022
- Co 12029





## India's National sugarcane improvement programme-through hybridization at Coimbatore

Participated by 24 research stations across the country since 1972.



the National Crossing facility

A unique facility for all breeding stations to effect location specific breeding programmes  
Quantity fluff supplied to 24 centres.

# Germplasm resources



## GENETIC RESOURCES (3368)

- Exploration and collection of *Saccharum* and related genera
  - Maintenance
    - Evaluation
      - Documentation
        - Cataloguing

### International Collection : 1806

*S. officinarum*: 759

*S. barberi* : 42

*S. sinense*: 30

*S. robustum*: 145

*S. spontaneum*: 67

Foreign hybrids : 611

Allied genera : 152

### Indian Collection: 1562

Indian hybrids : 1027

Allied genera: 88

*S. spontaneum*: 317

IA Clones : 30

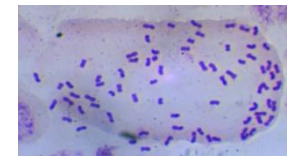


## b) Available genetic stocks:

### Maintenance at Coimbatore

S. No.	Category	No. of accessions	S. No.	Category	No. of accessions
1	<i>Saccharum spontaneum</i>	1451	1	<i>Saccharum spontaneum</i>	47
2	<i>Erianthus arundinaceus</i>	214	2	<i>Erianthus procerus</i>	6
3	<i>Erianthus</i> spp.	168	3	<i>Erianthus fulvus</i>	1
4	Allied genera	59	4	Miscanthus spp.	2
5	Improved <i>Erianthus</i>	48		<b>Total</b>	<b>56</b>
6	Other <i>Saccharum</i> clones	22			
	<b>Total</b>	<b>1962</b>			

Basic species



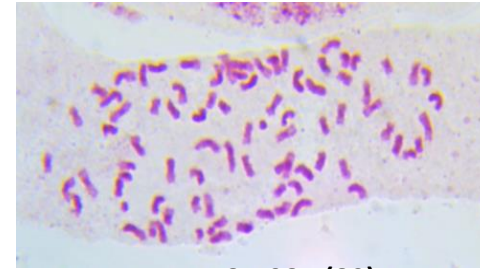
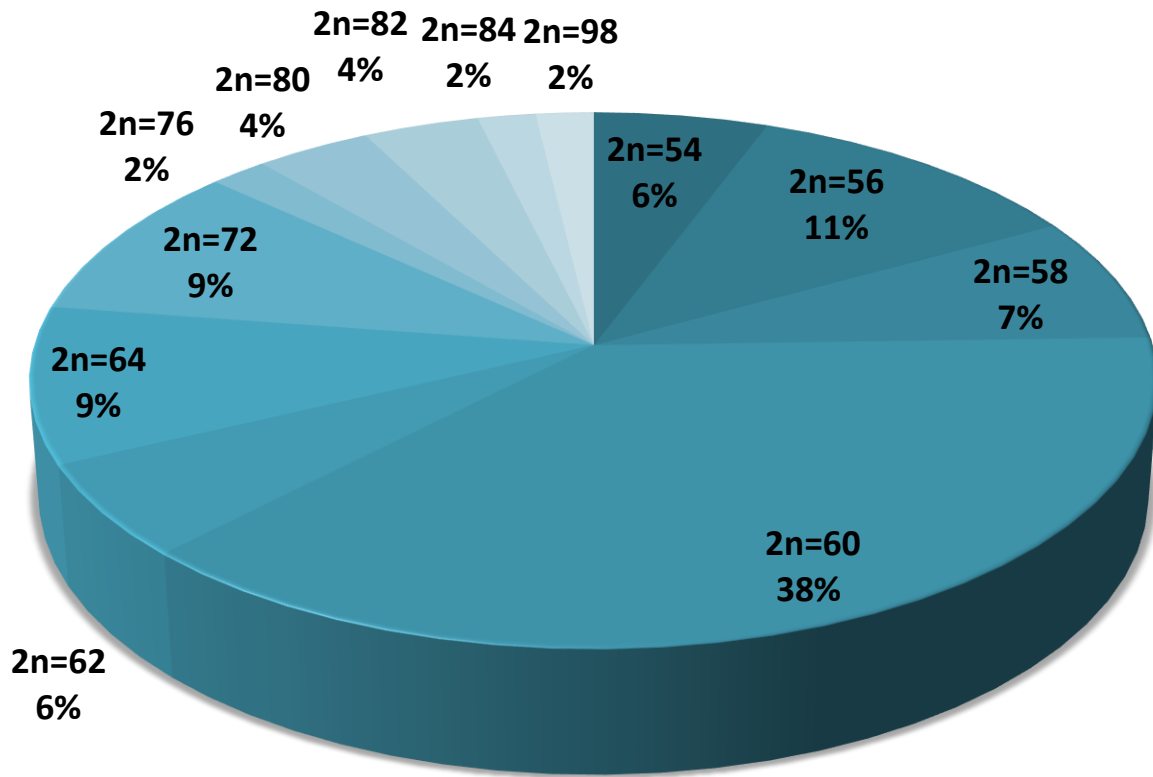
S. No.	Particulars	No. of clones	S. No.	Particulars	No. of clones
1	Co canes	1259	6	PL clones	64
2	Co allied	21	7	ISH clones	289
3	Exotic clones	36	8	IGH clones	39
4	IG derivatives	13	9	Other genetic stocks	95
5	IA clones	13		<b>Total</b>	<b>1734</b>

Interspecific and intergeneric hybrids

## Genetic stocks registered with ICAR NBPGR for Enhanced abiotic stress tolerance

S. No.	Donor identity	INGR No.	Year	Pedigree	Novel unique features
1	Co 13001	INGR20068	2020	Co 740 x CoT 8201	High sucrose at 240 days. Sucrose % 19.40.
2	Co 14016	INGR20069	2020	Co 86032 X Co 86011	High cane population (number of millable canes 1,07,670/ha). Donor for ratoonability.
3	Co 13003	INGR21068	2021	Co 86011 x CoT 8201	High fibre (15.05%) in cane combining high sucrose (19.77%) content of commercial level.
4	AS 04-2097	INGR20070	2020	Co 8371 x SH 216	Drought tolerance. Interspecific hybrid with broadened genetic base.
5	CYM 08-922	INGR20071	2020	CYM 07-971 X CoC 671	Potential pre-bred material for drought tolerance.
6	AS 04-1687	INGR20110	2020	BO 102 x IND 84-337	Drought tolerance. Water logging tolerance.
7	BM 1010-168	INGR20111	2020	Co 98010 x (Co 1148 x SES 404)	Drought tolerance. High relative water content under drought.
8	GU 07-2276	INGR21067	2021	GU 04 (50) RE-9 x CoH 70	High cane yield (89.66 t/ha) under drought condition. High Nitrogen use efficiency (77.92 kg of dry biomass/kg of nitrogen)

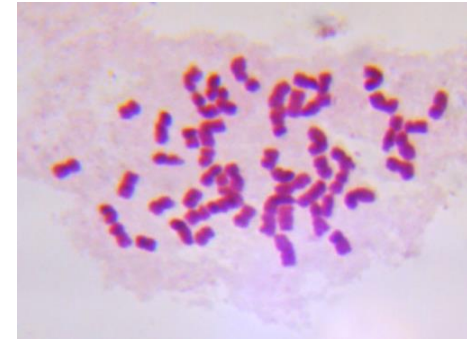
# *S. spontaneum* accessions



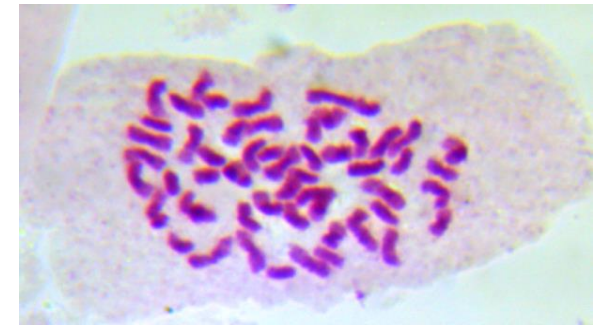
IND 18-1987 (80)



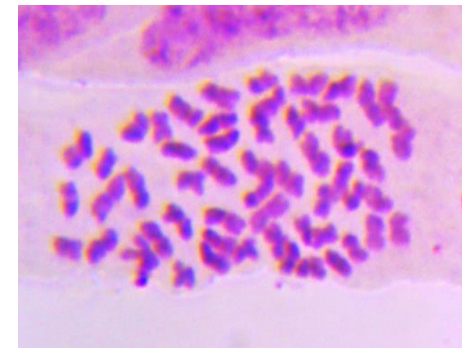
IND 18-1941 (72)



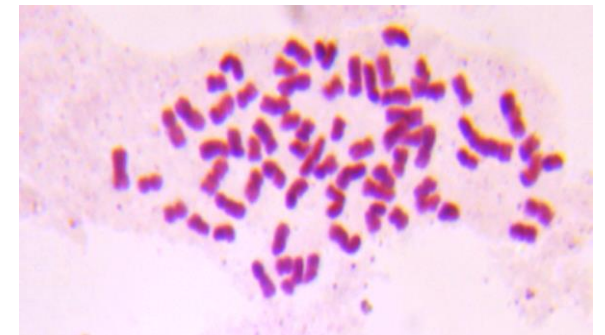
IND 18-1964 (56)



IND 18-1971 (56)



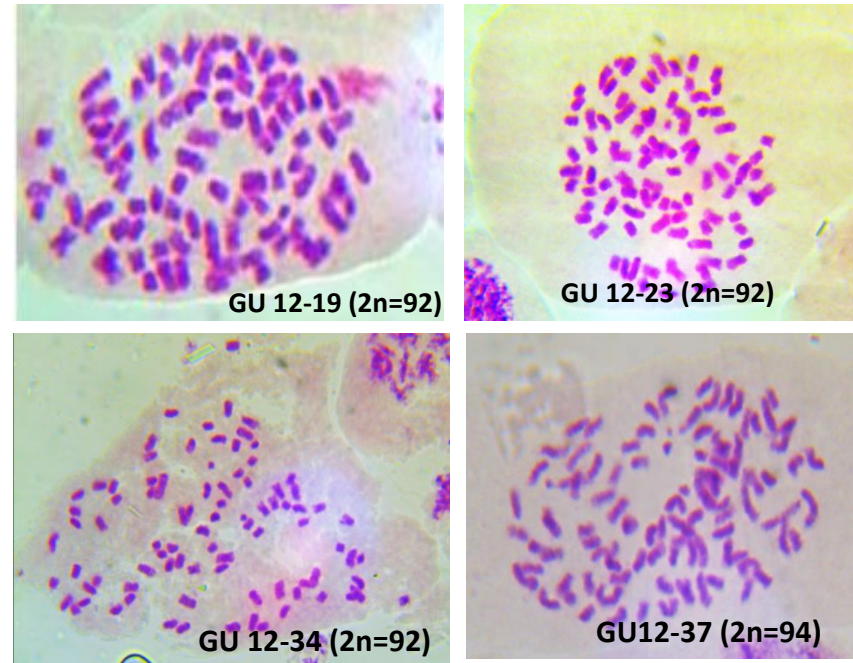
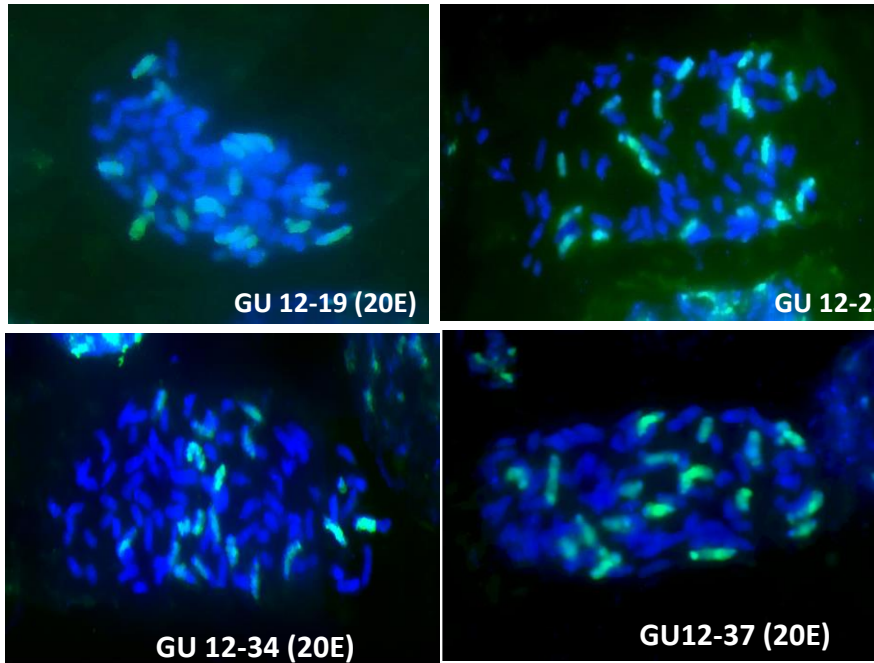
IND 18-1978 (54)



IND 18-1968 (72)

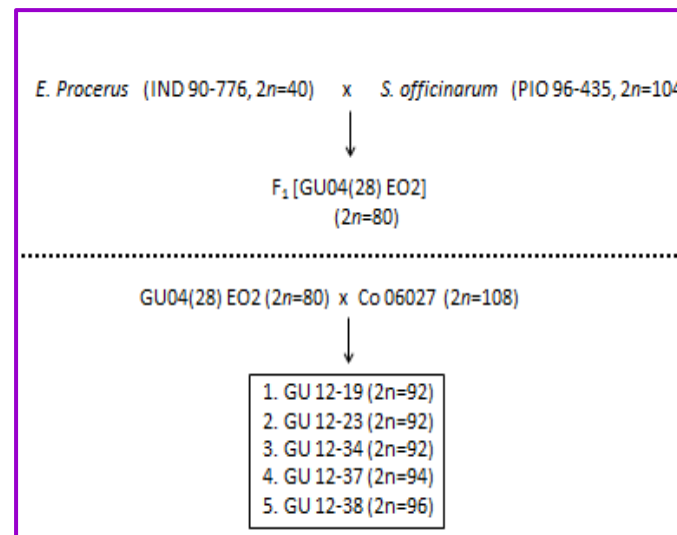
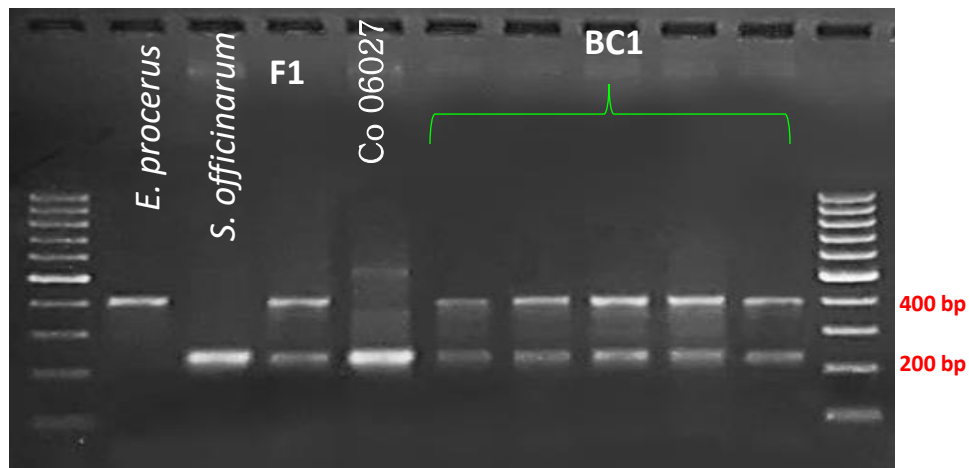
# Analysis of BC1 progenies of *E. procerus* x *Saccharum*

GISH



Mitosis

## 5SrDNA amplification



# Farmers' Participatory seed production- COIMBATORE

Average seed cane yields obtained by the seed farmers at 6-7 months against state average cane yield of 12 months

Year	Area (ha)	Quantity of seed supplied(t)	Cane yield (t/ha)	State Mean (t/ha)	Addition al seed produced (t)	Additional earning (Rs)	Additional earning/ha (Rs)
2016-17	7.17	799.72	111.54	87.10	437.49	13,12,476	1,83,051
2017-18	12.14	1221.32	100.63	92.02	261.23	7,83,690	64,554
2018-19	18.09	2147.95	118.75	98.24	927.46	27,82,380	1,53,808
2019-20	10.98	1188.99	108.33	98.24	276.87	8,30,609	75,647
Total / Average	48.38	5,357.98	110.75	93.90	1,903.05	57,09,155	1,18,007

5,357.98 t of quality seeds supplied during 4 years (2016-17 to 2019-20)

Seed demand from sugar mills and farmers of Tamil Nadu was met .

The importance of quality seeds, including rejuvenation of Co 86032 was emphasized to Commissioner of Sugar, TN

Resulted in introduction of a subsidy programme on quality seed under NADP/RKVY, with the active coordination by the ICAR-Sugarcane Breeding Institute, Coimbatore,

Implemented from 2018-19 season onwards.



# SBI RC KARNAL: Variety wise seed sale in quintals

Year														
	Co 98014	Co 0118	Co 0238	Co 0239	Co 0124	Co 0237	Co 05011	Co 05009	Co 06034	Co 09022	Co 12029	Co 13035	Co 15023	Total (q)
2007-08	444	429.4	704.19	470.95	438.76									2421.7
2008-09	611.4	494.95	783.85	539.05	65.55	82.25								2529.2
2009-10	559.3	589.3	1475.75	180.1		155.05								2784.1
2010-11	116.82	836.57	1475.41	291	47.3									2704.8
2011-12	123.7	284.9	977.4	702.3	28.2	45.8	78.7							2181.0
2012-13	153.8	942.3	611.4		118.9	60.4	290.3	40						2217.1
2013-14	147.8	1015.3	896.9		55.8	40	834.08	25.1						3014.3
2014-15	120.3	451.1	850		66.4	85.75	1667.65	204.1	62.2					3507.5
2015-16	47.6	1466.1	696		24.2	35.8	1793.02	57.55	125.8					4246.1
2016-17	8.4	1395.19	844.95		224.21	64.04	1120.74	2.4	106.3					3766.2
2017-18	6.1	4742.27	6969.78			10.55	181.52			55.2				11965.4
2018-19	7.15	10888.8	5722.65		1.1	2.3	13		1.18	8.4	279.69			16924.3
2019-20	0.09	6046.71	27741.3								529.92			34318.0
2020-21		9371.52	21332.4								480.75	27.86	4624.4	35837.0
<b>Total</b>	<b>2346.5</b>	<b>38954.4</b>	<b>71082.0</b>	<b>2183.4</b>	<b>1070.4</b>	<b>581.94</b>	<b>5979.01</b>	<b>329.15</b>	<b>295.48</b>	<b>63.6</b>	<b>1290.4</b>	<b>27.86</b>	<b>4624.4</b>	<b>128416.7</b>





# Management of YLD in sugarcane through healthy seed nursery programme

Effectively managed varietal degeneration due to YLD epidemics in the popular cv Co 86032 **through healthy seed nursery programme**

Virus indexing service was provided to the private tissue culture production units to produce and supply healthy planting materials.

Year	No of batch samples tested	Testing cost generated in Rupees
2015-16	274	1,08,400
2016-17	330	1,17,200
2017-18	843	3,21,000
2018-19	1339	5,17,200
2019-20	2427	6,12,800
Total	5213	16,76,600



Severely degenerated sugarcane cv Co 86032 due to ScYLV and other viruses



Demonstration of varietal rejuvenation programme of Co 86032 in Kallipatti village in Sakthi Sugars area, Appakudal, Tamil Nadu. The virus-free canes maintained a vigorous and healthy canes amidst disease affected fields in the area.



Record of 100 tonnes per acre of sugarcane by planting YLD-free planting materials cv Co 86032 (Vellode village, Erode Dt, 2016)

## TISSUE CULTURE + Virus indexing for viruses and phytoplasma

- **Virus indexing was started from 2008 at the institute with the recognition of Plant Pathology lab as accredited test lab (ATL) by the DBT, New Delhi.**
- **From 2014 onwards the service is done as part of institute's service.**
- **Three major RNA viruses viz *Sugarcane yellow leaf virus* (SCYLV) causing yellow leaf disease and *Sugarcane mosaic virus* (SCMV) and *Sugarcane streak mosaic virus* (SCSMV) causing mosaic and grassy shoot phytoplasmas are indexed following RT-PCR and PCR assays.**
- **The integration of virus indexing resulted in restoration of the lost vigour in sugarcane varieties due to varietal degeneration caused by systemic infection of non-fungal pathogens.**
- **A total of 6,934 samples of mother clones/ *in vitro* stock cultures were indexed during 2009-2020**

# Management of white grub with Entomopathogenic fungi

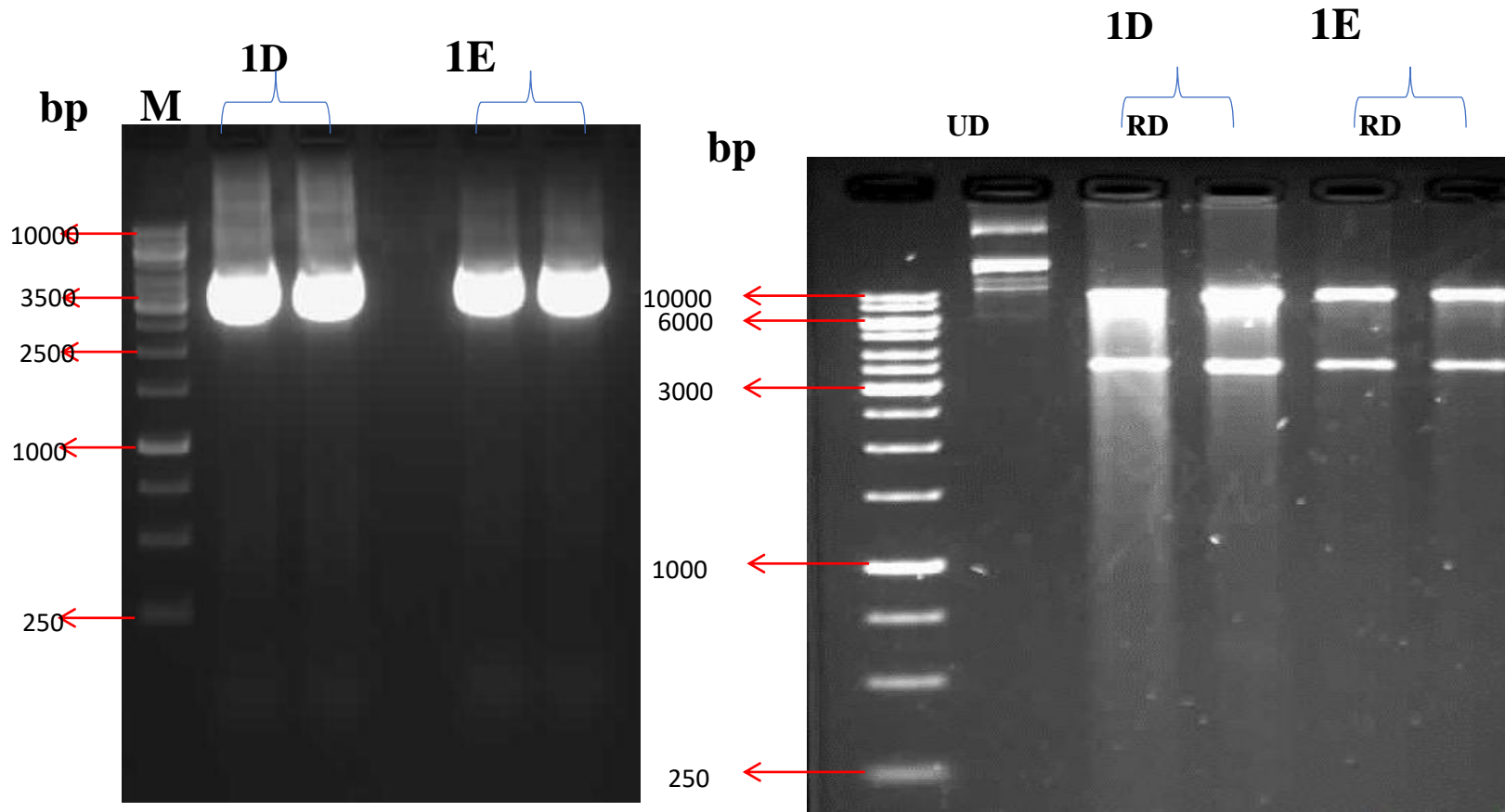
Treatments	Grubs/m			
	Pretreatment*	Post treatment	% reduction pretreatment	% reduction over control
<i>M. anisopliae</i>	6.75	0.75a	88.06b	76.92
<i>B. brongniartii</i>	6.75	1.0a	84.97b	69.23
<i>Ma + B. br</i>	7.00	0.25a	95.83b	92.31
Im+Fi	7.25	0.25a	96.43b	92.31
Control	7.0	3.25b	52.08a	

In field trial at Bannariamman sugars, Sathyamangalam with *M. anisopliae* + *B. brongniartii* and/or *Lesenta* against white grub, the reduction of grub ranged from 69.2% (*B. brongniartii*) to 92.3% (*M. anisopliae* + *B. brongniartii* or *Lesenta*).

*Beauveria brongniartii* and *M. anisopliae* could be recovered from the soil samples retrieved



# Cloning and expression studies with novel *cry* toxin genes from *Bt* isolate SBI KK27



*cry1D* and *cry1E* amplification

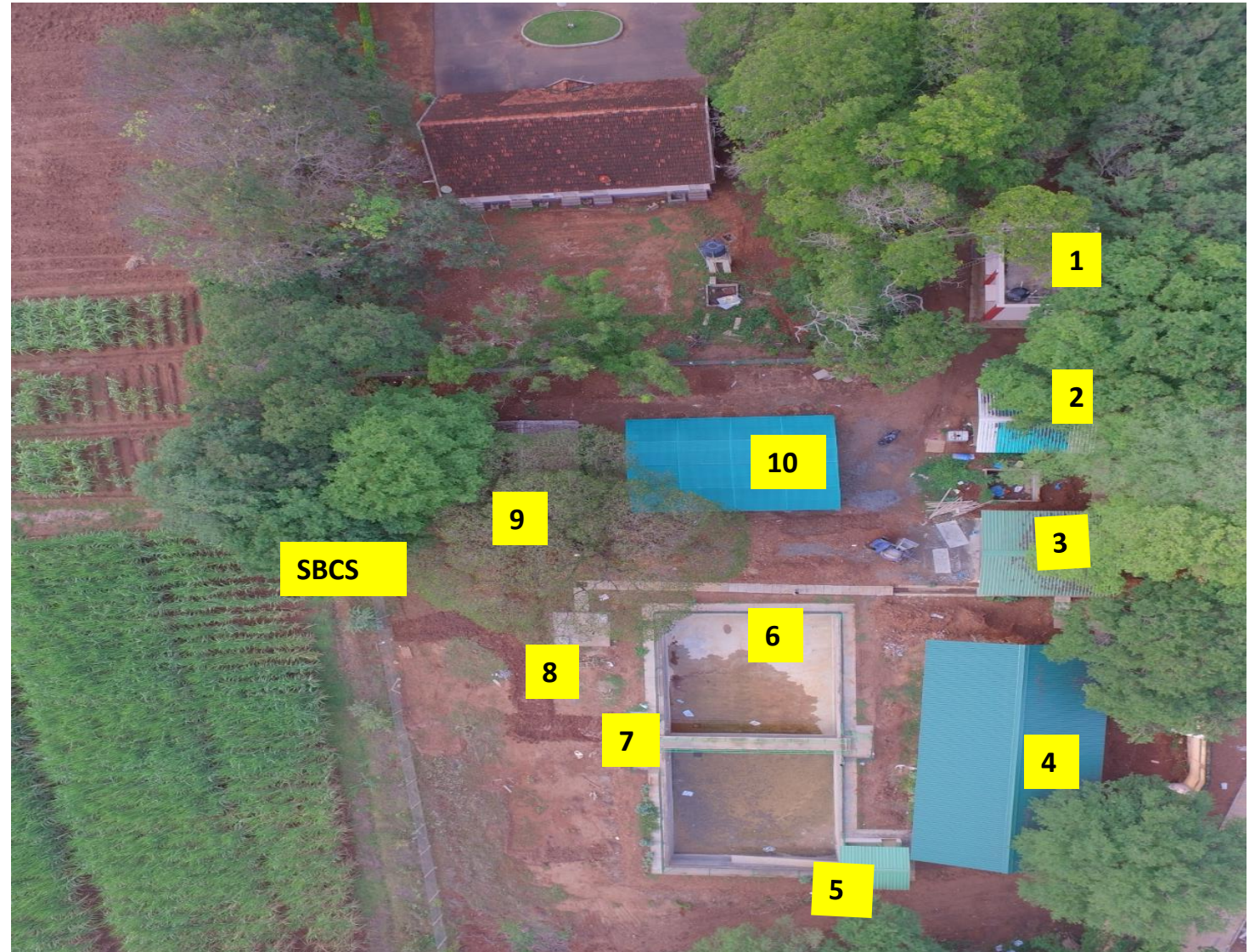
Confirmation of the recombinant plasmids through restriction digestion

From the *Bt* isolate SBI-KK 27, which has 7 toxin genes, two novel *cry1* genes viz *cry1D* and *cry1E* were cloned in acrySTALLIFEROUS *Bt* HD73- isolate.

# Established of sugarcane based farming system (SBCS) model with various components

## Sugarcane Based Cropping System

1. Farm House
2. Goat Unit
3. Dairy Unit
4. Vermicompost Unit
5. Duck Unit
6. Poultry Unit
7. Fishery Unit
8. Integrated waste Mgt
9. Mushroom Unit
10. Settling Production Unit
11. SBCS (organic farming)



# Best management practices for profit maximization in sugarcane agriculture



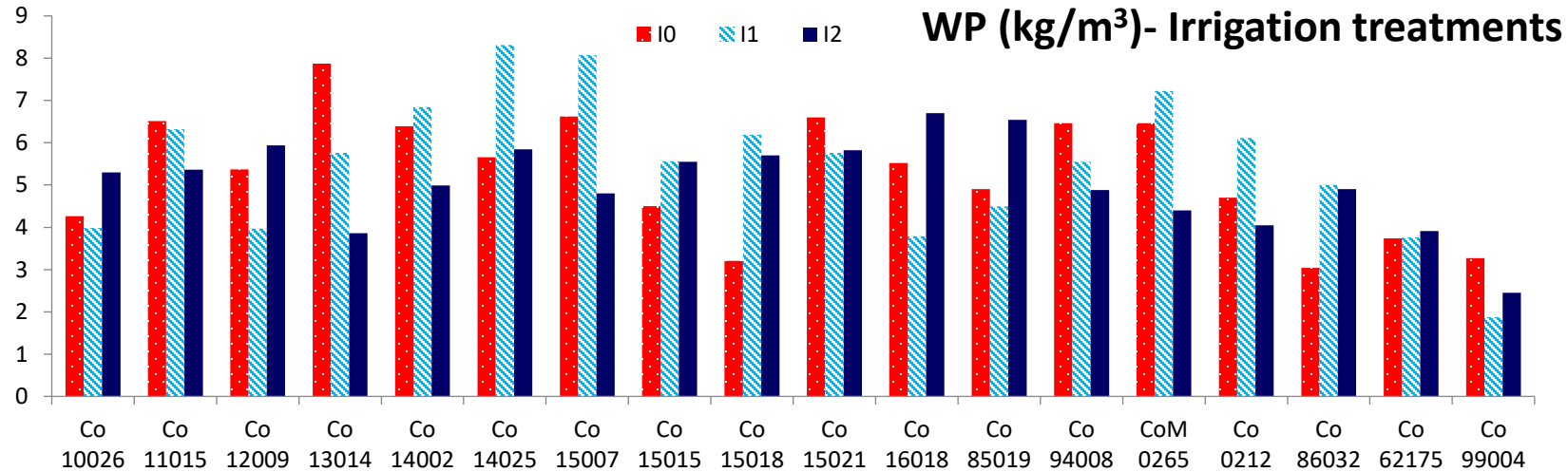
**Ratoon V as on 12 Sep 2021**

## **A combination of technologies**

- High yielding better quality genotype
- Single-bud settling transplantation,
- Wide-row planting,
- Intercropping with black gram,
- Drip irrigation based on Evaporation demand and crop co-efficient,
- Fertigation based on Soil Test Crop Response approach
- Multiple ratooning
- Trash mulching
- Mechanization for profit maximization

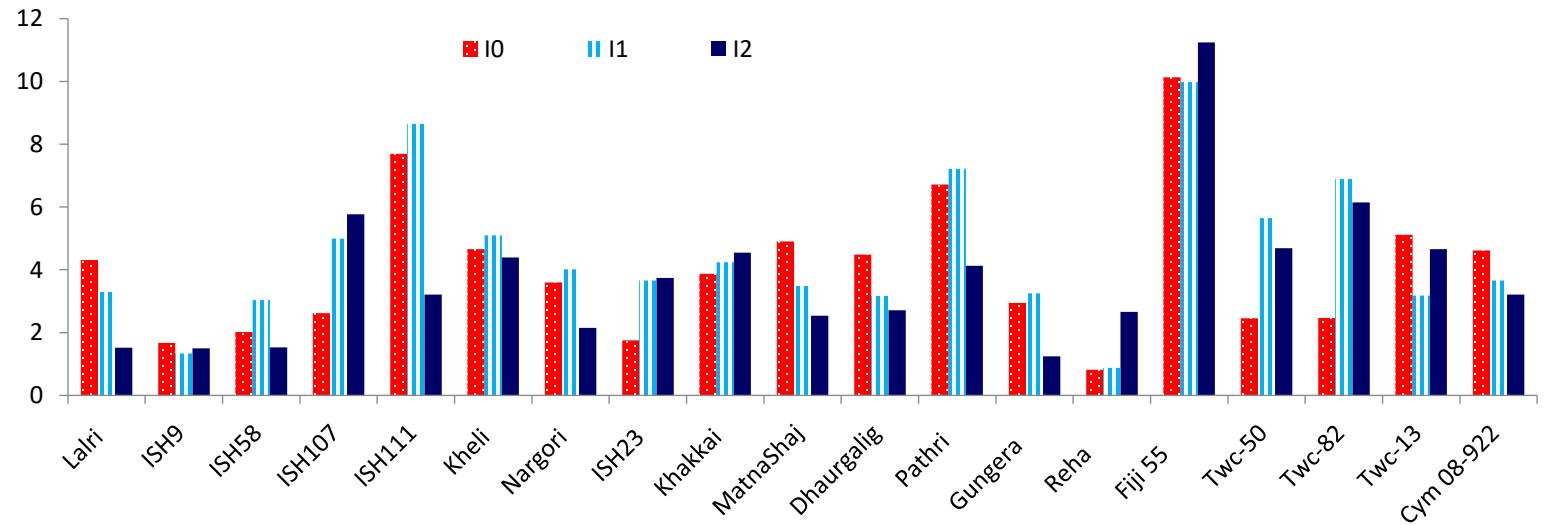
- Residual effect of intercropping on soil organic carbon (SOC) after three seasons (1 Plant + 2 ratoons) showed that ridges (0.78%) had higher SOC than the furrows (0.57%) (n=30).
- Among intercrops, black gram intercropping (0.74%) showed higher SOC than others.

# Evaluation of physiological efficiency of commercial hybrids and species clones of *Saccharum* for water use under water limited conditions



Co 62175, Co 85019,  
Co 86249, Co 94008,  
Co 0212, Co 99004,  
Co 86010, Co 10026,  
Co 12009, Co 14002,  
Co 15007, Co 15015,  
Co 15018 and Co 15021

Gungera, Fiji 55, Pathri,  
Khakkai, Kheli, ISH 111, ISH107  
and ISH58



# Nutrient management for sugarcane in calcareous soil

Treatment		Cane Yield (t/ha)	CCS Yield (t/ha)
T1	STCR 150 + basal FYM @5t/ha	118.59 <sup>a</sup>	17.62
T2	T1+ Soil Fe and Zn	137.43 <sup>bc</sup>	20.53
T3	T1 + Foliar Fe and Zn	141.40 <sup>bc</sup>	21.98
T4	Blanket NPK + basal FYM @5t/ha	135.01 <sup>abc</sup>	19.83
T5	T4 + Soil Fe and Zn	139.79 <sup>bc</sup>	21.19
T6	T4 + Foliar Fe and Zn	147.77 <sup>c</sup>	23.31
T7	FYM @5t/ha	128.49 <sup>ab</sup>	20.69
T8	Absolute control	125.33 <sup>ab</sup>	19.79
Mean		134.23	20.62
CD 5%		16.77	NS

Var. Co 11015 in 1.5 m spacing

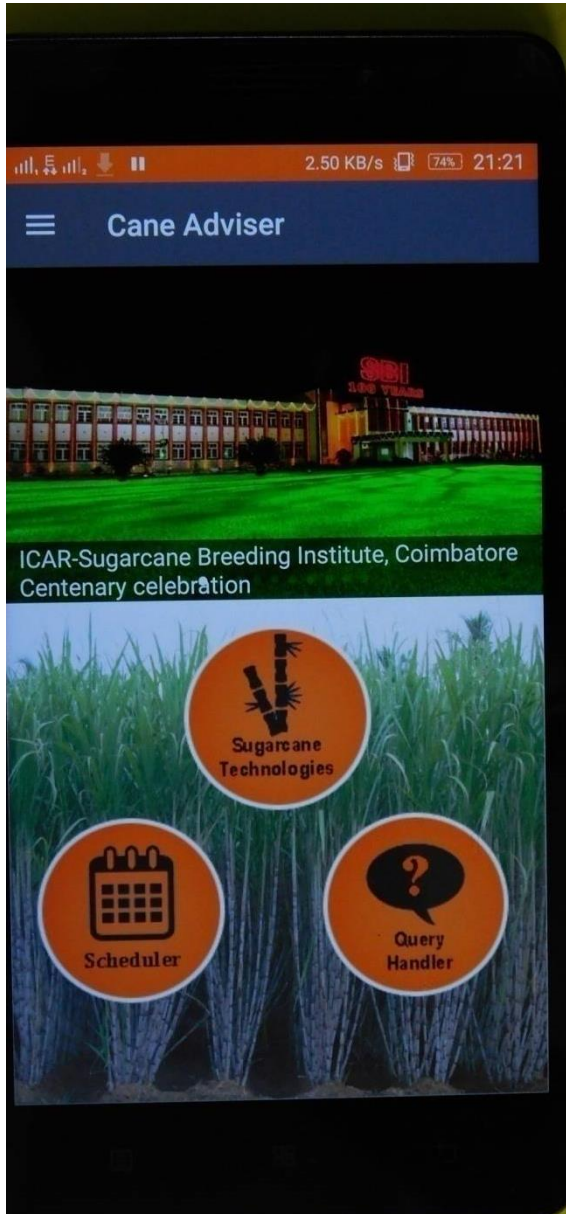
Application of NPK (entire P as basal, N and K in three splits) along with soil applied  $\text{FeSO}_4$  and  $\text{ZnSO}_4$  or with symptomatic foliar spray (5 sprays) of Urea,  $\text{FeSO}_4$  and  $\text{ZnSO}_4$  till 120 DAP recorded significantly higher cane yield than NPK alone, FYM Only and absolute control in calcareous soil.



## Sugarcane R&D workshops during 2015-2020

WORKSHOP	MAJOR TOPICS
TAMIL NADU SUGARCANE R&D WORKSHOP	<ul style="list-style-type: none"><li>• Varietal management to improve sugar recovery in factories throughout the season</li><li>• Weed management in Sugarcane</li><li>• Wild boar and rodent management</li><li>• Sugarcane mechanization including mechanical harvesting.</li><li>• Soil fertility based fertigation for sugarcane</li><li>• Ratoon management in sugarcane</li></ul>
NK SUGARCANE R&D WORKSHOP	<ul style="list-style-type: none"><li>• Approaches to maximize cane yield and reduce cost of cultivation</li><li>• Pest management in sugarcane farming</li><li>• <i>Fertigation</i> for sugarcane including post-installation micro-irrigation system-maintenance</li></ul>

# CANE ADVISER



- 🌸 **Android based**
- 🌸 **Designed to run on mobile devices- smart phones & tablet computers**
- 🌸 **Available for free download in google playstore**

## **Trilingual**

**Cane Adviser (English)**

**Ganna Salahkar (Hindi)**

**Karumbu Aalosakar (Tamil)**

## Technology disclosures – Licensing to foreign countries

Through Agri-Innovate

Co 0238



Co 86032



Co 0118

Co 91010

Co 11015

One firm from Nigeria is in progress, & Algeria, Sri Lanka, Brazil, Uzbekistan queries from a few other countries

# NEW SUGARCANE TECHNOLOGIES COMMERCIALIZED


## For improving productivity

1. **SOIL MOISTURE INDICATOR**
2. **EPN BIOPESTICIDE FORMULATION**
3. **ENERGY CANE**
4. **SETT TREATMENT DEVICE**
5. **SUGARCANE DETRASHING TOOL**
6. **SUGARCANE MECHANICAL PLANTER**
7. **QUATRO SUGARCANE SINGLE BUD CUTTER**

## For entrepreneur development and for self help groups

1. **PRODUCTION OF SPRAY DRIED SUGARCANE JUICE**
2. **LIQUID JAGGERY PROCESS**
3. **CANE JAM PRODUCTION**
4. **PRESERVATION OF SUGARCANE JUICE / BOTTLING OF SUGARCANE JUICE**
5. **PRODUCTION OF CANE DIETARY FIBRE FOOD PRODUCTS**
6. **POWDER JAGGERY PROCESSING FROM SUGARCANE JUICE**

# Soil Moisture indicator



**SOIL MOISTURE INDICATOR**  
*Easy to use, simple, helps in deciding when to irrigate*

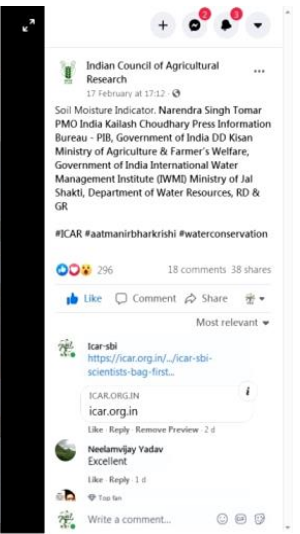
SMI is a simple electronic device developed by **ICAR-Sugarcane Breeding Institute** to indicate soil moisture

Suitable for use in **agricultural farms** and **potted plants**

Instant indication of **soil moisture status** & **suitable for different soil types**

**Low cost**

The technology has been awarded with **First prize** in the Best Research/ Innovation/ Adoption of New Technology for Water Conservation category the in the **2nd NATIONAL WATER AWARDS 2019**



Indian Council of Agricultural Research  
 17 February at 17:12 · @icarorgin

Soil Moisture Indicator. Narendra Singh Tomar PMO India Kalish Choudhary Press Information Bureau - PIB, Government of India DD Kisan Ministry of Agriculture & Farmer's Welfare, Government of India International Water Management Institute (IWMI) Ministry of Jal Shakti, Department of Water Resources, RD & GR

#ICAR #aatmanirbharikrishi #waterconservation

296 likes, 18 comments, 38 shares

icar-sbi [https://icar.org.in/\\_/icar-sbi-scientists-bag-first...](https://icar.org.in/_/icar-sbi-scientists-bag-first...)

icar.org.in

Neelamjay Yadav Excellent

To facilitate the achievement of UN-SDG 6 on water, TERI is initiating the 'Water Sustainability Awards' in collaboration with IWA and UNDP India





**SOIL MOISTURE INDICATOR**  
 DEVELOPED BY  
 माकडनुप - गन्ना प्रजनन संस्थान, कोयंबटूर - 641007  
 ICAR - Sugarcane Breeding Institute, Coimbatore - 641007  
 भारतीय कृषि अनुसंधान परिषद  
 Indian Council of Agricultural Research

**KEY HIGHLIGHTS**

- It is handy & user-friendly electronic moisture-indicating device developed to save water and to facilitate irrigation scheduling.
- It helps farmers in deciding when to irrigate their fields.
- The sensor rods of SMI inserted into the soil indicate the soil moisture level.
- It is suitable for use in agricultural farms as well as in potted plants.



द्वितीय राष्ट्रीय जल पुरस्कार  
 2<sup>nd</sup> National Water Awards

प्रशस्ति पत्र  
 CITATION

11 November 2019

1<sup>st</sup> prize National Water Award 2019  
 Ministry of Jal Shakti, Govt of India

Twitter/Facebook pages of Ministry of Agriculture and Farmers' Welfare and ICAR

# Entomopathogenic nematode biopesticide formulation (through Agri innovate)

## Commercialization

Sl No.	Biopesticide Producer/company	License Fee
1	M/s.T. Stanes & Company Ltd., Coimbatore	Rs. 2,00,000/-
2.	M/s. SKR Agrotech, Wardha, Maharashtra	Rs. 2,00,000/-
3.	M/s.Indigo Agro Akola, Maharashtra	Rs. 2,00,000/-
4	M/s. Bio Vigyan Agrotech Private Ltd, Tirunelveli, Tamilnadu	Rs. 2,00,000/-
5	Varsha Agrotech, Vijayapura (Bijapur), Karnataka	Rs. 2,00,000/-
6	Linga Chemicals, Madurai, Tamilnadu	Rs. 2,00,000/-
	<b>Total</b>	<b>Rs. 12,00,000</b>



# SETT TREATMENT DEVICE

For healthy planting material

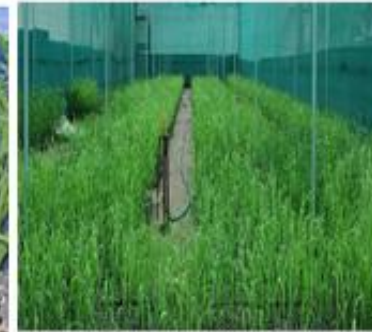


- Disease management
- Healthy nursery
- Varietal rejuvenation
- Application in vegetatively propagated crops

Sett Treatment Device with the provision of hot water treatment (STD-HWT)



Disease management with fungicide treatment



Production of healthy settlings by treating single bud setts with fungicide, insecticide and nutrients



# Quatro sugarcane bud cutter



Design PATENT No 297432 dt of issue 12/06/2019  
GRANTED



7000 buds/hour



ICAR-CIAE-SBI Motorised  
double headed sugarcane single  
bud cutting machine





# SUGARCANE SETTLING MECHANICAL PLANTER



- For Sugarcane bud settling planting sugarcane bud chip settlings raised in protrays
- 3 Acres can be planted with three people
- ICAR Central Institute of Agricultural Engineering, Regional Centre, Coimbatore in collaboration with ICAR - Sugarcane Breeding Institute, Coimbatore, Tamil Nadu.

# Tractor operated two row sugarcane sett cutter planter



- Cost of the unit is Rs.2,30,000/-



- The cost of planting operation can be saved by 54 % when compared to conventional planting

## Doubling Farmers income (Seed farmers)

Particulars		2020-21
A	No of farmers	15
B	Area (ha)	29.5
C	Seed yield (t/ha)	109.87
D	Avg yield of the Karnal dist (t/ha)	84.0*
E	Total Income (per ha) to the seed farmers	3,84,545
F	States average income sugarcane farmers	294000
G	Cost of Cultivation state (as per CACP) @ Rs 310/qtl	248000
H	Cost of Cultivation seed farmers (save in harvest & transport cost)	199932
I	Net Income seed farmers	184613
J	Net Income states average	46000
K	Increase in seed farmers income	4.01 times





Thank you