

ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE

East Coast Zone

**ANNUAL REPORT - AGRONOMY
(2016 – 2017)**



**SUGARCANE RESEARCH STATION
TAMILNADU AGRICULTURAL UNIVERSITY
CUDDALORE – 607 001**

ANNUAL REPORT OF AICRP (S) FOR THE YEAR 2016-2017

Sugarcane Research Station, Cuddalore (East Coast Zone)

Discipline: AGRONOMY

1. Project No. : AS 67

2. Title: Optimization of fertigation schedule for sugarcane through micro irrigation technique under different agro-climatic conditions.

3. Objective :

To economize water use in cultivation and improve sugarcane productivity

4. Details of Technical programme:

Place of the technical project: Sugarcane Research Station, Cuddalore

Irrigated / Rainfed : Irrigated

Variety : CoC 24

Date of ratooning : 02.07.2015

Date of Harvest : 12.07.2016

Year of start : 2011-12

Treatments

A. Irrigation water / Method applied

I₁ – Subsurface drip irrigation at 75 % Pan Evaporation (PE) – Irrigation once in two days

I₂ - Subsurface drip irrigation at 100 % Pan Evaporation (PE) -Irrigation once in two days

I₃ - Subsurface drip irrigation at 125 % Pan Evaporation (PE) – Irrigation once in two days

I₄ – Farmers Practice – Surface irrigation

B. Nitrogen levels

N₁ – 100 % Recommended dose of nitrogen (RDN)

N₂ - 75 % Recommended dose of nitrogen (RDN)

N₃ - 50 % Recommended dose of nitrogen (RDN)

5. Design : Strip Plot

6. Replication : Three

7. Plot size : 10 rows of 10 meter length

8. Climatic parameters:

Month	Temperature °C		RH (%)	Rain fall (mm)
	Maximum	Minimum		
April 2016	36.2	21.9	81.5	0.0
May 2016	36.3	21.9	71.6	91.0
June 2016	35.4	20.8	79.8	63.0
July 2016	35.3	19.2	82.1	90.8
August 2016	36.2	18.0	78.6	112.6
September 2016	34.8	16.6	81.3	35.6
October 2016	34.7	15.6	83.9	159.2
November 2016	32.1	20.8	85.3	5.6
December 2016	39.8	18.6	89.0	76.8
January 2017	29.5	17.6	87.3	91.0
February 2017	30.9	16.6	86.6	0.0
March 2017	32.5	24.1	91.1	0.0

9. Observation on soil health:

Initial Soil analysis

The pre-plant soil samples were collected and analyzed for the estimation of physico chemical properties. The result indicated that, available N (182.36 kg/ha), available P (39.65 kg/ha), available K (137.86 kg/ha), OC (0.56 %), bulk density (1.45 g/cc), infiltration rate (1.41 cm ha⁻¹) were presented in the surface soil profile.

10. Technical summary of the project:

i) Progress of work: 2014-15

The plant crop was raised during special (June) season of 2014 -15 at Sugarcane Research Station, Cuddalore with objective to economize water use and to improve sugarcane productivity. This experiment was laid out in Strip Plot Design with three replications. The plot size was 10 rows of 10 meter length. Drip laterals were laid out with a distance of 120 cm apart and about 20 cm below the soil surface. The setts were planted at 6 cm above the laterals placed.

The results of the plant crop revealed that, irrigating the sugarcane with sub surface drip at 125 % PE significantly out yielded with 139.4 t^{ha} compared to all other treatments. However, the maximum irrigation water use efficiency (1477 kg/ha^{cm}) was recorded with sub surface drip at 75 % PE which was significantly higher than the other irrigation treatments.

Among the nitrogen levels significantly maximum millable canes (1,34,250 ha⁻¹), cane yield (139.2 tha⁻¹) and IWUE (1200 kg/ha-cm) were recorded with 100 % recommended dose of nitrogen application.

ii) Progress of work: 2015-16

1. Germination count/plant population

The experiment was ratooned during fourth week of June 2015 with the same objective and treatments as per the technical programme. The result indicated that, among the methods of irrigation application, the sub surface drip irrigation at 125 per cent Pan Evaporation, irrigation once in two days recorded significantly the maximum sprouting count of 1,37,560/ha. Among the nitrogen levels a non significant results was observed. However, 100 per cent recommended dose of nitrogen recorded the numerically maximum sprouting of 1,30,870/ha.

2. Tiller population

Among the methods of irrigation application, the sub surface drip irrigation at 125 per cent Pan Evaporation, irrigation once in two days significantly recorded significantly the maximum tiller population of 1,78,600/ha. Among the nitrogen levels a non significant results was observed, although, 100 per cent recommended dose of nitrogen recorded the maximum of 1,66,280/ha sprouting. The same trend was also observed on root dry weight recorded at 120 DAP and at harvest.

Table 1. Performance of sugarcane under different irrigation methods and nitrogen levels
On growth parameters (2015-16)

Treatments	Sprouting (‘000/ha)	Tiller (‘000/ha)	Root dry weight (kg/ha)		cane weight (kg)	Cane length (cm)	Cane girth (cm)
			120 DAP	At harvest			
Irrigation							
I ₁ -SSDI at 75 % PE	121.63	145.30	119.63	122.60	1.35	256.98	2.72
I ₂ -SSDI at 100 % PE	130.89	167.60	128.63	130.26	1.44	269.65	2.92
I ₃ -SSDI at 125 % PE	137.56	178.60	131.26	134.65	1.51	279.89	2.89
I ₄ -Flood irrigation	124.65	162.50	124.23	125.63	1.46	264.89	2.82
CD(p=0.05)	5.83	5.77	6.59	6.71	0.09	12.40	0.13
Nitrogen levels							
N ₁ -50 % RDN	126.36	160.55	121.31	123.57	1.38	263.03	119.6
N ₂ -75 % RDN	128.81	163.66	126.20	128.55	1.44	268.12	126.3
N ₃ -100 % RDN	130.87	166.28	130.31	132.74	1.50	272.41	132.6
CD(p=0.05)	NS	NS	6.96	7.09	0.08	14.81	6.42

3. Number of Millable cane population, cane length, girth and cane weight

Among the methods of irrigation water application, the sub surface drip irrigation at 125 per cent Pan Evaporation, irrigation once in two days significantly recorded the maximum Millable cane population of 1,32,900/ha. Among the nitrogen levels, the 100 per cent recommended dose of nitrogen significantly recorded the maximum of 1,66,280/ha

sprouting. The same treatment was also recorded the maximum single cane weight (1.51 kg), cane length (279.89 cm) and cane girth (2.92 cm) and was on par with the sub surface drip irrigation at 100 per cent Pan Evaporation, irrigation once in two days which recorded ingle cane weight (1.44 kg), cane length (269.65 cm) and cane girth (2.89 cm).

4. Cane and sugar yield

Among the methods of irrigation the sub surface drip irrigation at 125 per cent Pan Evaporation, irrigation once in two days significantly recorded the maximum cane yield of 136.4 t^{-ha}, and sugar yield of 17.3 t^{-ha}. Among the nitrogen levels, 100 per cent recommended dose of nitrogen recorded the maximum cane yield of 132.6 t^{-ha}, and sugar yield of 16.4 t^{-ha}.

Table 2. Performance of sugarcane under different irrigation methods and nitrogen levels (2015-16)

Treatments	Millable cane ('000/ha)	Cane yield (t/ha)	Sugar Yield (t/ha)	Irrigation water applied (ha/cm)	Water expenses (cm)
Irrigation					
I ₁ -SSDI at 75 % PE	119.6	119.4	14.8	33.78	91.23
I ₂ -SSDI at 100 % PE	128.6	131.3	16.5	45.60	104.23
I ₃ -SSDI at 125 % PE	132.9	136.4	17.3	53.26	112.32
I ₄ -Flood irrigation	124.9	116.6	153	88.92	148.32
CD(p=0.05)	6.62	5.32	0.69	2.62	4.94
Nitrogen levels					
N ₁ -50 % RDN	121.8	119.6	15.8	54.39	111.91
N ₂ -75 % RDN	126.8	126.3	16.1	55.45	114.14
N ₃ -100 % RDN	130.9	132.6	16.4	56.33	115.97
CD(p=0.05)	4.53	6.42	0.89	3.06	6.31

5. Juice Quality parameters

The juice quality parameters of sugarcane was recorded at maturity and were statistically analyzed. Among the methods of irrigation non significant results were observed with regard to Brix, Pole, Purity and Commercial cane sugar per cent. However, among the methods the sub surface drips irrigation at 125 per cent Pan Evaporation, irrigation once in two days recorded Brix (20.86 %), Pole (12.96 %), Purity (89.39 %) and commercial cane sugar (12.67 %). Among the nitrogen levels, eventhough 100 per cent recommended dose of nitrogen recorded the maximum Brix (20.95 %), Pole (13.15 %), Purity (90.57 %) and commercial cane sugar (12.67 %), a non significant increment was observed.

Table 3. Performance of sugarcane under different irrigation methods and nitrogen levels (2015-16)

Treatments	IWUE (kg/ha-cm)	Cane produced (kg/1000 litre of water)	Brix	Pol	Purity	CCS (%)
Irrigation						
I ₁ -SSDI at 75 % PE	1488	5.93	20.45	12.89	88.63	12.42
I ₂ -SSDI at 100 % PE	1240	6.72	20.59	12.95	89.32	12.56
I ₃ -SSDI at 125 % PE	1036	7.23	20.86	12.96	89.39	12.67
I ₄ -Flood irrigation	825	5.12	20.51	12.92	88.89	12.55
CD(p=0.05)		0.33	NS	NS	NS	NS
Nitrogen levels						
N ₁ -50 % RDN	1126	6.14	20.23	12.70	87.45	12.42
N ₂ -75 % RDN	1148	6.26	20.62	12.94	89.15	12.56
N ₃ -100 % RDN	1166	6.36	20.95	13.15	90.57	12.67
CD(p=0.05)		0.35	NS	NS	NS	NS

6. Soil analysis

Post harvest Soil analysis

The post harvest soil samples were collected from the experimental plots as per the recommendation and soil samples are analyzed in the laboratory. The result revealed that, the sub surface drips irrigation at 125 per cent Pan Evaporation, irrigation once in two days enhanced the maximum values of soil parameters *viz.*, available N (212.23 kg/ha), available P (41.36 kg/ha), available K (152.36 kg/ha), OC (0.69 %), bulk density (1.36 g/cc), infiltration rate (1.33 cm ha⁻¹).

Table 4. Performance of sugarcane under different irrigation methods and nitrogen levels (2015-16)

Treatments	Bulk density g/cc	Infiltration rate (cm/hr)	Gross return (Rs)	Net return (Rs)	B:C ratio
Irrigation					
I ₁ -SSDI at 75 % PE	1.22	1.28	308544	98873	2.67
I ₂ -SSDI at 100 % PE	1.24	1.32	332856	123185	3.34
I ₃ -SSDI at 125 % PE	1.36	1.33	340464	130793	3.64
I ₄ -Flood irrigation	1.26	1.34	279792	70121	2.50
CD(p=0.05)	0.06	0.06			
Nitrogen levels					
N ₁ -50 % RDN	1.25	1.29	298997	91826	2.75
N ₂ -75 % RDN	1.27	1.32	315729	106058	3.05
N ₃ -100 % RDN	1.29	1.34	331516	119345	3.30
CD(p=0.05)	0.07	0.07			

7. Economics

The economics of sugarcane was also computed as per the treatments. Among the methods of irrigation the maximum B:C ratio of 3.64 recorded by the sub surface drips irrigation at 125 per cent Pan Evaporation, irrigation once in two days and was followed by sub surface drips irrigation at 100 per cent Pan Evaporation, irrigation once in two days, which recorded 3.34 of B:C ratio. Among the nitrogen levels, 100 per cent recommended dose of nitrogen recorded the maximum B:C ratio of 3.30 and it was closely followed by 75 per cent recommended dose of nitrogen, which recorded 3.05.

ii) Progress of work done 2016-17

The second year ratooning was done second week of July 2016 with the same objective and treatments as per the technical programme. The result indicated that, among the methods of irrigation applications, the sub surface drip irrigation at 125 per cent Pan Evaporation, irrigation once in two days recorded the maximum sprouting (1,38,200^{ha}), tiller population (1,76,560^{ha}), Millable population (1,76,560^{ha}), root dry weight at 120 (132.50 kg/ha) and 150 (134.26 kg/ha) DAP. Among the nitrogen levels, 100 per cent recommended dose of nitrogen recorded the maximum sprouting (1,33,440^{ha}), tiller population (1,69,460^{ha}), Millable population (1,27,800^{ha}), root dry weight at 120 DAP (132.01 kg/ha), it was on par with 75 per cent recommended dose of nitrogen.

Table 5. Performance of sugarcane under different irrigation methods and nitrogen levels (2016-17)

Treatments	Sprouting ('000/ha)	Tiller ('000/ha)	Millable cane ('000/ha)	Root dry weight (120 DAP)
Irrigation				
I ₁ -SSDI at 75 % PE	120.32	142.36	116.35	122.36
I ₂ -SSDI at 100 % PE	132.21	165.42	125.36	129.80
I ₃ -SSDI at 125 % PE	138.20	176.56	129.68	132.50
I ₄ -Flood irrigation	124.68	160.35	122.65	125.68
CD(p=0.05)	5.84	8.54	6.46	6.67
Nitrogen levels				
50 % RDN	124.09	153.08	118.96	122.90
75 % RDN	129.03	161.80	123.77	127.85
100 % RDN	133.44	169.46	127.80	132.01
CD(p=0.05)	6.83	6.83	6.83	7.06

Salient findings:

The sub surface drip irrigation at 125 per cent Pan Evaporation, irrigation once in two days with 100 per cent recommended dose of nitrogen perform better in both plant and first year ratoon crop.

1. Project No. : AS 68

2. Title Impact of integrated application of organics and inorganics in improving soil health and sugarcane productivity

3. Objective

To develop nutrient management strategy for sustaining soil health and sugarcane production.

4. Details of Technical programme

Place of the technical project: Sugarcane Research Station, Cuddalore

Irrigated / Rainfed : Irrigated

Variety : CoC 24

Date of Planting : 13.03.2014

Date of Harvest : 25.03.2015

Year of start : 2014-15

Cropping system : Sugarcane – Ratoon - Ratoon

Treatments:

T₁- No organic + 50 % RDF,

T₂- No organic + 100 % RDF,

T₃- No organic + soil test based recommendation,

T₄-Application of FYM/Compost @ 20 tonnes ha⁻¹ + 50 % RDF (inorganic source),

T₅-Application of FYM/Compost @ 20 tonnes ha⁻¹ + 100 % RDF (inorganic source),

T₆-Application of FYM/Compost @ 20 tonnes ha⁻¹ + inorganic nutrient application based on soil test (rating chart),

T₇- Application of FYM/Compost @ 10 tonnes ha⁻¹ + biofertilizer (*Acetobacter* + PSB) + 50 % RDF,

T₈- Application of FYM/Compost @ 10 tonnes ha⁻¹ + biofertilizer (*Acetobacter* + PSB) + 100 % RDF,

T₉- Application of FYM/Compost @ 10 tonnes ha⁻¹ + biofertilizer (*Acetobacter* + PSB) + soil test basis.

5. Design : RBD

6. Replication : Three

7. Plot size : 6 rows of 6 m length

10. Technical summary of the project

This experiment was conducted during 2014-15 with 9 treatments consisted the combinations of inorganic fertilizers with micro nutrients and FYM. As per the AICRP technical programme, the first year experiment was laid out during 2014-15 cropping seasons in Randomized Block Design with three replications. All the recommended package of practices was adopted uniformly.

i) Progress of work done report 2014-15

In plant crop the application of FYM @ 10 t/ha + biofertilizer (*Azotobacter* + PSB) + 100 % RDF (T₉) registered significantly maximum millable canes (1,48,520 ha⁻¹), CCS (12.12 %), cane yield (148.8 t ha⁻¹) and sugar yield (18.03 t ha⁻¹). The B:C ratio was also higher (3.81) with the same treatment which was closely followed by the T₈ treatment.

ii) Progress of work done report 2015-16

In first ratoon crop the treatment T₉ - application of FYM @ 10 t/ha + biofertilizer (*Azotobacter* + PSB) + 100 % RDF significantly registered maximum millable canes (1,45,620 ha⁻¹), cane yield (146.3 t ha⁻¹) and sugar yield (18.79 t ha⁻¹). However, the CCS 12.84 per cent was recorded with the same treatment and revealed insignificant difference among the treatments. The B:C ratio was also higher (3.63) with the same treatment which was closely followed by the T₈ treatment.

ii) Progress of work done report 2016-17

1. Germination count/plant population

The second ratoon crop for this experiment was allowed to grow in the same field from March 2016 with same set of treatments combinations. The data on sprouting count resulted significant variation among the treatments. The application of FYM/Compost @ 10 tonnes/ha + biofertilizers (*Acetobacter* + PSB) + soil test based NPK fertilizer application (T₉) recorded significantly the maximum sprouting population of 2,38,690/ha.

2. Tiller population

The application of FYM/Compost @ 10 tonnes/ha + biofertilizers (*Acetobacter* + PSB) + soil test based NPK fertilizer application (T₉) recorded significantly the maximum tiller population of 1,69,520/ha and was on par with T₈ application of FYM/Compost @ 10 tonnes/ha + biofertilizers (*Acetobacter* + PSB) + soil test based NPK fertilizer which recorded 1,68,960/ha.

Table 1. Effect of integrated application of organic and inorganic fertilizers on growth, parameters of sugarcane.

Treatments	Sprouting ('000/ha)	Tillers ('000 ha ⁻¹)	Millable canes ('000 ha ⁻¹)	Individual cane weight (kg)	Cane length (cm)	Cane girth (cm)
T ₁	118.36	103.25	74.02	0.82	136.25	1.56
T ₂	178.96	148.56	112.36	1.22	218.26	2.12
T ₃	188.69	156.32	115.26	1.32	226.58	2.32
T ₄	138.62	113.26	98.56	1.06	159.68	1.89
T ₅	217.23	162.32	126.35	1.35	256.35	2.42
T ₆	232.32	154.56	132.53	1.38	265.38	2.56
T ₇	146.35	128.26	116.23	1.12	189.65	2.12
T ₈	223.25	168.96	132.56	1.46	274.23	2.59
T ₉	238.69	169.52	136.25	1.48	277.45	2.72
CD (p=0.05)	8.69	9.35	6.15	0.07	11.80	0.12

3. Number of Millable cane population, cane length, girth and cane weight

The application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer application (T₉) recorded significantly the maximum millable cane population of 1,36,250/ha and was on par with T₈ application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer which recorded 1,32,560/ha. The same treatment recorded significantly the maximum individual cane weight (1.48 kg), cane length (277.45 cm) and cane girth (2.72 cm) and was on par with T₈.

4. Cane and sugar yield

The application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer application (T₉) recorded significantly the maximum cane yield (137.26 t/ha) and sugar yield (16.83 t/ha) and was on par with (T₈) application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer, which recorded cane yield (135.62 t/ha) and sugar yield (16.71 t/ha).

5. Juice Quality parameters

The application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer application (T₉) recorded significantly the maximum Brix (20.48 %), Pole (12.65 %), Purity (88.76 %) and Commercial Cane sugar (12.26 %) and was on par with T₈ application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer which recorded Brix (20.56 %), Pole (13.54 %), Purity (88.57 %) and Commercial Cane sugar (12.32 %)

Table 2. Effect of integrated application of organic and inorganic fertilizers on quality and yield of sugarcane.

Treatments	Brix (%)	Pole (%)	Purity (%)	CCS (%)	Cane yield (t ha ⁻¹)	Sugar yield (t ha ⁻¹)	B:C ratio
T ₁	19.53	12.05	83.25	11.56	65.32	7.55	1.84
T ₂	19.56	12.32	85.29	11.68	112.32	13.12	2.98
T ₃	19.63	12.46	85.46	11.78	118.56	13.97	3.17
T ₄	19.88	12.14	85.23	11.23	98.65	11.08	2.49
T ₅	20.12	12.98	86.56	11.68	126.89	14.82	3.03
T ₆	20.25	12.99	86.45	11.79	128.95	15.20	3.10
T ₇	19.32	12.22	85.35	11.35	108.56	12.32	2.83
T ₈	20.48	13.54	88.57	12.32	135.62	16.71	3.34
T ₉	20.56	12.65	88.76	12.26	137.26	16.83	3.40
CD (p=0.05)	1.06	NS	4.56	0.62	6.08	0.72	0.10

6. Soil analysis

Post harvest Soil analysis

The post harvest soil samples were collected from the experimental plots are analyzed in the laboratory. The result revealed that, application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer application (T₉) influenced the maximum soil parameters *viz.*, available N (141.23 kg/ha), available P (34.26 kg/ha), available K (136.52 kg/ha), OC (0.78 %), bulk density (1.67 g/cc), infiltration rate (1.39 cm ha⁻¹), azotobactor ($0.45 \times 10^{-4}/\text{gm}$), PSB ($1.35 \times 10^{-4}/\text{gm}$) and which was closely followed by the T₈ treatment.

Table 3. Effect of integrated application of organic and inorganic fertilizers on post harvest soil physical and chemical properties

Treatments	B.D g cc ⁻¹	Infiltration rate (cm hr ⁻¹)	OC (%)	EC (dSm ⁻¹)	pH	N kg ha ⁻¹	P kg ha ⁻¹	K kg ha ⁻¹	Soil Azoto x 10 ⁻⁴ /gm	Soil PSB x 10 ⁻⁴ /gm	Plant nutrient uptake		
											N kg ha ⁻¹	P kg ha ⁻¹	K kg ha ⁻¹
T ₁	1.09	1.25	0.32	0.75	6.52	113.26	22.36	128.56	0.14	0.34	65.23	10.23	63.24
T ₂	1.23	1.36	0.35	0.74	6.54	152.63	32.25	142.56	0.18	0.42	128.25	28.56	118.25
T ₃	1.26	1.33	0.39	0.75	7.12	166.32	38.56	162.35	0.19	0.46	130.21	30.21	120.12
T ₄	1.64	1.32	0.76	0.76	7.22	202.36	42.25	173.56	0.40	1.23	87.23	15.65	75.36
T ₅	1.66	1.37	0.77	0.76	7.32	212.32	47.98	179.65	0.44	1.38	141.21	30.21	125.65
T ₆	1.67	1.39	0.78	0.78	7.36	205.38	48.98	182.35	0.56	1.39	142.32	32.25	129.65
T ₇	1.66	1.32	0.75	0.78	7.21	203.85	45.69	185.65	0.36	1.02	86.35	18.69	92.35
T ₈	1.66	1.39	0.75	0.79	7.45	213.24	48.98	187.65	0.42	1.36	138.56	33.56	132.54
T ₉	1.67	1.39	0.78	0.78	7.23	213.52	49.78	188.56	0.45	1.35	141.23	34.26	136.52
CD(P=0.05)	0.06	0.09	0.02	NS	0.38	9.91	2.22	9.02	0.02	0.05	6.25	1.38	5.85

7. Economics

The application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer application (T₉) recorded the maximum B:C ratio of 3.40 and was on par with T₈ application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer which B:C ratio of 3.34.

Salient findings:

Application of FYM/Compost @ 10 tones/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer recorded significantly the maximum cane yield (137.26 t/ha), CCS (12.26 %) and sugar yield (16.83) with B:C ratio of 3.40 and it was comparable with treatment (T₈) application of FYM/Compost @ 10 tonnes ha⁻¹ + biofertilizer (*Azotobacter* + PSB) + 100 % RDF.

1. Project No. : AS 69**2. Title:** Use of plant growth regulator (PGRs) for enhanced yield and quality of sugarcane**3. Objectives:**

1. To accelerate rate and extent of sugarcane germination through the use of PGRs
2. To assess the effect of PGRs on sugarcane growth, yield and juice quality

4. Details of the treatments/Technical programme

Place of the technical project: Sugarcane Research Station, Cuddalore

Irrigated / Rainfed : Irrigated

Variety : CoC 24

Date of Planting : 08.01.2016

Date of Harvest : 12.02.2017

Year of start : 2015 -16

Treatments:T₁. Conventional planting (2-bud setts)T₂. Planting of setts after overnight soaking in waterT₃. Planting of setts after overnight soaking in 50 ppm ethrel solutionT₄. Planting of setts after overnight soaking in 100 ppm ethrel solutionT₅. T₁+GA₃ spray (35 ppm) at 90, 120 and 150 DAPT₆. T₂+ GA₃ spray (35 ppm) at 90, 120 and 150 DAPT₇. T₃ + GA₃ (35 ppm) spray at 90, 120 and 150 DAPT₈. T₄ + GA₃ (35 ppm) spray at 90, 120 and 150 DAP**5. Design** : RBD**6. Replication** : Three**7. Plot size** : 6 rows of 6 m length**8. Climatic parameters** :

Month	Temperature °C		RH (%)	Rain fall (mm)
	Maximum	Minimum		
April 2016	36.2	21.9	81.5	0.0
May 2016	36.3	21.9	71.6	91.0
June 2016	35.4	20.8	79.8	63.0
July 2016	35.3	19.2	82.1	90.8
August 2016	36.2	18.0	78.6	112.6
September 2016	34.8	16.6	81.3	35.6
October 2016	34.7	15.6	83.9	159.2
November 2016	32.1	20.8	85.3	5.6
December 2016	39.8	18.6	89.0	76.8
January 2017	29.5	17.6	87.3	91.0
February 2017	30.9	16.6	86.6	0.0
March 2017	32.5	24.1	91.1	0.0

9. Observation on soil health:

The initial soil samples were collected from the experimental plots and soil samples are analyzed. The result indicated that, available N (232.42 kg/ha), available P (42.36 kg/ha),

available K (152.36 kg/ha), OC (0.47 %), bulk density (1.42 g/cc), infiltration rate (1.32 cm ha⁻¹) were found to be present in the surface soil profile.

10. Technical summary of the project

i) Progress of work done report 2015-16

The data on varied growth, yield parameters, yield and quality were recorded and analyzed. Among the treatments, numerically higher germination percentage (83.07 %) was recorded with the T₄ treatment. However, the maximum millable canes (1,60,200 no.s/ha), cane yield (146.6 t/ha) and higher CCS per cent (11.61%) were recorded with T₈ treatment (Planting of setts after overnight soaking in 100 ppm ethrel solution and GA₃ @ 35 ppm spray at 90, 120 and 150 DAP) and the lowest germination, millable canes, cane yield and CCS (%) were observed with the farmers practice of conventional planting (T₁).

ii) Progress of work done report 2016-17

1. Germination count/plant population

The second year plant crop was raised on 01.04.2016 with the same objectives and treatments. The result indicated that, the maximum germination was recorded, setts treated with ethrel 100 ppm solution, which recorded 7.35,67.85,84.35,84.85 and 84.98 per cent on 10th, 20th, 30th, 40th and 50th days after planting respectively and which is closed followed by 50 ppm solution treated plots. The same trend was also recorded on root bio mass from 50th to 180th DAP of sugarcane, which recorded 1.28, 4.68 and 7.68 t/ha of root dry weight on 50th, 120th and 180th days after planting and was comparable with 50 ppm solution treated sugarcane setts.

Table-1. Effect of PGR's on germination and root dry weight of sugarcane

Treatments	Germination (%)					Root dry weight (t/ha)		
	10 th DAP	20 th DAP	30 th DAP	40 th DAP	50 th DAP	50 th DAP	120 th DAP	180 th DAP
T ₁ : FP	2.12	45.60	68.23	69.23	70.12	0.92	4.21	6.12
T ₂ : ONSW	2.86	46.30	74.56	75.68	78.19	0.98	4.25	6.23
T ₃ : ONS 50	6.15	52.90	80.43	80.86	81.23	1.21	4.32	7.02
T ₄ : ONS 100	6.72	65.35	83.07	83.65	83.98	1.22	4.35	7.12
T ₅ : T ₁ +GA spray	3.28	47.69	70.12	70.89	71.23	1.10	4.24	6.26
T ₆ : T ₂ +GA spray	3.86	45.31	72.12	72.96	73.23	1.12	4.35	6.35
T ₇ : T ₃ +GA spray	7.21	54.62	78.32	78.89	79.89	1.24	4.64	7.56
T ₈ : T ₄ +GA spray	7.35	67.85	84.35	84.85	84.98	1.28	4.68	7.68
CD (p=0.05)	0.31	4.04	5.32	6.02	5.06	0.06	0.23	0.36

2. Tiller population

The tiller population of sugarcane crop was recorded on monthly intervals and the data presented in table 2. The maximum tiller population of 2,45,630/ha recorded in 100 ppm ethrel solution for setts treated with 100 ppm ethrel and foliar spray of GA₃ at 90, 120 and 150 DAP followed by 100 ppm ethrel spray without GA₃ foliar application, which recorded 2,42,650/ha. The trend was maintained upto harvest stage of sugarcane.

The data on plant height was recorded on monthly intervals from 30 DAP to harvest and the data presented in table 3. Among the treatments, setts treated with ether 100 ppm with foliar spray of GA₃ 35 ppm on 90, 120 and 150 DAS recorded the maximum plant height of 25.8 cm on 30 DAP and 194.3 cm at harvest, the same trend was observed in all the stages observation and it was followed by 50ppm of ethrel setts treatment and foliar spray of GA₃ 35 ppm, which recorded 25.7 cm on 30 DAP and 186.5 at harvest.

Table -3. Use of plant growth regulators (PGRs) on plant height (cm) of sugarcane

Treatments	30 th DAP	60 th DAP	90 th DAP	120 th DAP	150 th DAP	180 th DAP	210 th DAP	240 th DAP	270 th DAP	300 th DAP	330 th DAP	Harvest
T ₁	16.6	22.7	38.7	51.2	65.9	80.2	94.4	102.4	118.4	124.4	130.3	142.5
T ₂	17.3	26.5	41.4	52.6	67.4	88.4	97.3	108.4	121.2	127.6	136.5	149.7
T ₃	21.7	45.4	62.6	68.6	82.4	90.4	105.3	128.4	148.7	165.3	172.2	182.5
T ₄	22.4	46.6	65.7	71.2	89.4	94.6	108.4	129.4	152.4	168.9	174.6	188.6
T ₅	20.1	30.3	58.7	65.7	76.4	86.4	95.7	102.3	125.4	145.4	162.5	156.3
T ₆	20.4	38.7	62.4	69.4	82.3	90.2	97.4	108.4	138.7	152.5	166.6	162.4
T ₇	25.7	48.7	71.7	82.3	96.4	104.3	125.4	136.3	161.5	170.3	184.6	186.5
T ₈	25.8	49.6	72.4	65.4	97.9	109.4	127.6	142.4	165.3	172.6	188.7	194.3
CD(P=0.05)	1.13	2.07	3.17	3.66	4.41	4.98	5.70	6.42	7.58	8.22	8.82	9.13

The LAI of sugarcane crop was recorded with 30 days interval from 90th DAP and significant results was also recorded (Table-4). Among the treatments, setts treated with ether 100 ppm with foliar spray of GA₃ 35 ppm on 90, 120 and 150 DAS recorded the maximum LAI of 1.65 on 90 DAP and 4.67 at harvest and it was closely followed by 50ppm of ethrel setts treatment and foliar spray of GA₃ 35 ppm, which recorded 1.67 on 90 DAP and 4.35 at harvest.

Table -4. Use of plant growth regulators (PGRs) on LAI of sugarcane

Treatments	90 th DAP	120 th DAP	150 th DAP	180 th DAP	210 th DAP	240 th DAP	270 th DAP	300 th DAP	Harvest
T ₁	1.21	2.24	4.11	4.01	3.98	3.87	3.85	3.76	3.56
T ₂	1.25	2.28	4.21	4.12	4.02	3.97	3.96	3.86	3.62
T ₃	1.62	2.42	4.52	4.35	4.26	4.12	4.02	3.98	3.78
T ₄	1.64	2.65	4.65	4.56	4.42	4.36	4.26	4.12	3.87
T ₅	1.25	2.36	4.32	4.23	4.21	4.13	4.06	3.98	3.75
T ₆	1.22	2.52	4.52	4.46	4.36	4.29	4.16	4.08	3.89
T ₇	1.65	2.83	5.12	5.02	4.98	4.87	4.76	4.65	4.35
T ₈	1.67	2.87	5.21	5.16	5.02	5.01	4.98	4.87	4.67
CD(P=0.05)	0.08	0.14	0.25	0.24	0.24	0.23	0.23	0.22	0.21

The DMP of sugarcane crop was recorded with 30 days interval from 90th DAP and significant results was also recorded. Among the treatments, setts treated with ether 100 ppm with foliar spray of GA₃ 35 ppm on 90, 120 and 150 DAP recorded the maximum DMP of

9.68 t/ha and followed by 50ppm of ethrel setts treatment and foliar spray of GA₃ 35 ppm, which recorded 9.64 t/ha on 120 DAP. The same trend was also recorded in most of periodical observations were recorded from 90th DAP.

Table-5. Use of plant growth regulators (PGRs) on DMP (t/ha) of sugarcane 2016-17

Treatments	90 th DAP	120 th DAP	150 th DAP	180 th DAP	210 th DAP	240 th DAP	270 th DAP	300 th DAP	Harvest
T ₁	3.65	6.24	7.98	12.02	26.35	42.36	52.36	58.32	60.23
T ₂	4.546	7.25	8.69	12.25	28.36	46.35	55.36	59.36	61.23
T ₃	5.63	8.58	10.09	15.24	30.26	52.36	63.25	64.32	65.32
T ₄	5.64	8.69	10.12	15.68	31.26	58.62	68.52	70.23	72.36
T ₅	5.24	8.24	10.23	14.12	29.65	46.35	54.36	58.36	62.12
T ₆	5.35	8.35	10.36	14.25	30.65	42.36	56.38	58.89	63.45
T ₇	5.64	9.64	12.35	18.24	32.65	62.32	66.33	70.32	73.25
T ₈	5.68	9.68	12.36	18.36	34.25	64.23	70.36	75.32	77.89
CD(P=0.05)	0.28	0.45	0.55	0.81	1.63	2.78	3.26	3.45	3.59

3. Number of Millable cane population, cane length, girth and cane weight

The data on millable cane and single cane weight were recorded and presented in table 6. The maximum millable cane (1,72,650/ha) and single cane weight (1.56 kg) was recorded significantly with the treatment (T₈) setts treated with ethrel 100 ppm with foliar spray of GA₃ 35 ppm on 90, 120 and 150 DAS and was on par with 50ppm of ethrel setts treatment and foliar spray of GA₃ 35 ppm, which recorded millable cane (1,63,250/ha) and single cane weight (1.51 kg).

Table-6. Effect of PGR's on growth, yield and quality of sugarcane

Treatments	Brix %	Pole %	Purity %	Single cane weight (kg)	Millable cane '000 ha ⁻¹	Cane yield t ha ⁻¹	CCS (%)	Sugar yield (t/ha)	B:C ratio
T ₁	20.45	12.89	88.13	1.35	136.91	128.56	12.12	15.58	3.12
T ₂	20.59	12.95	89.32	1.44	140.25	129.65	12.19	15.80	3.15
T ₃	20.86	12.96	89.49	1.51	146.35	132.36	12.36	16.36	3.22
T ₄	20.51	12.92	88.69	1.46	152.36	137.56	12.45	17.13	3.33
T ₅	20.56	12.96	88.43	1.35	145.32	134.25	12.32	16.54	3.26
T ₆	20.59	12.95	89.48	1.44	151.23	136.25	12.42	16.92	3.31
T ₇	20.96	12.96	89.69	1.51	163.25	141.26	12.59	17.78	3.43
T ₈	20.86	12.99	88.89	1.56	172.65	145.36	12.75	18.53	3.53
CD(p=0.05)	NS	NS	NS	NS	11.83	8.55	NS	1.22	

4. Cane and sugar yield

The data on cane yield and sugar yield were recorded and presented in table 6. The maximum cane yield (145.36 t/ha) and sugar yield (18.53 t/ha) was recorded significantly with the treatment (T₈) setts treated with ethrel 100 ppm with foliar spray of GA₃ 35 ppm on 90, 120 and 150 DAS and followed by 50ppm of ethrel setts treatment and foliar spray of GA₃ 35 ppm, which recorded cane yield (141.26 t/ha) and sugar yield (17.78 t/ha).

5. Juice Quality parameters

The data on juice quality were recorded and commercial cane sugar calculated, the data presented in table 6. The data revealed that all the quality parameters are shown non significant results. However, numerically the maximum CCS (12.75 %) was recorded with the treatment (T₈) setts treated with ethrel 100 ppm with foliar spray of GA₃ 35 ppm on 90, 120 and 150 DAS and was closely followed by 50ppm of ethrel setts treatment and foliar spray of GA₃ 35 ppm, which recorded CCS (12.59 %).

6. Soil analysis

The post harvest soil samples were collected from the experimental plots and soil samples are analyzed. The result indicated that, available N (232.42 kg/ha), available P (42.36 kg/ha), available K (152.36 kg/ha), OC (0.47 %), bulk density (1.42 g/cc), infiltration rate (1.32 cm ha⁻¹).

7. Economics

The maximum B:C ratio of 3.53 was recorded with the treatment (T₈) setts treated with ethrel 100 ppm with foliar spray of GA₃ 35 ppm on 90, 120 and 150 DAS and was closely followed by 50ppm of ethrel setts treatment and foliar spray of GA₃ 35 ppm, which recorded 3.43.

Salient findings:

Among the treatments, the setts treated with ethrel 100 ppm with foliar spray of GA₃ 35 ppm on 90, 120 and 150 DAS was recorded significantly the maximum millable cane (1,72,650/ha), cane yield (145.36 t/ha), CCS (12.75) and sugar yield (18.53).

1. Project No. : AS 70

2. Title : Scheduling of irrigation with mulch under different sugarcane planting methods

3. Objective : To enhance crop and water productivity in sugarcane

4. Details of Technical programme:

Place of the technical project : Sugarcane Research Station, Cuddalore

Irrigated / Rainfed : Irrigated

Variety : CoC 24

Date of Planting : 22.05.2016

Date of Harvest : 26.05.2017

Year of start : 2016 -17

Treatments:

Planting techniques: (Main plots)

P₁ - Furrow planting of sugarcane setts at 120 cm spacing without mulch

P₂ - Furrow planting of sugarcane setts at 120 cm spacing with green manure sowing at 30 DAP, mulch at 75 DAP and earthing up 120 DAP

P₃ - Furrow planting of sugarcane setts at 120 cm spacing with alternate skip furrow irrigation after earthing up without mulch

P₄ - Furrow planting of sugarcane setts at 120 cm spacing with alternate skip furrow irrigation after earthing up with green manure/brown mulch

Irrigation scheduling: (Sub plots)

I₁ - 0.6 IW/CPE ratios with irrigation depth of 7.5 cm

I₂ - 0.8 IW/CPE ratios with irrigation depth of 7.5 cm

I₃ - 1.0 IW/CPE ratios with irrigation depth of 7.5 cm.

5. Design : RBD

6. Replication : Three

7. Plot size : 6m width x 8m length

10. Technical summary of the project:

1. Soil moisture, irrigation water applied, WUE and Germination count.

This experiment was laid out on 22.05.2016 with the objective to enhance the crop and water productivity of sugarcane in Strip Plot Design with three replications.

The result revealed that, non significant result was observed among the treatment on soil moisture content of soil up to 10th days after planting. Even though, among the methods of planting, the furrow planting of sugarcane setts at 120 cm spacing with green manure sowing on 30 DAP, mulch at 75 DAP and earthing up 120 DAP recorded maximum soil moisture content upto 40th day after planting (62.5 %) and it was on par with furrow planting (120cm row spacing) with alternate skip furrow irrigation after earthing up with green manure/brown mulching, and adopting the IW/CPE ratio of 1.0 recorded the maximum soil moisture upto 40th DAP (51.9 %). The same trend was also recorded upto 100th day after planting.

Among the methods of planting, furrow planting of sugarcane setts at 120 cm spacing with alternate skip furrow irrigation after earthing up with green manure/brown mulch recorded the maximum WUE of 2069.41 kg/ha^{-cm} and it was on par with furrow planting (120cm row spacing) with alternate skip furrow irrigation after earthing up with green manure/brown mulching, which recorded WUE of 2038.69 kg/ha^{-cm}. By adopting the IW/CPE ratio of 1.0 recorded the maximum WUE of 1831.87 kg/ha^{-cm}.

Table-1. Performance of methods of planting, mulching and irrigation scheduling on soil moisture

Treatments	Soil Moisture (%)								
	Planting	3 rd day	10 th day	17 th day	24 th day	31 st day	40 th day	50 th day	60 th day
Planting method and mulch practice									
P ₁	34.3	85.2	71.3	69.6	58.0	53.8	52.6	55.4	53.3
P ₂	35.2	86.0	74.4	74.1	64.1	61.0	62.5	65.4	63.2
P ₃	34.5	84.3	66.0	62.9	36.03	32.7	36.6	45.4	43.3
P ₄	34.7	84.1	68.6	64.2	54.6	56.4	57.6	63.3	61.3
CD(p=0.05)	NS	NS	2.91	5.43	2.18	3.87	2.09	4.40	2.20
Irrigation schedule (IW/CPE) with depth of irrigation 7.5 cm									
I ₁	34.1	86.8	69.8	66.1	51.7	46.9	49.6	53.5	52.3
I ₂	34.3	85.4	70.7	68.3	52.6	48.7	50.5	55.4	53.3
I ₃	34.6	87.8	71.5	70.6	53.5	50.3	51.9	57.2	54.2
CD(p=0.05)	NS	NS	NS	3.78	2.91	2.69	2.79	3.06	NS

Table-1a. Performance of methods of planting, mulching and irrigation scheduling on soil moisture

Treatments	Soil Moisture (%)				Irrigation water applied (ha ^{-cm})	WUE kg/ha ^{-cm}
	70 th day	80 th day	90 th day	100 th day		
Planting method and mulch practice						
P ₁	51.6	48.5	45.3	42.2	90.00	1371.67
P ₂	62.5	58.7	59.3	56.4	68.50	2038.69
P ₃	36.5	36.3	38.6	36.5	60.50	1987.60
P ₄	58.6	45.4	57.3	55.3	63.25	2069.41
CD (p=0.05)	3.99	1.98	3.79	1.86		
Irrigation schedule (IW/CPE) with depth of irrigation 7.5 cm						
I ₁	48.5	46.9	46.1	44.2	68.23	1766.04
I ₂	50.2	47.9	47.8	45.0	70.59	1800.04
I ₃	51.9	48.7	49.4	45.8	72.86	1831.87
CD (p=0.05)	NS	NS	2.64	NS		

Regarding the growth parameters, the result revealed that, non significant result among the treatment on germination per cent of cane. Even though, among the methods of planting, the furrow planting (120cm row spacing) with alternate skip furrow irrigation after earthing up without mulching recorded the maximum germination of 88.36 per cent, it was on par with furrow planting (120cm row spacing) with alternate skip furrow irrigation after earthing up with green manure/brown mulching, which recorded 88.21 per cent and adopting the IW/CPE ratio of 1.0 recorded the maximum germination of 88.88 per cent.

2. Tiller population

Among the methods of planting, the furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing up without mulching recorded the maximum tillers of 2,42,320/ha and it was on par with furrow planting (120cm row spacing) with alternate skip furrow irrigation after earthing up with green manure/brown mulching, which recorded 2,32,560/ha and adopting the IW/CPE ratio of 1.0 recorded significantly the maximum tillers of 2,32,110/ha.

Table -2. Performance of method of planting, mulching and irrigation scheduling on growth and yield parameters of sugarcane

Treatments	Germination (%)	Tiller population ('000/ha)			Plant height (cm)			NMC '000/ha	Cane length (cm)
		90 DAP	120 DAP	180 DAP	90 DAP	120 DAP	180 DAP		
Planting method and mulch practice									
P ₁	87.18	203.24	221.32	236.24	68.35	86.23	106.34	76.32	159.36
P ₂	89.69	232.56	245.32	258.65	76.35	112.36	146.35	132.56	282.32
P ₃	88.36	224.32	132.24	141.23	74.32	104.25	112.32	110.36	218.24
P ₄	88.21	242.32	248.65	222.32	82.32	111.24	144.35	134.56	275.32

CD P=0.05	NS	14.73	13.84	13.03	4.92	6.76	8.32	7.41	15.27
Irrigation schedule (IW/CPE) with depth of irrigation 7.5 cm									
I ₁	87.26	219.02	204.97	191.68	70.07	93.26	112.45	98.40	203.19
I ₂	88.40	225.70	211.97	199.70	75.36	104.12	127.35	113.49	233.89
I ₃	89.42	232.11	218.70	217.45	80.57	113.18	142.22	128.46	264.35
CD P=0.05	NS	9.54	11.72	11.07	4.17	5.72	7.04	6.27	12.93

3. Number of Millable cane population, cane length, girth and cane weight

Among the methods of planting, the furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing up without mulching recorded the maximum Millable cane population of 1,32,560/ha and it was on par with furrow planting (120cm row spacing) with alternate skip furrow irrigation after earthing up with green manure/brown mulching, which recorded 1,34,560/ha and adopting the IW/CPE ratio of 1.0 recorded significantly the maximum Millable cane population of 1,28,460/ha.

The result on individual cane length, cane diameter and cane weight revealed that, the furrow planting of sugarcane setts at 120 cm spacing with green manure sowing at 30 DAP, mulch at 75 DAP and earthing up 120 DAP recorded the maximum cane length (282.32 cm), cane diameter (2.84 cm) and cane weight (1.72 kg), it was on par with furrow planting (120cm row spacing) with alternate skip furrow irrigation after earthing up with green manure/brown mulching, which recorded 275.32cm, 2.74 cm and 1.65 kg of cane length, cane diameter and cane weight respectively. Adopting the IW/CPE ratio of 1.0 recorded the maximum cane length of 264.35cm, cane diameter of 2.93 cm and cane weight of 1.76 kg respectively.

4. Cane and sugar yield

Among the methods of planting, the furrow planting of sugarcane setts at 120 cm spacing with green manure sowing at 30 DAP, mulch at 75 DAP and earthing up 120 DAP recorded significantly the maximum cane yield (139.65 t/ha) and sugar yield (17.72 t/ha). Adopting the IW/CPE ratio of 1.0 recorded significantly the maximum cane yield (131.87 t/ha), sugar yield (16.43 t/ha).

5. Juice Quality parameters

The result on quality parameters revealed that, non significant result among the treatment on quality parameters of cane. Among the methods of planting, the furrow planting of sugarcane setts at 120 cm spacing with green manure sowing at 30 DAP, mulch at 75 DAP and earthing up 120 DAP recorded the maximum commercial cane per cent of 12.69, it was on par with furrow planting (120cm row spacing) with alternate skip furrow irrigation after earthing up with green manure/brown mulching, which recorded 12.42 per cent. Adopting the IW/CPE ratio of 1.0 recorded the maximum 12.65 per cent of CCS.

Table -3. Performance of method of planting, mulching and irrigation scheduling on yield and quality parameters of sugarcane

Treatments	Cane Diameter (cm)	Cane weight (kg)	Brix (%)	Pole (%)	Purity (%)	CCS (%)	Cane yield (t/ha)	Sugar yield (t/ha)	B:C ratio
Planting method and mulch practice									
P ₁	1.92	1.24	20.12	12.12	87.26	12.45	123.45	15.37	3.35
P ₂	2.84	1.72	20.87	12.96	89.56	12.69	139.65	17.72	3.78
P ₃	2.12	1.32	20.02	12.96	87.12	12.36	120.25	14.86	3.26
P ₄	2.74	1.65	20.06	12.87	88.65	12.42	130.89	16.26	3.55
CD P=0.05	0.16	0.28	0.98	NS	NS	NS	8.45	1.38	
Irrigation schedule (IW/CPE) with depth of irrigation 7.5 cm									
I ₁	1.88	1.20	19.92	12.29	85.30	12.34	123.64	15.41	3.40
I ₂	2.41	1.48	20.35	12.69	88.02	12.51	127.84	16.11	3.47
I ₃	2.93	1.76	20.74	13.06	90.62	12.65	131.87	16.43	3.58
CD P=0.05	0.13	0.22	NS	NS	NS	NS	7.07	0.88	

6. Soil analysis

Post harvest Soil analysis

The post harvest soil samples were collected from the experimental plots as per the recommendation and soil samples are analyzed in the laboratory. The analyzed data presented in table 5. The result revealed that, among the methods of planting, the furrow planting of sugarcane setts at 120 cm spacing with green manure sowing at 30 DAP, mulch at 75 DAP and earthing up 120 DAP influenced the maximum soil parameters *viz.*, available N (212.23 kg/ha), available P (36.32 kg/ha), available K (138.65 kg/ha), OC (0.68 %), bulk density (1.37 g/cc), infiltration rate (1.24 cm ha⁻¹), azotobactor (1.06x10⁻⁴/gm), PSB (2.97x10⁻⁴/gm).

7. Economics

Regarding the result on economics, the furrow planting of sugarcane setts at 120 cm spacing with green manure sowing at 30 DAP, mulch at 75 DAP and earthing up 120 DAP recorded the maximum B:C ratio of 3.78, it was on par with furrow planting (120cm row spacing) with alternate skip furrow irrigation after earthing up with green manure/brown mulching, which recorded 3.55.

Salient findings:

Among the methods of planting, the furrow planting of sugarcane setts at 120 cm spacing with green manure sowing at 30 DAP, mulch at 75 DAP and earthing up 120 DAP recorded significantly the maximum cane yield (139.65 t/ha), sugar yield (17.72 t/ha) and B:C ratio of 3.78 and adopting the IW/CPE ratio of 1.0 recorded significantly the maximum cane yield (131.87 t/ha), sugar yield (16.43 t/ha) and B:C ratio 3.58.

Table 5. Performance of method of planting, mulching and irrigation scheduling on post harvest soil physical and chemical properties

Treatments	B.D g cc ⁻¹	Infiltration rate (cm hr ⁻¹)	OC (%)	EC (dSm ⁻¹)	pH	N kg ha ⁻¹	P kg ha ⁻¹	K kg ha ⁻¹	Soil Azoto x 10 ⁻⁴ /gm	Soil PSB x 10 ⁻⁴ /gm	Plant nutrient uptake		
											N kg ha ⁻¹	P kg ha ⁻¹	K kg ha ⁻¹
Planting method and mulch practice													
P ₁	1.23	1.38	0.38	1.12	6.72	121.36	17.65	119.63	0.39	0.94	125.36	22.35	68.56
P ₂	1.37	1.24	0.68	0.98	7.32	212.23	36.32	138.65	1.06	2.97	146.32	36.54	120.35
P ₃	1.27	1.32	0.42	1.02	6.64	153.26	24.25	122.38	1.02	3.12	128.65	20.25	72.56
P ₄	1.39	1.23	0.69	0.97	7.42	208.53	38.65	140.39	0.98	2.97	145.38	35.87	132.65
CD (P=0.05)	0.10	0.05	0.04	0.04	0.57	7.20	5.43	16.18	0.04	0.20	1.21	2.29	4.08
Irrigation schedule (IW/CPE) with depth of irrigation 7.5 cm													
I ₁	1.09	1.07	0.45	1.15	6.83	144.29	24.25	108.12	0.35	1.02	127.77	23.86	81.78
I ₂	1.26	1.24	0.52	1.18	7.24	166.89	28.05	125.05	0.39	1.10	130.97	27.60	94.59
I ₃	1.59	1.56	0.66	1.24	7.50	210.35	35.35	157.62	0.36	1.05	150.54	34.79	119.22
CD(P=0.05)	0.07	0.07	0.03	0.06	0.39	9.61	4.85	7.20	NS	0.06	7.54	1.59	5.45

1. Project No. : AS 71

2. Title : Carbon sequestration assessment in sugarcane based cropping system

3. Objective : To improve the total soil organic build-up and sustain crop yield

4. Details of Technical programme

Place of the technical project : Sugarcane Research Station, Cuddalore

Irrigated / Rainfed : Irrigated

Variety : CoC 24

Date of Planting : 12.02.2016

Date of Harvest : 21.02.2017

Year of start : 2016 -17

Treatments:

T₁ - Soybean – Maize,

T₂ - Sugarcane – Ratoon – Cow pea/Moong bean

T₃ - Sugarcane – Ratoon (trash mulching without *Trichoderma*) – Maize

T₄ - Sugarcane – Ratoon (trash removal without *Trichoderma*) – Maize

T₅ - Sugarcane – Ratoon (trash mulching with *Trichoderma*) – Maize

T₆ - Sugarcane – Ratoon – Maize (trash incorporation through rotovator and *Trichoderma* incorporation before planting of Maize)

T₇ - Sugarcane – Ratoon - Maize (Zero tillage without *Trichoderma*)

T₈ - Sugarcane – Ratoon – Maize (Zero tillage with *Trichoderma*)

5. Design : RBD

6. Replication : Three

7. Plot size : 6 rows of 6 meter length

8. Climatic parameters :

Month	Temperature °C		RH (%)	Rain fall (mm)
	Maximum	Minimum		
April 2016	36.2	21.9	81.5	0.0
May 2016	36.3	21.9	71.6	91.0
June 2016	35.4	20.8	79.8	63.0
July 2016	35.3	19.2	82.1	90.8
August 2016	36.2	18.0	78.6	112.6
September 2016	34.8	16.6	81.3	35.6
October 2016	34.7	15.6	83.9	159.2
November 2016	32.1	20.8	85.3	5.6
December 2016	39.8	18.6	89.0	76.8
January 2017	29.5	17.6	87.3	91.0
February 2017	30.9	16.6	86.6	0.0
March 2017	32.5	24.1	91.1	0.0

9. Observation on soil health:

Initial Soil analysis

The pre plant soil samples were collected and analyzed for the estimation of physico-chemical properties. The result showed that, the pH of 7.84, EC of 0.47 dS m⁻¹, organic carbon content of 0.35 per cent, CEC of 29.84 c mol p⁽⁺⁾ kg⁻¹, available nitrogen content of 240.33 kg ha⁻¹, available phosphorus content of 39.67 kg ha⁻¹ and available potassium content of 123.7 kg ha⁻¹ were found to be in the surface soil.

10. Technical summary of the project

1. Germination count/plant population

This experiment was laid out on 24.02.2016 with the objective to improve soil organic carbon build-up and sustain sugarcane yield in Randomized Block design with three replications. Observations on soil parameters, crop growth and yield parameters were documented.

The result revealed that, among the treatment non significant result was recorded with respect to germination on 35th and 45th DAP. Eventhough, the maximum germination recorded Sugarcane – Ratoon – Maize (trash incorporation through rotovator and Trichoderma incorporation before planting of Maize) with 74.26 and 74.36 per cent respectively on 35th and 45th DAP.

Table -1. Effect of different mulch in operations and biofertilizers application on growth of sugarcane under varied cropping programme

Treatments	Germination (%)		Tiller population ('000 ha ⁻¹)			Plant height (cm)		
	35 DAP	45 DAP	90 DAP	120 DAP	180 DAP	90 DAP	120 DAP	180 DAP
T ₁	-		-	-	-	-	-	-
T ₂	68.25	68.95	205.32	224.56	245.68	72.32	112.12	138.56
T ₃	70.12	70.32	212.32	223.65	251.23	76.56	110.25	143.26
T ₄	73.26	73.46	208.53	235.62	243.21	74.25	108.78	146.35
T ₅	73.68	73.84	206.58	229.68	246.35	73.68	109.56	145.68
T ₆	74.26	74.36	212.35	231.25	253.21	78.56	115.26	147.69
T ₇	73.56	73.65	215.63	218.56	239.68	78.92	109.26	147.23
T ₈	73.86	73.89	214.23	229.65	249.65	81.24	114.23	143.69
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS

2. Tiller population

The result revealed that, among the treatment non significant result was recorded with respect to tiller population and plant height recorded on 90th, 120th, and 180th DAP. Among the treatments, Sugarcane – Ratoon – Maize (Zero tillage with *Trichoderma*) recorded numerically the maximum tiller and plant height.

3. Number of Millable cane population, cane length, girth and cane weight

The result revealed that, among the treatment non significant result was recorded with respect to NMC, cane length, cane diameter and individual cane weight of sugarcane.

4. Cane and sugar yield

The result revealed that, among the treatment non significant result was recorded with respect to cane yield and sugar yield. Eventhough, the maximum cane yield (137.6 t/ha) and sugar yield (16.66 t/ha) was recorded in Sugarcane – Ratoon (trash mulching with *Trichoderma*) – Maize cropping sequence.

5. Juice Quality parameters

The result revealed that, among the treatment non significant result was recorded with respect to juice quality of sugarcane.

Table -2. Effect of different mulch in operations and biofertilizers application on yield and quality of sugarcane under varied cropping programme

Treat-ments	NMC ('000 ha ⁻¹)	Cane length (cm)	Cane diameter (cm)	Single cane weight (kg)	Brix %	Pole %	Purity %	CCS (%)	Cane yield t ha ⁻¹	Sugar yield t ha ⁻¹	B:C ratio
T ₁	-	-	-	-	-	-	-	-	-	-	-
T ₂	132.0	282.3	2.12	1.45	20.6	17.9	86.9	12.3	129.0	15.89	2.45
T ₃	138.0	275.6	1.89	1.49	20.4	17.4	84.8	12.8	130.2	16.60	2.72
T ₄	135.0	283.2	1.98	1.48	20.5	18.1	88.3	12.5	131.3	16.43	2.67
T ₅	132.3	284.2	2.13	1.58	20.7	17.9	86.3	12.2	137.6	16.66	2.74
T ₆	136.0	179.6	1.98	1.51	20.7	17.7	85.3	12.0	137.5	16.51	2.68
T ₇	133.2	178.6	2.14	1.49	20.5	17.8	86.3	12.1	130.3	15.81	2.51
T ₈	135.0	179.6	1.97	1.46	20.3	17.7	86.7	12.1	132.6	16.06	2.53
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	

Soybean

Regarding the cropping sequence the soybean (Table-3) recorded the maximum germination (65.36 per cent), plant height (42.32 cm), LAI (2.81), number of pod per plant (42.21), number of seed per plant (35.69), seed weight (2.23 g/seed) and grain yield (16.23 q/ha).

Table -3. Performance of soybean on growth and yield

Time of observations	Germination (%)	Plant height (cm)	LAI	Pod No./plant	Seed No./plant	Seed wt.(g)	Yield (q/ha)
7-10 DAS	65.36						
30 DAS		28.56	1.82				
60 DAS		42.32	2.81				
Harvest		68.32	3.10	42.21	35.69	2.23	16.23

Maize

The maize crop recorded (Table 4) recorded the maximum germination (85.26 per cent), plant height (64.23 cm), LAI (3.27), number of cob per plant (1.96), number of seed per cob (438.65) and grain yield (23.86 q/ha).

Table -4. Performance of maize on growth and yield

Time of observations	Germination (%)	Plant height (cm)	LAI	Cob No./plant	Grains No./Cob	Cob length (cm)	Yield (q/ha)
10-15 DAS	85.26						
30 DAS		33.00	0.63				
60 DAS		64.23	3.27				
Harvest		86.52	3.01	1.96	438.65	15.26	23.86

6. Soil analysis

Post harvest Soil analysis

The post harvest soil samples were collected from the experimental plots as per the recommended soil sampling depth of 0 to 30 cm, 30 to 60 cm and 60 to 90 cm and soil samples are analyzed in the laboratory and the data presented in table 5, 6 and 7. The result revealed that, non significant results were recorded in all the soil parameters.

7. Economics

The result revealed that, among the treatment no significant result was recorded with respect to B:C ratio. However, Sugarcane – Ratoon – Maize (trash incorporation through rotovator and *Trichoderma* incorporation before planting of Maize) cropping programme recorded 2.74 B:C ratio.

Salient findings:

The result indicated that, non significant result was recorded in all the parameters. Among the sequence the soybean recorded the maximum germination (65.36 per cent), plant height (42.32 cm), LAI (2.81), number of pod per plant (42.21), number of seed per plant (35.69), seed weight (2.23 g/seed) and grain yield (16.23 q/ha). The maize crop recorded (Table 3) the maximum germination (85.26 per cent), plant height (64.23 cm), LAI (3.27), number of cob per plant (1.96), number of seed per cob (438.65) and grain yield (23.86 q/ha).

1. Project No. : AS 72

2. Title : Agronomic performance of elite sugarcane genotypes

3. Objective:

To assess the performance of promising sugarcane genotypes of Advance Varietal Trial (AVT)

4. Details of technical programme

Place of the technical project : Sugarcane Research Station, Cuddalore

Irrigated / Rainfed : Irrigated

Year of start : 2016 - 17

Treatments:

i. Season : Spring (Early) - One

Date of Planting : 24.02.2016

Date of Harvest : 01.03.2017

ii. Genotypes : V1- CoA 12321
V2 - CoA 12322
V3 - CoA 12323
V4 - CoOr 12346
V5 - CoV 12356

iii. Varieties : V6 – Co 6907
V7 – CoC 01061
V8 – CoA 92081

iv. Levels of fertilizers : 125 per cent recommended dose of Nitrogen

5. Design : RBD

6. Replication : Three

7. Plot size : 5 rows of 6 meter length

8. Climatic parameters :

Month	Temperature °C		RH (%)	Rain fall (mm)
	Maximum	Minimum		
April 2016	36.2	21.9	81.5	0.0
May 2016	36.3	21.9	71.6	91.0
June 2016	35.4	20.8	79.8	63.0
July 2016	35.3	19.2	82.1	90.8
August 2016	36.2	18.0	78.6	112.6
September 2016	34.8	16.6	81.3	35.6
October 2016	34.7	15.6	83.9	159.2
November 2016	32.1	20.8	85.3	5.6
December 2016	39.8	18.6	89.0	76.8
January 2017	29.5	17.6	87.3	91.0
February 2017	30.9	16.6	86.6	0.0
March 2017	32.5	24.1	91.1	0.0

9. Observation on soil health:

Initial Soil analysis

The pre plant soil samples were collected and analyzed for the estimation of physico-chemical properties. The result indicated that, available N (256.36 kg/ha), available P (45.36 kg/ha), available K (202.15 kg/ha), OC (0.49 %), bulk density (1.35 g/cc), infiltration rate (1.28 cm ha⁻¹) was recorded.

10. Technical summary of the project

The experiment was laid out on 24.02.2016 with the objective to assess the Agronomic performance of sugarcane genotype promoted from the Advance Varietal Trials (AVT) in Randomized Block Design with three replications.

Three sugarcane genotypes viz., CoA 12321, CoA 12322, CoA 12323, CoOr 12346 and CoV 123456 along with the standards Co 6907, CoC 01061 and CoA 92081 were planted in combination with application of 125 per cent of recommended dose of NPK (300:100:200 kg NPK/ha) in spring season.

1. Germination count/plant population

The results revealed that the genotype CoA 12321 have recorded the maximum germination of 82.62 per cent and it was comparable with the standard CoC 01061 and genotype CoA 13222, which recorded 87.96 and 81.89 per cent of germination.

2. Tiller population

The results revealed that the genotype CoA 12321 have recorded the maximum tiller population of 1,94,650/ha and it was comparable with the standard CoC 01061 and genotype CoA 13222, which recorded 1,99,860/ha tillers and 1,89,680/ha respectively.

3. Number of Millable cane population, cane length, girth and cane weight

The results revealed that the genotype CoA 12321 have significantly recorded the maximum Millable cane population of 1,36,980/ha, cane weight (1.55 kg), cane length (294.3 cm) and cane diameter (2.87 cm).

4. Cane and sugar yield

The results revealed that the genotype CoA 12321 significantly recorded the maximum cane yield (139.3 t ha⁻¹) and sugar yield (16.81 t/ha) and it was on par with the entries CoA 12323, CoC 01061 and CoOr 12346.

5. Juice Quality parameters

The non significant result was recorded on brix, pole, purity and commercial cane sugar percent. Even though, the new entry CoOr 12346 recorded numerically the maximum of 12.8 per cent CCS.

6. Soil analysis

Post harvest Soil analysis

The post harvest soil samples were collected from the experimental plots as per the treatments. The result revealed that, the soil parameters indicated *viz.*, available N (236.25 kg/ha), available P (42.13 kg/ha), available K (136.89 kg/ha), OC (0.58 %), bulk density (1.38 g/cc), infiltration rate (1.28 cm ha⁻¹).

7. Economics

The clone CoA 12321 recorded the maximum B:C ratio of 3.18 and followed by CoOr 12346 which recorded 3.13 of B: C ratio.

Table -1. Performance of sugarcane genotypes on growth and yield

Treatments	Germination (%)	Millable canes '000 ha ⁻¹	Cane wt. (kg)	Cane leth. (cm)	Cane Dia. (cm)	Cane yield t ha ⁻¹	CCS (%)	Sugar yield t ha ⁻¹	B:C ratio
V ₁ : CoA 12321	82.86	136.98	1.55	294.3	2.87	139.3	12.7	16.81	3.18
V ₂ : CoA 12322	81.69	132.54	1.39	293.3	2.92	136.6	12.6	15.39	3.10
V ₃ : CoA 12323	67.35	121.25	1.52	283.7	2.79	128.3	12.7	16.03	2.85
V ₄ : CoOr 12346	72.36	129.35	1.47	281.0	2.48	137.7	12.8	16.71	3.13
V ₅ : CoV 12356	79.62	121.20	1.43	270.7	2.76	122.3	12.6	14.29	2.67
V ₆ : Co 6907	72.65	124.32	1.19	263.7	2.58	112.4	11.9	13.66	2.37
V ₇ : CoC 01061	87.96	135.69	1.43	275.7	2.35	134.6	12.7	16.34	3.04
V ₈ : CoA 92081	67.89	121.25	1.49	261.7	2.73	122.3	12.5	14.12	2.67
CD (p=0.05)	4.98	7.16	0.08	9.96	0.15	7.19	0.70	0.86	

Salient findings:

The genotype CoA 12321 significantly recorded higher cane yield (139.2 t/ha) and sugar yield (16.81 t/ha) resulted higher B: C ratio (3.18) with 125 % recommended dose of Nitrogen per hectare.

TAMIL NADU AGRICULTURAL UNIVERSITY

From
Dr. M. Jayachandran, Ph.D.,
Professor and Head,
Sugarcane Research Station,
Cuddalore – 607 001.

To
The Project Coordinator
AICRP on Sugarcane
Indian Institute of Sugarcane Research (IISR)
Rae Bareli Road, Dilkusha, Post
Lucknow – 226 002.
Uttar Pradesh

No. P&H/ SRS/ CDL/ AICRP (S)/ Annual Report for 2016-17 /2017 dt. 01.06.2017

Sir,

Sub : Sugarcane Research Station, Cuddalore – AICRP on Sugarcane- Annual Report for 2016-17 – Submitted – Regarding.

As per the references cited above, I submit to enclose herewith the Annual Report of AICRP (S) pertaining to Crop Production under East Coast Zone of AICRP on Sugarcane of this centre for kind perusal.

**-Sd/--
Professor and Head**

Copy submitted to the Principal Scientist & P.I. (Crop Production), ICAR – Indian Institute of Sugarcane Research, Lucknow – 226 002.

Copy submitted to the Director of Research, TNAU, Coimbatore - 641 003.

Copy submitted to the Director, Tamil Nadu Rice Research Institute, Aduthurai – 612 001.