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ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE

TECHNICAL REPORT
2017-2018
Crop Production
(Agronomy & Soil Science)

Compiled by

Dr. T.K. Srivastava, Principal Scientist
&
Principal Investigator

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CONTENTS

PROJECT No.: AS-68

Title: Impact of integrated application of organics and in organics in improving soil health and sugarcane productivity

Objective : To develop nutrient management strategy for sustaining soil health and sugarcane production.
Year of start : 2014 - 2015
Locations : All the participating centres
Cropping system : Sugarcane – Ratoon-I – Ratoon-II

Treatment & Methodology:

Treat-ments	**Sugarcane (plant crop)**	**Ratoon-I**	**Ratoon- II**
T1	No organic + 50% RDF	Application of trash at 10 tonnes/ ha + 50% RDF	Application of trash at 10 tonnes/ ha + 50% RDF
T2	No organic + 100% RDF	Application of trash at 10 tonnes/ ha + 100% RDF	Application of trash at 10 tonnes/ ha + 100% RDF
T3	No organic + soil test based recommendation	Application of trash at 10 tonnes/ ha + soil test basis (NPK application)	Application of trash at 10 tonnes/ ha + soil test basis (NPK application)
T4	Application of FYM/Compost @ 20 tonnes / ha + 50% RDF (inorganic source)	Application of FYM/Compost @ 20 tonnes / ha + 50% RDF (inorganic source)	Application of FYM/Compost @ 20 tonnes / ha + 50% RDF (inorganic source)
T5	Application of FYM/Compost @ 20 tonnes / ha + 100% RDF (inorganic source)	Application of FYM/Compost @ 20 tonnes / ha + 100% RDF (inorganic source)	Application of FYM/Compost @ 20 tonnes / ha + 100% RDF (inorganic source)
T6	Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (NPK application)	Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (NPK application)
T7	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter + PSB*) + 50% RDF	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter + PSB*) + 50% RDF	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter + PSB*) + 50% RDF
T8	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter + PSB*) + 100% RDF	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter + PSB*) + 100% RDF	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter + PSB*) + 100% RDF
T9	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter + PSB*) + soil test basis	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter + PSB*) + soil test basis (NPK application)	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter + PSB*) + soil test basis (NPK application)

Note:

1. The application rate of biofertilizer (*Azotobacter/ Acetobacter* + PSB) will be 5 kg/acre (solid based fertilizer 10^{7-8}cfu).
2. $ZnSO_4$ @ 25 kg/ha will be applied at the start of the cycle.
3. Trash will be inoculated with cellulolytic organism such as *Trichoderma viride* @ 500 g/tonne.
4. The experiment will be conducted in permanent field lay out.

Design	:	RBD
Replications	:	Three
Plot size	:	6 rows of 6 m length
Planting season:		February – March / Main season

Observations to be recorded:

1. Germination count/ plant population at 30 and 45 DAP / DAR
2. Tiller population at 120 and 150 DAP/DAR
3. Millable canes, length, girth and cane weight at harvest
4. Cane and sugar yield
5. Juice quality parameters (Brix, pol, purity) at 10 and 12 months age
6. Soil analysis initial and after harvest of each crop (bulk density, infiltration rate, organic carbon, soil pH, EC, available N, P_2O_5, K_2O in kg/ha)
7. Economics
8. Nutrient uptake (N, P, K)) at harvest (optional)
9. Soil microbial parameters (optional)

SUMMARY REPORT FOR THE LAST YEAR (2016-17)

The trial initiated during the year 2014-15 with allotment to all the centres. However, during the year 2016-17 only 21 centres carried out the trial.

NORTH WEST ZONE

1. FARIDKOT

On the basis of one plant and two ratoon crops it can be concluded that application of FYM/ Compost (20 t/ha) + inorganic nutrient based on soil test (T6) is the best for getting higher mean cane yield followed by T5, T9 and T8. The Gross and net returns are also having same trend.

2. LUCKNOW

Significantly the highest rate of ratoon stubble sprouts (83.6%) was observed under 20 t FYM + STRC nutrient application followed by the treatment of only organic application. Highest number of tillers (217.3 thousand/ha at 150 days after initiation), shoot count (235.7 thousand/ha at 210 DAI), number of millable canes (156.8 thousand/ha), cane yield (89.4 t/ha) and sugar yield (9.87 t/ha) were recorded under the treatment where application of FYM @ 20 t/ha was done along with soil test (rating chart) based inorganic fertilizer recommendations.

3. PANTNAGAR

In Ratoon II highest cane yield (54.69 t/ha) was recorded in T6- FYM@20t/ha + inorganic fertilizer on soil test based. Millable cane, cane girth, cane length and weight of individual cane were also higher in T6. Commercial cane sugar was higher in T5 which was significantly higher over rest of the treatments.

4. UCHANI

Significantly highest number of tillers (137.9, 136.0 thousands/ha), NMC (114.9, 113.2 thousands/ha) and cane yield (93.6, 91.9 t/ha) and sugar yield were recorded under treatment of FYM @ 20 t/ha with soil test based fertilizer application or 100 % RDF. However these treatments were found at par with application of FYM @ 10 t/ha+ bio fertilizers along with fertilizers on soil test basis or 100 % RDF. So continuous application of FYM @ 10 t/ha + bio fertilizers in sugarcane plant-ratoon-I and ratoon-II will be equally effective in comparison to FYM @ 20 t/ha.

5. KAPURTHALA

On the basis of three year (one plant and two ratoons) data it can be concluded that the application of FYM/Compost @ 20 tonnes / ha + in-organic nutrient based on soil test (T6) is the best for getting higher cane yield followed by T9 and T5.

6. SHAHJAHANPUR

Application of FYM @ 10 tones/ha + bio-fertilizers (Azotobacter + PSB) + soil test basis NPK (T9) gave significantly higher second ratoon cane yield (82.16 t/ha) followed by

application FYM @ 20 tones/ha + inorganic nutrient application based on soil test (T6). Maximum benefit cost ratio (1.64) was also obtained in T9 treatment.

7. SRIGANGANAGAR

The result indicated that number of tillers, NMC, single cane weight and cane yield were influenced significantly due to different nutrient treatments while, the effect on CCS % was non-significant. Cane yield (68.4 t/ha) was the highest with the application of FYM @ 20 t/ha + inorganic nutrient based on soil test (T6) which was significantly higher over other treatments except T5 – application of FYM @ 10 t/ha + bio fertilizers + soil test basis inorganic nutrients (64.3 t/ha).

8. KOTA

Among the nutrient management practices, application of 150:50:30 Kg N, P2O5, K2O/ha based on soil test through inorganic sources and enriched with FYM (10 t/ha) +12.5 + 12.5kg/ha (Azotobacter + PSB) was found best for increasing cane yield, CCS yield and net returns during three years. Whereas, application of 150:50:30 kg N, P2O5, K2O/ha through inorganic source enriched with FYM (20 t/ha) (T6) was found significantly superior and next best treatment in respect of cane quality and improving the status of soil during three years.

PENINSULAR ZONE

9. THIRUVALLA

In plant crop, among the various treatments, T8 (FYM/ compost @ 10 t/ha + bio fertilizer (Azotobacter/Acetobacter + PSB) + 100% RDF) recorded significantly higher values for cane length (255.61 cm), MCC (91000/ha) and resulted in highest yield (108.50 t/ha). Brix and sugar yield also followed the same trend with significantly higher values for sugar yield (12.42 t/ha) for the very same treatment. It was followed by T6 (FYM/ Compost @ 20 t/ha + inorganic nutrient application based on soil test (rating chart). With regard to ratoon crop also, the same trend was visible where T8 itself recorded the highest values for cane length (262.07 cm), MCC (93240/ha), cane yield (111.10 t/ha) and sugar yield (12.74 t/ha).

10. MANDYA

The data on cane and ratoon I and II yield indicated that, application of FYM (20 t/ha) + inorganic nutrient application based on soil test results recorded significantly higher cane, ratoon I and ratoon II yield (96.58, 90.33 and 74.84 t/ha, respectively) compared to all other treatments. However, it was on par with application of FYM (20 t/ha) + 100% RDF (93.12, 88.07 and 65.71 t/ha, respectively), application of FYM (10 t/ha) + bio fertilizer (Azotobacter + PSB) + 100% RDF (90.63, 85.50 and 67.54 t/ha, respectively) and application of FYM (10 t/ha) + bio fertilizer (Azotobacter + PSB) + soil test basis fertilizer application (88.73, 84.72 and 68.42 t/ha, respectively).

11. SANKESHWAR

The treatment differences did not exist due to severe drought for the last 3 years. Hence, most of the parameters recorded in the experiment did not show any variation due to moisture stress.

12. PADEGAON

The data in respect of yield and yield contributing parameters revealed that the treatment T6 receiving RDF as per soil test along with 20 t/ha FYM recorded significantly the higher number of millable canes and cane yield (92.76 '000/ha and 119.10 t/ha, respectively) and it was found at par with treatment T9, T5, T8 and T4 for cane yield. However, as far CCS yield the treatment T6 (15.35 t/ha) was found at par with the treatments T9, T5, T8, T4, T7 and T3. Significantly higher number of internodes (27), cane girth (7.31cm), millable height (230cm) was recorded in treatment T6 which was found at par with T9, T8, T5 and T4.

13. NAVSARI

Cane yield (117.59 t/ha) was recorded significantly higher with T9 over T1 and remained at par with T3, T6 and T8. CCS yield was significantly influenced due to various nutrient management treatments. Various quality parameters were not significantly influenced due to different nutrient management treatments except purity % at 10 month. Almost, all the treatment round equally effective over T5. While at 12 month, quality parameters were not significantly influenced due to different treatments. There was no significant difference observed due to various inorganic and organic treatments on soil pH, EC (1:2.5 dS/m), and available K_2O and BD.

14. COIMBATORE

In first ratoon sugarcane crop, 20 t FYM + 150 STCR based fertilizer application was found beneficial in improving cane yield over rest of the nutrient management treatments. The treatment 20 t FYM + 150 STCR based fertilizer application recorded the highest NMC (119753 NMC/ha) and cane yield (137.74 t/ha) and was closely followed by the treatments 10 t FYM+ bio fertilizers + 150 STCR (127.27 t/ha). Sugarcane juice analysis done at 12 months revealed that Brix, Sucrose %, Purity % and CCS % were not influenced significantly by application of organics and inorganics.

15. PUNE

The treatment of soil test based fertilizer application without organic fertilizer was found numerically superior over 100 % RDF. All the treatments were found at par to each other. Compost application @ 20 t/ha and 10 t/ha with 100 % RDF, 50% RDF and soil test based fertilizer with bio fertilizer were at par to each other and superior over 100% RDF without organics. With respect to cane yield, application of 100% RDF with organic fertilizers was showed significant results over 50% RDF without organics.

EAST COAST ZONE

16. CUDDALORE

Application of FYM/Compost @ 10 tones/ha + bio fertilizers (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 + bio fertilizer (Azotobacter + PSB) + 100 % RDF.

17. ANAKAPALLE

Studies on impact of integrated application of organics and in-organics in improving soil health and ratoon sugarcane productivity indicated that application of FYM (10 t/ha) + bio fertilizer + 100% RDF (89.9 t/ha) or application of FYM (10 t/ha) + bio fertilizer + inorganic nutrient application based on soil test (89.6 t/ha) registered significantly higher cane yield as compared to the other treatments. Application of trash at 10 t/ha + 50% RDF registered lowest cane yield of 76.4 t/ha.

18. NAYAGARH

The NMC and cane yield were 68.42 '000 & 75.03 t/ha in T8 and 69.85'000 & 75.93 t/ha in T9, respectively. This exhibits the positive effect of organic manures and bio fertilizers on cane yield. The soil physico-chemical parameters like BD, pH, EC, organic carbon content as well as available N, P and K content exhibited marked improvement upon application of organic source of plant nutrients.

NORTH CENTRAL ZONE

19. SEORAHI

Application of FYM (10 t/ha) + bio-fertilizer (Azotobacter + PSB) + soil test basis (NPK Application) produced significantly higher cane yield. Sucrose percent was recorded significantly higher in application of FYM (20 t/ha) + inorganic nutrient application based on soil test.

20. PUSA

Integrated application of nutrients was found effective in improving soil fertility and second ratoon cane yield. The application of fertilizers on soil test i.e. 170 kg N, 50 kg P_2O_5 and 80 kg K_2O along with organics (20 t/ha) was found suitable for boosting ratoon cane yield and maintaining soil fertility in calcareous soil of Bihar.

NORTH EASTERN ZONE

21. BURALIKSON

In the second year ratoon crop, application of FYM (10 t/ha) along with bio-fertilizer and inorganic fertilizer based on soil test recorded significantly the higher cane yield (44.79 t/ha) which is statistically at par with application of FYM (10 t/ha) along with bio-fertilizer (Azotobacter + PSB) and 100% RDF (44.09 t/ha) and the yield recorded by application of FYM (20 t/ha) along with soil test based fertilizer (40.39 t/ha) respectively.

CURRENT YEAR (2017-18) REPORT

NORTH WESTERN ZONE

1. FARIDKOT

Sugarcane variety CoJ 88 was planted on 23.3.2017. Cane yield (101.4 t/ha) was the highest with application of FYM @ 20 tonnes / ha + inorganic nutrient based on soil test (T_6) which was significantly higher than only 50% RDF without organic sources **(T_1),** 100% RDF without organic sources **(T_2),** No organic + soil test based recommendation (T3), application of FYM @ 20 tonnes / ha + 50% RDF from inorganic source (T4), application of FYM @ 10 tonnes / ha + biofertilizer (*Azotobacter/Acetobacter* + *PSB*) + 50% RDF (T7) and application of FYM @ 10 tonnes / ha + biofertilizer (*Azotobacter/Acetobacter* + *PSB*) + 100% RDF (T8) . All other treatments were at par with T_6. There was no effect of treatments on sucrose %(**Table AS 68.1.1**).

Table AS 68.1.1: Performance of plant (second cycle) crop as influenced due to nutrient management in plant-ratoon system at Faridkot

Treatment	Germination (%)	No. of Shoots 000/ha	NMC 000/ha	Cane length (cm)	Cane diameter (cm)	Single cane wt. (g)	Cane yield (t/ha)	Sucrose (%)
T_1	30.4	132.8	113.3	239	2.41	1009	81.5	19.51
T_2	30.8	152.0	120.4	244	2.48	1071	85.9	19.79
T_3	31.5	153.5	127.6	248	2.51	1033	89.6	19.74
T_4	30.1	157.2	119.6	241	2.43	1079	87.0	19.60
T_5	30.9	162.2	132.2	246	2.51	1142	93.3	19.84
T_6	31.5	165.9	135.7	251	2.52	1228	101.4	19.8
T_7	31.7	148.9	118.5	241	2.42	1052	81.8	19.67
T_8	29.6	155.6	124.6	244	2.48	1104	91.9	19.49
T_9	30.3	159.4	129.1	247	2.46	1144	97.8	19.61
CD (5%)	NS	11.5	12.2	NS	NS	NS	9.3	NS

2. KAPURTHALA

Sugarcane (CoPb 93) was planted on 24.3.2017. The results revealed that all parameters were significantly influenced by different treatments except cane girth, cane length, POL% and brix. Number of shoots at 120 days after planting (DAP) was highest in treatment T_4, where the crop was applied with 20 t/haof farm yard manure along with 50% of recommended dose of fertilizers (75 kg/ha) that was similar to that of treatments T_8(FYM @ 10 t/ha + biofertilizer (*Azotobacter/Acetobacter* + *PSB*) + 150 kg N/ha), T_6(FYM @ 20 t/ha +

Soil test based on soil test), T_7(FYM@ 10 t/ha + bio-fertilizer (*Azotobacter/Acetobacter* + *PSB* + 75 Kg N/ha), T_9 (FYM @ 10 t/ha+ bio-fertilizer (*Azotobacter/Acetobacter* + *PSB*) + soil test based fertilizer) and T_1(75 kg N/ha) but significantly higher over T_2(150 kg N/ha) and T_3(soil test based fertilizer application). However at periodic stage of 150 DAS, significantly higher number of shoots were recorded in T_6in comparison to all other treatments followed by T5, T_8 and T_9.Lowest number of shoots were observed in treatment T_1 amongst all at 150 DAS. The single cane weight was highest in T_6 (1433.3 g) that was similar to T_5 (1388.7 g) and T_9 (1350.3g) but significantly higher over remaining treatments. Treatments T_2, T_3 and T_8 also produced similar single cane weight. Lowest single cane was produced in T_1 which was statistically similar to the cane weight produced in treatment T_4 and T_7.

Application of 20 t/haFYM along with soil test based fertilizer application produced significantly higher number of millable cane among all the treatments. The millable cane produced in treatment T_5 were statistically similar to treatments T_3, T_8 and $T_9$and also statistically similar number of millable canes were recorded in T_2, T_4 and T_7, whereas least number of millable canes were produced in treatment T_1. Soil test based fertilizer application (190 kg N/ha) along with 20 t/ha FYM produced highest cane yield that was statistically similar under treatment T_3, T_5 and T_9 but it was significantly higher over the cane yield produced under remaining treatments. Cane yield produced under treatments T_2, T_4 and T_7 were also similar but significantly higher than the cane yield under treatment T_1. The juice POL % and brix % were statistically similar in all treatments, but higher values of POL % was observed in treatment T_4 whereas the brix % was higher in treatment T_5.

Table AS 68.2.1: Performance of plant cane as influenced due to nutrient management in plant-ratoon system at Kapurthala

Treatment	Number of Shoots (000 ha^{-1})		Single Cane wt. (g)	Millable canes (000/ha)	Cane yield (t/ha)	Pol (%) in juice	Brix (%)
	120 DAS	**150 DAS**					
T_1	99.2	114.0	1155.0	79.3	78.0	13.58	15.87
T_2	92.5	122.0	1266.0	100.2	88.6	14.33	16.52
T_3	84.1	124.9	1327.7	103.9	95.1	14.21	16.45
T_4	108.0	121.7	1255.0	102.7	87.0	15.19	17.18
T_5	96.1	133.4	1388.7	112.9	98.3	14.87	17.42
T_6	101.2	143.0	1433.3	129.2	103.1	14.36	16.95
T_7	100.2	122.2	1277.3	95.6	84.3	14.92	17.28
T_8	107.6	134.5	1322.0	107.0	91.9	14.74	16.81
T_9	99.2	135.9	1350.3	109.0	98.9	14.18	16.43
CD (P=0.05)	9.2	6.1	96.0	9.2	8.7	NS	NS

3. LUCKNOW

Significantly the highest rate of germination (41.6%) was observed under the treatment of only organic matter application along with FYM. Highest number of tillers (176.9 thousand /ha at 120 days after planting), shoot count (165.3 thousand/ha at 180 DAP), number of millable canes (124.8 thousand/ha), cane yield (89.20 t/ha) and sugar yield (10.69 t/ha) were recorded under the treatment where application of FYM @ 20t/ha was done along with soil test (rating chart) based inorganic fertilizer recommendations.

However it was found comparable to the treatment of FYM @ 10 t/ha along with biofertilizer and soil test basis inorganic fertilizers application. The yield attributing characters vis. cane length (286.00 cm), cane girth (3.18cm) and weight of individual cane (1.20kg) was recorded significantly highest with the application of FYM @ 20 t/ha along with inorganic fertilizers applied on the basis of soil test rating chart. The quality parameters viz. brix value and pol % were significantly improved with application of FYM and biofertilizers. The soil health indicators viz. bulk density (1.27 M/m3), infiltration rate (4.63 mm/hr) and soil organic carbon (0.49 %) showed positive responses with the application of organic manure in the system(**Table AS 68.3.1**).

Table AS 68.3.1: Performance of plant crop as influenced due to nutrient management in plant-ratoon system at Lucknow

Treatment	Germ 45 (%)	Tillers ('000/ha) 120 DAP	NMC ('000/ha)	Yield (t/ha)	Pol % (%)	CCS (t/ha)
50 %RDF	34.7	115.6	85.6	52.70	14.41	5.13
100 % RDF	36.2	139.4	92.7	71.80	15.50	7.56
STBR	36.2	147.6	89.2	71.90	15.07	7.33
20 t 50 %	40.6	143.2	86.9	66.70	15.19	6.86
20 + 100	39.7	162.7	103.7	82.60	15.94	8.94
20 + STRC	39.6	176.9	124.8	89.20	17.44	10.69
10+ B +50	38.7	167.0	103.2	75.70	15.77	8.18
10+B+100	40.2	167.8	112.9	85.60	16.23	9.51
10+ B STB	38.7	167.1	119.7	87.70	16.37	9.84
Organic	41.6	160.9	102.6	73.20	15.87	7.95
SEm ±	0.58	2.78	2.55	1.64	0.48	0.80
CD (P= 0.05)	1.72	8.26	7.59	4.86	1.42	2.41

4. PANTNAGAR

Sugarcane ratoon (II) of variety Co Pant 05224 was initiated after harvesting of first ratoon on 06.03.2017 and was harvested on 03.03.2018. Soil of experimental field was silty clay loam, neutral in pH and was medium in organic carbon 0.75 %. Ratoon crop was raised as per recommended package and practices. Full nitrogen was given before onset of the monsoon. Gap filling was done from the three budded sugarcane setts.

Highest clumps were recorded in the treatment T6 - application of FYM @ 20 tonnes/ha + inorganic nutrient application based on soil test (NPK application). Highest cane yield, NMC, Girth and length of cane were recorded from treatment T6 - application of FYM @ 20 tonnes/ha + inorganic nutrient application based on soil test (NPK application) which was significantly higher over T1, T2 and T7. The highest cane yield and NMC were the result of higher initial shoot population. Individual cane weight was also higher in T5 and T6 which was significantly higher over rest of the treatments except treatment T5 and T7. CCS yield was also recorded highest in the treatment T6 which was significantly higher over rest of the treatments. (Table AS 68.4.1). Soil organic carbon was recorded highest in the treatment T6 - application of FYM @ 20 tonnes/ha + inorganic nutrient application based on soil test (NPK application) which was significantly higher over rest of the treatments except T4 and T5. Lowest organic contents was recorded in the soil in treatment T1- application of trash (10 tonnes /ha + 50 % RDF) though the organic carbon in soil was

increased in all the treatments having FYM/compost along with 100 % RDF. Availability of NPK was more in T6 and Potassium, Zn, Fe and S in T5. (**Table AS 68.4.2**).

Summary: Highest cane yield in ratoon was recorded in the treatment T6 - application of FYM @ 20 tonnes/ha + inorganic nutrient application based on soil test (NPK application). Highest cane yield in T6 was due to higher NMC, cane girth, cane length and weight of individual cane. CCS yield was recorded highest in T5 which was significantly higher over rest of the treatments.

Table AS 68.4.1: Performance of second ratoon as influenced due to nutrient management packages at Pantnagar

Treatment	Shoot population (000/ha) 120 DAR	Cane yield (t/ha)	Millable canes (000/ha)	Cane girth at harvest (cm)	Cane length (cm)	Per cane weight (g)	Sucrose (%) at harvest	CCS (t/ha)
T_1- Trash at 10 tonnes /ha + 50 % RDF	70.3	37.5	58.0	7.7	316	750	17.8	9.5
T_2-Trash at 10 tonnes /ha +100 % RDF	72.0	41.3	60.7	7.9	340	740	19.1	10.7
T_3- Trash at 10 tonnes /ha + soil test basis (NPK application)	73.8	50.0	61.7	8.5	360	820	20.5	11.6
T_4- FYM/ Compost @ 20 tonnes/ha + 50 % RDF (inorganic source)	88.5	51.0	65.0	9.5	374	843	20.6	13.2
T_5- FYM /Compost @ 20 tonnes/ha + 100 % RDF (inorganic source)	84.8	51.0	65.3	9.6	375	860	20.4	13.5
T_6- FYM /Compost @ 20 tonnes/ha + in organic nutrient application based on soil test (NPK application)	79.3	50.7	65.3	9.7	378	888	20.5	13.7
T_7- FYM /Compost @ 10 tonnes/ha + biofertilizer (*Azotobacter/ Acetobactor* + *PSB*) + 50 % RDF	74.6	42.7	62.3	8.5	364	786	18.9	10.8
T_8- FYM/compost @ 10 tonnes/ha + biofertilizer (*Azotobacter/ Acetobactor* + PSB) + 100 % RDF	76.1	47.7	63.7	8.8	376	630	19.7	12.6
T_9- FYM/Compost @ 10 tonnes/ha + biofertilizer (*Azotobacter/ Acetobactor* + PSB) + soil test basis (NPK application)	78.0	46.4	62.7	8.6	368	838	19.6	12.0
CD at 5 %	2.7	9.9	5.7	0.12	4.0	14.1	0.3	0.4

5. SHAHJAHNPUR

Soil of experimental field was low in organic carbon (0.44%), and phosphorus (7.8 kg/ha) and medium in potash (134kg/ha) with pH 7.5. Sugarcane crop (CoS 08279) was planted on 03.02.2017 and harvested on 16.02.2018. Result (**Table AS 68.5.1**) showed that application of FYM @ 10 tonnes/ ha + bio–fertilizers (*Azotobacter* + PSB) @ 10 kg /ha each + application of nutrients on soil test basis (NPK) produced significantly higher shoots, millable canes and cane yield than that of other treatments in first plant cane. CCS% in cane was not affected significantly with various treatments.

Summary: Application of FYM @ 10 tonnes/ ha + bio – fertilizers (*Azotobacter* + PSB) + application of nutrients on soil test basis (NPK) produced significantly higher cane yield (114.10 t/ha) than that of other treatments. CCS% in cane was found to be more or less similar.

Table AS 68.5.1: Performance of plant crop as influenced due to nutrient management in plant-ratoon system at Shahjahanpur

Treatment	Germination %	Shoots (000/ha	NMC (000/ha)	Cane yield (t/ha)	CCS%
	45 DAP	120DAP			
T_1- No organic + 50% RDF	45.40	125.46	98.61	78.80	11.98
T_2- No organic + 100 % RDF.	43.50	135.42	102.66	83.00	11.71
T_3 - No organic + inorganic nutrient + Application on soil test basis.	42.70	141.50	106.25	84.80	11.94
T_4 - Application of FYM @ 20 t/ha + 50% RDF (inorganic sources).	43.10	127.20	100.35	82.20	11.75
T_5 - Application of FYM @20 t/ha + 100 % RDF (inorganic sources).	43.60	137.62	109.48	90.20	11.85
T_6- Application of FYM @20 t/ha + inorganic nutrients application based on soil test.	41.60	144.44	114.62	97.40	11.96
T_7- Application of FYM @10 t/ha+ bio fertilizers (*Azotobacter* + P.S.B) +50%RDF	44.80	129.40	108.22	88.20	11.92
T_8- Application of FYM @ 10 t/ha+ bio fertilizers *(Azotobacter* + P.S.B) + 100% RDF.	44.20	150.88	117.60	10.20	11.65
T_9- Application of FYM @ 10 t/ha+ bio fertilizers (*Azotobacter* + P.S.B) + Inorganic nutrients application on soil test basis.	43.40	156.13	123.50	114.10	11.95
CD	**NS**	**5.37**	**5.88**	**8.39**	**NS**

6. UCHANI

Variety CoH 160 (early maturing and good ratooner) was planted on March 3, 2017 at 75 cm spacing in randomized block design with three replications. The experiment was

conducted on clay loam in texture having pH 8.0, EC 0.4 dS m^{-1}, organic carbon 0.35%, available P 11.8 kg/ha and available K 178.2 kg/ha, available S (12.0 kg/ha), available Zn (0.8 ppm) and available Fe (4.0 ppm) and available Mn (7.5 ppm). Doses of phosphorus, potash as per treatments were applied at the time of planting whereas dose of nitrogen was applied in three equal splits as top dressing (April, May & June). Recommended dose of Nitrogen, phosphorus and potash are 150, 50 and 50 kg/ha, respectively for Haryana state. The values for Nitrogen, phosphorus and potash on soil test basis were 165, 53 and 62 kg/ha, respectively. The crop was irrigated at 8-10 days intervals during pre-monsoon period and 20 days interval during post monsoon period. The plant crop was harvested on March 15, 2018.

No significant differences were observed in germination percent among different treatments. The treatments with 100 % RDF and soil test based fertilizer with and without FYM application being at par produced significantly higher number of tillers, millable canes and cane yield as compared to the treatments of 50 % RDF with and without FYM (Table 1). Application of 20 t/ha FYM with 50 % RDF or 100% RDF or Soil test based fertilizers application produced similar number of tillers, millable canes, cane yield in comparison to the treatments of 10 t/ha FYM + Biofertilizers application with 50 % RDF or 100% RDF or Soil test based fertilizers application. FYM/Compost 20 t/ ha + 100% RDF through inorganic source (T6) and FYM/Compost @ 10 t/ ha + biofertilizer (Azotobacter/ Acetobacter + PSB) + soil test basis (T9) were found best and at par treatments in terms of number of tillers, millable canes and cane and sugar yield as compared to rest of the treatments. So FYM 10t /ha can be saved with application of biofertilizer in sugarcane crop in addition in increasing the population of soil microorganism (**Table AS 68.6.1**).

Summary: FYM 20 t/ ha + 100% RDF through inorganic source (T6) and FYM @ 10 t/ ha + biofertilizer (Azotobacter/ Acetobacter + PSB) + soil test basis (T9) were found best and at par treatments in terms of number of tillers (146.4, 144.3 thousands/ha) , millable canes (116.5, 117.2 thousands/ha) and cane yield (101.3, 99.8 t/ha) and sugar yield (12.79, 12.27 t/ha) as compared to rest of the treatments.

Table AS 68.6.1: Performance of plant crop as influenced due to nutrient management in plant-ratoon system at Uchani

Treatment	Germination (%)	Tillers (000/ha)	NMC (000/ha)	Cane weight (g)	Cane yield (t/ha)	CCS (%)	Sugar yield (t/ha)
RDF50%	45.3	86.7	78.2	690	51.7	12.4	6.39
RDF100%	46.1	132.4	108.2	865	89.6	12.2	10.89
No organic + soil test based recommendation	45.0	135.2	110.1	870	91.8	12.3	11.25
Application of FYM/ Compost @ 20 t/ ha + 50% RDF (inorganic)	45.8	108.1	90.6	728	63.1	12.4	7.80
Application of FYM/ Compost @ 20 t/ ha + 100% RDF (inorganic)	44.7	143.1	114.2	905	99.0	12.4	12.23
Application of FYM/ Compost @ 20 t/ ha + inorganic nutrient based on soil test (NPK)	44.5	146.4	116.5	908	101.3	12.6	12.79

Application of FYM/ Compost 10 t/ ha + biofertilizer (*Azotobacter Acetobacter* + *PSB*) + 50% RDF	46.0	100.7	84.8	725	58.9	12.4	7.29
Application of FYM/ Compost 10 t / ha + biofert. Azoto/ *Aceto* + *PSB*) + 100% RDF	45.6	140.1	114.0	890	97.1	12.4	12.08
Application of FYM/ Compost @ 10 t/ ha + biofert. (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis (NPK application)	44.8	144.3	117.2	890	99.8	12.3	12.27
CD at 5%	NS	14.3	11.8	72	10.1	NS	1.07

7. SRIGANGANAGAR

The field experiment was conducted with early maturing and good ratooning variety Co 6617 in RBD with three replications. The second ratoon crop was initiated during last week of February, 2017. In 100 % RDF (150 kg N + 40 kg P2O5), phosphorus was applied at the time of first inter-culture for ratoon initiation, whereas doses of nitrogen (150 kg/ha) was applied in three equal splits as top dressing (at ratoon initiation, May & June). On soil test basis Nitrogen & phosphorus were applied @ 175 & 43 kg/ha, respectively.

The result indicated that no. of tillers, NMC, single cane weight and cane yield were influenced significantly due to different nutrient treatments while, the effect on CCS % was non-significant. Cane yield (80.3 t/ha) was the highest (table1) with the application of FYM @ 20 tones/ha + inorganic nutrient based on soil test (T6) which was significantly higher over other treatments except T5 – application of FYM @ 20 q/ha + 100% RDF (77.9 t/ha), T9 - Application of FYM/Compost @ 10 t/ ha + biofertilizer (Azotobacter/ Acetobacter + PSB) + soil test basis NPK application (77.1 t/ha) and T8 - Application of FYM/Compost @ 10 t/ ha + biofertilizer (Azotobacter/ Acetobacter + PSB) + 100% RDF (75.2 t/ha). This indicated that T6, T5, T9 & T8 were found best and at pat treatment in terms of yield and yield attributing characters. The results also showed that continuous application of FYM @ 10t/ha in combination with inorganic fertilizers and bio fertilizers were equally effective in comparison to FYM @ 20 t/ha. The application of bio fertilizers with 10 t/ha FYM / hectare and inorganic fertilizers recorded significantly higher cane yield over alone application of trash @ 10 t/ha with inorganic fertilizers (**Table AS 68.7.1**).

Table AS 68.7.1: Performance of second ratoon crop as influenced due to nutrient management in plant-ratoon system at Sriganganagar

Treatment	Tillers (000/ha)	NMC (000/ha)	Cane weight (g)	Cane yield (t/ha)	CCS (%)
Application of trash at 10 t/ ha + 50% RDF	80.21	60.75	665	48.5	11.79
Application of trash at 10 t/ ha + 100% RDF	108.37	75.36	730	65.3	11.93
Application of trash at 10 t/ ha + soil test basis (NPK)	112.51	86.29	748	68.3	11.96
Application of FYM/Compost @ 20 t/ ha + 50% RDF (inorganic)	90.26	68.17	701	53.4	12.04
Application of FYM/Compost @ 20 t/ ha + 100% RDF (inorganic)	122.43	98.53	810	77.9	12.18
Application of FYM/Compost @ 20 t/ ha + inorganic nutrient based on soil test (NPK application)	126.81	102.61	826	80.3	12.08
Application of FYM/Compost @ 10 t/ ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 50% RDF	88.50	68.58	689	52.7	12.14
Application of FYM/Compost @ 10 t / ha + biofert. (*Azotobacter/ Acetobacter* + *PSB*) + 100% RDF	117.61	96.32	794	75.2	12.17
Application of FYM/Compost @ 10 t/ ha + biofert. (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis(NPK application)	121.38	97.57	808	77.1	12.09
CD	11.78	9.02	38	7.8	NS

PENINSULAR ZONE

8. COIMBATORE

The experimental field was low in available nitrogen (216.38 N kg/ha) and high in available P and K. After harvest of first ratoon crop, ratooning and treatment scheduling was done consisting of application of organics and inorganics for nutrient management in sugarcane variety Co 86032 wherein at the time of ratooning as basal dose full phosphorous, FYM , 1/3 N and K was applied as per the treatments. In two split applications i.e. at the time of partial earthing up (30 DAP) and full earthing up (60 DAP) 1/3 nitrogen and potassium were applied. In second ratoon sugarcane crop, 20 t FYM + 150 STCR based fertilizer application was found beneficial in improving cane yield over rest of the nutrient management treatments**(Table AS 68.8.1)**. The treatment 20 t FYM + 150 STCR based fertilizer application recorded the highest NMC (95150 NMC/ha) and cane yield (84.56 t/ha). Sugarcane juice analysis done at 12 months revealed that Sucrose %, Purity % and CCS % were not influenced significantly by application of organics and inorganics.

Table AS 68.8.1: Performance of sugarcane second ratoon as influenced due to nutrient management packages at Coimbatore

Treatment	NMC	Cane yield (t/ha)	Net Returns (Rs/ha)	BC ratio
T1 : 10 t/ha trash + 50% % RDF	83.01	67.84	72415	1.60
T2 : 10 t/ha trash + 100 % RDF	69.02	71.69	74587	1.57
T3 : 10 t/ha trash + STCR 150	92.68	75.76	74847	1.53
T4 : 20 t FYM + 50 % RDF	86.00	73.24	45250	1.28
T5 : 20 t FYM + 100 % RDF	81.06	77.75	46922	1.27
T6 : 20 t FYM + STCR 150	95.15	84.56	53279	1.28
T7 : 10 t FYM + 50 % RDF	78.90	66.85	45752	1.32
T8 : 10 t FYM + 100 % RDF	87.33	68.76	37041	1.23
T9 : 10 t FYM + STCR 150	69.33	72.15	40063	1.24
SE (d)	9.22	6.43	-	-
CD (0.05)	18.90	13.18	-	-

9. PUNE

The field experiment was conducted with variety Co 86032 second ratoon initiated on 03.01.2017 and harvested on 07.12.2017. The highest cane yield 114.6 t/ha was obtained in the treatment of compost @ 10 t/ha with inorganic fertilizer based on soil test and bio-fertilizer followed by 114.5 t/ha in the treatment of compost @ 20 t/ha with inorganic fertilizers based on soil test. Commercial cane sugar yield was recorded significantly higher in 100 % RDF than 50 % RDF without organics. Recommended dose of fertilizers and soil test based fertilizer recommendation were responded more or less same. All the treatments except 50% RDF without organics gave at par results with respect to CCS yield.

The plant population showed that highest significant plant population 87.7 thousand/ha was recorded in treatment T6 where compost @ 20 t/ha with inorganic fertilizer based on soil test was applied; followed by 87.9 thousand/ha in treatment T9 where compost @ 10 t/ha with inorganic fertilizer based on soil test and biofertilizers were applied. All the treatments

of combination of organic, inorganic and soil test based fertilizer recommendation found significant over treatment T2 where applied 100 % recommended dose of fertilizer. The numerically maximum millable cane height (239.0 cm) was found in treatment T3 where only soil test based fertilizer applied followed by 236.1 cm in treatment T9 where FYM/compost @ 10 t/ha with inorganic fertilizer based on soil test and biofertilizer. Maximum cane girth (9.64 cm) obtained in treatment T6 where applied FYM/compost @ 20 t/ha with inorganic fertilizer based on soil test and biofertilizer followed by 9.55 cm where applied FYM/compost @ 20 t/ha with inorganic fertilizer based on soil test and biofertilizer. Numbers of internodes were remained more or less same in all the treatments.

The juice quality parameters with respect to brix, pol, and purity and CCS percent indicated that the juice quality was not affected.

Summary: The results concluded that application of FYM /compost @ 10 t/ha with inorganic fertilizer based on soil test and biofertilizer or application of FYM /compost @ 20 t/ha with inorganic fertilizer based on soil test increased cane yield by 13.4 t/ha.

Table AS 68.9.1: Performance of sugarcane second ratoon crop as influenced due to nutrient management at Pune

Treatment	Cane yield (t/ha)	CCS yield (t/ha)	B:C ratio	No. of millable canes ('000/ha)	Girth (cm)	CCS %
No organic + 50% RDF	88.3	11.8	3.7	75.9	9.0	13.1
No organic + 100% RDF	101.5	14.3	3.7	80.1	9.1	14.0
No organic + soil test based recommendation	105.4	14.9	4.1	84.1	9.5	14.0
Application ofFYM/compost @ 20t/ha+50% RDF (inorganic source)	109.5	14.4	3.3	87.4	9.2	13.0
Application of FYM/compost@ 20 t/ha+100% RDF (inorganic source)	113.7	16.1	3.1	86.4	9.5	14.1
Application of FYM/compost@ 20 t/ha+ inorganic nutrient application based on soil test (rating chart)	114.5	15.4	3.3	87.9	9.6	13.4
Application of FYM/compost@10 t/habiofertilizer(Azotobacter/Acetobacter + PSB)+50% RDF	111.4	14.7	3.9	87.5	9.5	13.2
Application of FYM/compost@10 t/habiofertilizer(Azotobacter/Acetobacter + PSB) +100% RDF	113.1	14.7	3.6	88.3	9.5	13.0
Application of FYM/compost@10 t habiofertilizer(Azotobacter/Acetobacter + PSB)+soil test basis	114.6	16.0	3.9	87.7	9.5	14.0
SED CD at 5%	2.69 5.71	0.63 1.34	-	1.38 2.93	0.11 0.24	0.48 NS

10. NAVSARI

The first ratoon crop was initiated on 12.12.2016 and harvested on 18.12.2017. Significantly higher number of tillers were recorded with T9 i.e. application of FYM 10 t/ha +biofertilizers(Acetobacter + PSB) + soil test basis (NPK application) over application of trash at 10 t/ha + 50 % RDF (T1). However it remained at par with T3, T4 and T6 at 120 & 150 DAP.NMC (103.78 '000/ha) was recorded significantly higher with treatment T9 over T1 and at par with T3, T6 and T7. Millable cane length and cane diameter was not significantly influenced due to different treatments. Significantly highest and lowest single cane weight was observed with T9 and T1 respectively.

Cane yield (120.15 t/ha) was recorded significantly highest with T9 over T3 and remained at par with T4, T5, T6 and T7. CCS yield was not significantly influenced due to various nutrient management treatments. Various quality parameters were not significantly influenced due to different nutrient management treatments at 10 and 12 months.

Almost all the soil parameters were significantly influenced due to various inorganic and organic treatments except soil EC. Significantly lowest pH was recorded with application of trash at 10 tonnes ha-1 applied with 100 % RDF (T2) and remained at par with T1, T3 and T4; OC% was found significantly highest with treatment T2 and T3 and remained at par with each other over T1. Available nitrogen was recorded significantly highest with T1 and at par with T3; available phosphorus with T7 and at par with T8 and T9 while potash with T5 and at par with T3. Bulk density was recorded significantly lowest with T4 and at par with T1, T5, T6 and T9(**Table AS 68.10.1**). .

Table AS 68.10.1: Performance of first ratoon crop as influenced due to nutrient management in plant-ratoon system at Navsari

Treatment	No. of tillers at 120 DAP (000 ha^{-1})	Number of Millable cane at harvest (000 ha^{-1})	Millable cane length (cm) at harvest	Single cane weight (kg)	Cane yield (t ha^{-1})	CCS yield (t ha^{-1}) at harvest
T_1	140.35	78.51	190.81	1.11	92.79	12.36
T_2	143.69	90.62	230.01	1.23	101.85	13.19
T_3	161.57	92.86	226.09	1.29	90.84	12.07
T_4	151.46	89.15	231.24	1.17	104.04	13.93
T_5	141.08	91.37	220.84	1.35	105.19	14.34
T_6	165.41	99.48	239.57	1.42	111.19	14.75
T_7	149.52	94.38	237.95	1.47	104.53	13.43
T_8	145.16	90.36	229.41	1.33	103.85	13.78
T_9	171.72	103.78	254.88	1.68	120.15	16.15
S. Em. ±	7.04	4.11	11.61	0.06	5.43	0.83
C.D.at 5%	21.12	12.33	NS	0.18	16.27	NS
C.V.%	8.02	7.72	8.78	7.84	9.06	10.47

11. THIRUVALLA

Variation due to different treatments were significant for growth and yield parameters(**Table AS 68.11.1**). In both the ratoon crops (I & II) among the various treatments

T8 (FYM/compost @ 10 t/ha + biofertilizer(Azotobacter/Acetobacter+PSB) +100 RDF) recorded significantly higher values for cane length(265.07 and 255.83 cm, respectively), MCC (73240 and 71320/ha) and resulted in maximum yield(81.10 and 74.48t/ha). Brix % and sugar yield also followed the same trend with significantly higher values for sugar yield (8.55 and 7.98t/ha) for the very same treatment. It was followed by T6(FYM/Compost @ 20 t/ha + inorganic nutrient application based on soil test (rating chart). The treatment T8 recorded the highest BC ratio(1.38).

Table AS 68.11.1: Performance of sugarcane first ratoon as influenced due to nutrient management at Thiruvalla

Treatment		**Tiller count (000/ha)**		**Cane length (cm)**	**Cane diameter (cm)**	**Single cane weight (kg)**	**MCC ('000 / ha)**	**Cane yield (t/ha)**	**Sugar yield (t/ha)**	**BC ratio**
		120 DAP	**150 DAP**							
T_1	Trash + 50% RDF	74.18	66.25	242.06	2.96	1.53	48.74	52.25	6.21	0.80
T_2	Trash + 100% RDF	88.00	84.16	247.51	2.99	1.57	66.00	63.27	5.95	1.25
T_3	Trash + soil test based recommendation	89.00	81.25	254.72	3.02	1.61	64.98	69.52	6.22	1.26
T_4	FYM/Compost @ 20 tonnes / ha + 50% RDF (inorganic source)	89.91	83.00	249.13	3.00	1.59	68.11	66.31	5.81	1.15
T_5	FYM/Compost @ 20 tonnes / ha + 100% RDF (inorganic source)	86.30	78.43	251.70	3.01	1.60	63.56	67.02	6.25	1.26
T_6	FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	95.60	86.33	255.75	2.92	1.67	70.05	71.52	6.97	1.20
T_7	FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter + PSB*) + 50% RDF	77.41	68.30	250.06	2.88	1.58	62.83	64.34	5.89	1.18
T_8	FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/*	100.16	90.10	265.07	3.20	1.80	73.24	81.10	8.55	1.38

	Acetobacter + *PSB*) + 100% RDF									
T_9	FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis	80.04	75.24	255.14	3.03	1. 59	60.17	71.24	6.38	1.23
CD (0.05)		**NS**	**NS**	**5.02***	**0.13***	**0.12***	**3.08***	**8.50***	**0.40**	**NS**

Table AS 68.11.2: Performance of sugarcane second ratoon as influenced due to nutrient management at Thiruvalla

Treatments		**Tiller count (000/ha)**		**Cane length (cm)**	**Cane diameter (cm)**	**Single cane weight (kg)**	**MCC ('000/ ha)**	**Cane yield (t/ha)**	**Sugar yield (t/ha)**	**BC ratio**
		120 DAP	**150 DAP**							
T_1	Trash + 50% RDF	72.26	64.10	233.67	2.91	1.49	45.12	46.91	3.94	0.80
T_2	Trash + 100% RDF	86.88	82.78	238.67	2.94	1.53	64.57	57.92	5.43	1.25
T_3	Trash + soil test based recommendation	87.75	79.34	245.60	2.97	1.57	62.96	63.27	5.39	1.26
T_4	FYM/Compost @ 20 tonnes / ha + 50% RDF (inorganic source)	88.04	81.25	240.00	2.95	1.55	65.84	60.08	5.24	1.15
T_5	FYM/Compost @ 20 tonnes / ha + 100% RDF (inorganic source)	84.51	76.25	242.67	2.96	1.60	61.70	60.49	5.63	1.26
T_6	FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	93.08	84.52	248.33	2.98	1.63	68.12	66.66	6.49	1.20
T_7	FYM/Compost @ 10 tonnes / ha + biofertilizer	75.60	66.22	241.00	2.83	1.54	65.73	59.77	5.45	1.18

	(*Azotobacter/ Acetobacter* + *PSB*) + 50% RDF									
T_8	FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 100% RDF	98.00	87.65	255.83	3.15	1.75	71.32	74.48	7.98	1.38
T_9	FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis	77.81	73.20	247.33	2.97	1. 55	67.98	65.74	5.86	1.23
CD (0.05)		**NS**	**NS**	**4.91***	**0.10***	**0.10***	**3.01***	**8.17***	**0.35**	**NS**

12. MANDYA

Sugarcane was planted during 23-01-2017 (II cycle plant crop).The data on germination percentage after 45 DAP indicated that, the germination percentage was significantly higher in the treatments which received FYM @ 20 t/ha + 100% RDF and application of fertilizers based on soil test results (61.92 to 62.60%) and also application of FYM @ 10 t/ha + 100% RDF and application of fertilizers based on soil test results with biofertilizers application (Azotobacter @ 5 kg/ha and PSB @ 25 kg/ha) (60.95 to 61.05%). While, the lower germination per cent was recorded in the treatments which received only 50% RDF (48.89%), 100% RDF (52.80%) and soil test based fertilizer application (54.44%), application of FYM @ 20 t ha + 50% RDF (50.87%) and application of FYM @ 10 t/ha + (Azotobacter + PSB) + 50% RDF (56.57%).

Application of FYM @ 20 t /ha + inorganic nutrient application based on soil test results recorded significantly higher cane yield (156.93 t/ha) compared to all other treatments (**Table AS 68.12.1**). However, it was on par with application of FYM @ 20 t / ha + 100% RDF (141.30 t/ha), application of FYM @ 10 t / ha + biofertilizer (Azotobacter + PSB) + 100% RDF (146.27 t/ha, respectively) and application of FYM @ 10 t/ha + biofertilizer (Azotobacter + PSB) + soil test based fertilizer application (149.80 t/ha). This increased ratoon yield in above treatments was mainly attributed to increased yield parameters viz., single cane weight, cane length, No. of internodes and No. millable cane (1.96 kg, 2.70 m, 24.93 and 91.56 thousand/ha, respectively in T6; 1.84 kg, 2.57 m, 22.47 and 84.91 thousand/ha, respectively in T5; 1.83 kg, 2.47 m, 22.05 and 86.70 thousand/ha, respectively in T8 and 1.88 kg, 2.57 m, 22.45 and 87.07 thousand/ha, respectively in T9). The commercial cane sugar production was significantly higher in T6 (23.13 t/ha) as compared to other treatments due to enhanced cane yield. However, it was on par with T8 (20.30 t/ha) and T9 (20.80 t/ha).

Summary: The data on cane indicated that, application of FYM @ 20 t/ha + inorganic nutrient application based on soil test results recorded significantly higher cane yield (156.93 t/ha) compared to all other treatments. However, it was on par with application of FYM @ 20 t/ ha + 100% RDF (141.30 t/ha), application of FYM @ 10 t/ ha + biofertilizer (Azotobacter + PSB) + 100% RDF (146.27 t/ha) and application of FYM @ 10 t/ha + biofertilizer (Azotobacter + PSB) + soil test basis fertilizer application (149.80 t/ha).

Table AS 68.12.1: Performance of plant crop as influenced due to nutrient management in plant-ratoon system at Mandya

Treat	Initial shoot count(45 DARI)	Single cane weight (kg)	Cane length (m)	No. of inter nodes	Millable cane ('000/ha)	Cane yield (t/ha)	Sucrose %	CCS (t/ha)
T_1	48.89	1.39	2.00	18.64	59.73	84.23	18.63	11.05
T_2	52.80	1.59	2.43	19.76	77.99	122.57	18.87	16.43
T_3	54.44	1.65	2.67	21.60	78.95	131.57	19.69	18.39
T_4	50.87	1.56	2.23	19.35	63.39	94.90	19.53	13.11
T_5	61.92	1.84	2.57	22.47	84.91	141.30	19.77	19.85
T_6	62.60	1.96	2.70	24.93	91.56	156.93	20.60	23.13
T_7	56.57	1.48	2.10	20.06	61.77	112.57	19.01	15.11
T_8	60.95	1.83	2.47	22.05	86.70	146.27	19.54	20.30
T_9	61.05	1.88	2.57	22.45	87.07	149.80	19.54	20.80
S.Em.±	2.93	0.04	0.07	1.04	2.29	6.01	0.32	0.98
CD@5%	8.78	0.13	0.22	3.12	6.86	18.02	NS	2.95

13. SANKESHWAR

Sugarcane planting was carried out on 26.11.2016 and the crop was harvested on 22.12.2017. The yield and yield attributes recorded significant differences among the treatments. Soil test based nutrients application along with 20 t/ha farm yard manure recorded highest cane yield (119.83 t/ha), number of millable canes (97500/ha) and CCS yield (11.36 t/ha). However, treatments with soil test based nutrients application recorded on par cane yield irrespective of application of organics and microbial inoculants.The lowest cane yield (92.43 t/ha) was recorded in 50 percent inorganics without any organics application.

All the quality parameters differed significantly for treatment variations. Soil test based nutrients application without addition of organics recorded significantly higher brix, POL, CCS and Purity percent and the lowest was recorded in 50 percent nutrients application along with either 20 t/ha FYM or 10 t/ha FYM and microbial inoculants. However, all the soil test based nutrients applied treatments recorded on par results for all the quality parameters.

Table AS 68.13.1: Performance of sugarcane plant cropas influenced due to nutrient management at Sankeshwar

Treatment	Cane yield (t/ha)	NMC (000/ha)	Cane girth (cm)	Single cane weight (kg)	CCS yield (t/ha)	Pol (%)
1	92.43	91.40	2.88	1.55	9.08	14.86
2	96.27	93.20	2.97	1.65	9.52	15.06
3	109.47	94.87	2.89	1.64	11.36	15.60
4	92.73	86.40	2.90	1.39	8.24	13.62
5	101.10	94.40	2.91	1.47	9.73	14.58
6	119.83	97.50	2.90	1.46	11.36	14.51
7	95.70	90.40	2.80	1.27	8.38	13.63
8	102.83	94.30	2.91	1.64	9.33	14.01
9	115.03	95.20	2.95	1.49	11.11	14.59
CD 5%	12.21	5.15	0.15	0.19	1.32	1.00

14. PADEGAON

Sugarcane (CoM 0265) was planted on 02.202.2017 and harvested on 07.03.2018. Higher cane yield (176.94 t/ha), CCS yield (21.15 t/ha) and number of millable cane (83093) were observed in treatment T6 receiving RDF as per soil test along with 20 t/ha FYM and it was found at par with treatment T9, T5 and T8. The brix, sucrose (%), CCS (%) and purity (%) were found to be non-significant.

Soil organic carbon content reduced in the inorganic treatments T1, T2 and T3 and it increased in all integrated nutrient management treatments over the initial values. The treatments T6 receiving RDF as per soil test along with 20 t/ha FYM recorded significantly the highest organic carbon (0.77 %) and it was found at par with T4, T5, T9, T8 and T7. The lowest organic carbon was recorded in the treatments T1 receiving 50 % RDF only (0.67 %).

Application of RDF as per soil test along with 20 t/ha FYM (T6) recorded significantly the higher gross return (Rs.398125/ha) and it was found at par with treatment T9 receiving RDF as per soil test along with 10 t/ha FYM + biofertilizers (Rs.391250/ha), T5 receiving 100 % RDF along with 20 t/ha FYM (Rs.390000/ha) and T8 receiving 100 % RDF along with 10 t/ha FYM + biofertilizers (Rs.384583/ha).The higher B:C ratio was recorded in treatment T3 receiving only RDF as per soil test (3.58) followed by treatment T2 (3.39).

Table AS 68.14.1: Performance of plant cane under various integrated nutrient management at Padegaon

Treat	Germi-nation (%)	TR (120 days)	Girth (cm)	No of Internodes	ACW (Kg)	NMC (ha^{-1})	Cane yield (tha^{-1})	CCS yield ($t\ ha^{-1}$)	CCS %	Purity (%)
T_1	65.31	2.00	10.27	20.80	1.89	77538	146.11	17.22	11.79	92.57
T_2	69.01	2.03	10.30	22.07	1.88	78611	148.24	18.16	12.28	92.39
T_3	62.38	2.07	10.60	21.60	1.99	78889	156.67	18.25	11.66	91.35

T_4	71.17	2.13	10.77	20.53	2.02	78922	159.07	18.54	11.80	90.85
T_5	70.25	2.21	10.90	22.53	2.11	82130	174.33	20.37	11.75	90.97
T_6	70.80	2.31	11.07	22.73	2.14	83093	176.94	21.15	11.96	91.44
T_7	68.70	2.10	10.70	21.00	1.99	79037	157.22	18.27	11.61	90.66
T_8	66.08	2.16	10.77	21.27	2.13	80185	170.93	18.84	11.00	93.66
T_9	69.01	2.29	10.87	22.47	2.11	82407	173.89	19.95	11.47	92.44
SE±	**4.54**	**0.15**	**0.19**	**0.95**	**0.06**	**1293**	**5.33**	**0.86**	**0.29**	**1.05**
CD at 5%	**NS**	**NS**	**0.58**	**NS**	**0.19**	**3877**	**15.99**	**2.58**	**NS**	**NS**

EAST COAST ZONE

15. ANAKAPALLE

During the year second ratoon crop was initiated on 21.1.2017 and harvested on 09.01.2018. At 120 days after ratooning, application of FYM @10 t/ha + biofertilizers +inorganic nutrient application on soil test recorded significantly higher tiller population (121759 /ha) which was on par with all the other treatments except application of trash at 10 t/ha + 50% RDF (78,125 /ha). Significant differences were observed in number of millable canes due to different organic and inorganic treatments. Application of FYM @10 t/ha + biofertilizer+100% RDF (89597 /ha) or application of 100% RDF or application of FYM @10 t/ha + biofertilizer+ inorganic nutrient application on soil test basis (80816/ha) recorded significantly higher number of millable canes at harvest. Number of millable canes recorded in application of FYM @ 20 t/ha + inorganic nutrient application based on soil test (81597/ha) or application of FYM @20 t/ha + 100% RDF through inorganic source (80555/ha) or application of trash at 10 t/ha + Soil Test based recommendation (78117/ha) treatments were on par. Significantly lower number of millable canes were recorded in application of trash at 10 t/ha + 50% RDF treatment (65972/ha).

Application of FYM @ 10 t/ha + biofertilizer+ 100% inorganic nutrient (87.6 t/ha) or application of FYM @ 10 t/ha+ biofertilizer r+ inorganic nutrient application based on soil test (86.9 t/ha) registered significantly higher cane yield as compared to the other treatments. Application of trash @ 10 tonnes/ha + 50% RDF registered lowest cane yield of 69.7 t/ha. Per cent juice sucrose values did not vary significantly due to different organic and inorganic treatments. Commercial cane sugar was calculated treatment wise and did not vary significantly due to different treatments (**Table AS 68.15.1**).

Summary: The results indicated that application of FYM @ 10 t/ha + biofertilizer+ 100% inorganic nutrient (87.6 t/ha) or application of FYM @ 10 t/ha+ biofertilizer+ inorganic nutrient application based on soil test (86.9 t/ha) registered significantly higher cane yield as compared to the other treatments. Application of trash at 10 tonnes /ha + 50% RDF registered lowest cane yield of 69.7 t/ha.

Table AS 68.15.1: Performance of sugarcane second ratoon as influenced due to nutrient management at Anakapalle

Treatment	Tiller population at 120 DAR	NMC/ha	Cane yield (t/ha)	Juice Sucrose (%)	CCS (%)	Sugar yield (t/ha)
Application of trash at 10 t/ha + 50% RDF	78125	70747	69.7	13.15	8.91	6.2
Application of trash at 10 t/ha + 100% RDF	112037	74653	80.2	12.55	8.35	6.7
Application of trash at 10 t/ha + Soil Test based recommendation	99190	77691	81.3	12.19	8.11	6.6
Application of FYM @20 t/ha + 50% RDF(inorganic source)	104282	72396	73.8	13.00	8.84	6.5
Application of FYM/@20 t/ha + 100% RDF(inorganic source)	113657	78646	84.8	14.35	9.88	8.4
Application of FYMt@20 t/ha + inorganic nutrient application based on soil test	101968	80295	83.6	12.88	8.72	7.3
Application of FYM @10 t/ha + Biofertilizer(Azotobacter+PSB)+50% RDF	110880	78906	75.7	12.78	8.54	6.5
Application of FYM @10 t/ha + biofertilizer+100% RDF	114120	81597	87.6	12.93	8.75	7.7
Application of FYMt@10 t/ha + Biofertilizer inorganic nutrient application on soil test	121759	80816	86.9	12.60	8.41	7.3
C.D (0.05)	22732	4,564	9.95	NS	NS	-

16. CUDDALORE

The second plant crop for this experiment was laid out during April 2017 with same set of treatments combinations. The data on germination 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 germination of 72.12 per cent. The same treatment recorded highest tiller population of 186320/ha and was on par with T8- application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer which recorded 189650/ha of tillers.T9 recorded significantly the maximum millable cane population of 159360/ha and was on par with T8- application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer which recorded 148360/ha. The same treatment recorded significantly the maximum individual cane weight (1.69 kg), cane length (298.96 cm) and cane girth (2.76 cm) and it was on par with T8 treatment.

The highest cane yield(157.69 t/ha) was registered with the application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer application (T9).Sugar yield (19.47 t/ha) was found highest under T9 and it was on par with

T8- application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer, which recorded cane yield (148.56 t/ha) and sugar yield (18.66 t/ha). Similarly application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer application (T9) recorded significantly the maximum Brix (20.79 %), Pole (12.66 %), Purity (88.56 %) and Commercial Cane sugar (12.35 %) and it was on par with T8 application of FYM/Compost @ 10 tonnes/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer treatment which recorded Brix (20.78 %), Pole (12.65 %), Purity (89.63 %) and Commercial Cane sugar (12.56 %). 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) registered the maximum soil available N (216.25 kg/ha), available P (51.24 kg/ha), available K (190.21 kg/ha), OC (0.51 %), bulk density (1.73 g/cc), infiltration rate (1.89 cm ha-1), Azotobacter (1.36 x10-4/gm), PSB (2.62x10-4/gm) and it was closely followed by the T8 treatment (**Table As 68.16.1**).

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 3.37 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 3.28.

Summary: Application of FYM/Compost @ 10 tones/ha + biofertilizers (Acetobacter + PSB) + soil test based NPK fertilizer recorded significantly the maximum cane yield (157.69 t/ha), CCS (12.35 %) and sugar yield (19.47) with B:C ratio of 3.37 and it was comparable with treatment (T8) application of FYM/Compost @ 10 tonnes ha-1 + biofertilizer (Azotobacter + PSB) + 100 % RDF.

Table AS 68.16.1: Performance of sugarcane plant crop as influenced due to nutrient management in plant-ratoon system at Cuddalore

Treatment	Germination (%)	Tillers ('000 ha^{-1})	Millable canes ('000 ha^{-1})	Individual cane weight (kg)	Cane yield (t ha^{-1})	Sugar yield (t ha^{-1})	Pole (%)
T_1	62.35	106.93	99.65	0.78	86.54	10.00	12.01
T_2	72.12	165.35	136.52	1.25	114.56	13.46	12.12
T_3	69.58	179.36	148.36	1.38	125.68	14.94	12.54
T_4	71.25	135.65	112.36	1.06	107.25	12.54	12.56
T_5	72.35	178.65	156.35	1.52	142.35	17.01	12.68
T_6	71.65	189.65	158.56	1.56	149.36	18.19	12.69
T_7	70.65	146.35	126.35	1.13	116.23	14.08	12.74
T_8	69.89	189.65	148.36	1.65	148.56	18.66	12.65
T_9	72.12	186.32	159.36	1.69	157.69	19.47	12.38
CD (p=0.05)	3.72	8.70	7.40	0.06	6.76	0.81	0.66

17. NAYAGARH

Results obtained from plant crop indicated that application of FYM/Compost @ 10t/ha+Azotobacter+PSB with 100% RDF (T8) and application of FYM/Compost @ 10t/ha + Azotobacter + PSB + Soil test based (NPK) fertilizer application (T9) recorded higher percentage of germination at 45 DAP i.e. 55.56 and 60.59%, respectively. These treatments subsequently performed better than other treatment combinations leading to higher yield parameters and cane yield. The length and girth of the cane were also higher 3.12m & 2.46 cm in T8 and 3.15m & 2.48 cm in T9, respectively. The NMC and Cane yield were 86660 & 93.04 t/ha in T8 and 91500& 98.35 t/ha in T9, respectively. This exhibits the positive effect of organic manures and bio fertilizers on cane yield(**Table AS 68.17.1**).

Table AS 68.17.1: Performance of sugarcane plant crop as influenced due to nutrient management in plant-ratoon system at Nayagarh

Treatment	Germination %		No of shoots (000/ha)		Length of cane (m)	Girth of cane (cm)	Wt./ cane (kg)	NMC (000/ ha)	Cane yield (t/ha)
	30 DAP	45 DAP	120 DAP	150 DAP					
T_{1}- 50% RDF	30.8	44.9	67.2	69.7	2.4	1.8	1.18	75.20	80.53
T_2-100% RDF	31.6	51.7	74.9	79.2	2.7	2.2	1.34	82.08	85.87
T_3Soil test based fert. application (NPK)	32.5	52.7	77.5	80.2	3.0	2.2	1.56	82.34	87.43
T_4Application of FYM/Compost @ 20t/ha+ 50% RDF	32.0	49.3	75.8	77.2	2.3	2.3	1.25	78.19	81.91
T_5Application of FYM/Compost @ 20t/ha+ 100% RDF	33.5	53.3	79.7	80.0	2.5	2.3	1.29	82.51	86.65
T_6Application of FYM/Compost @ 20t/ha+ Soil test based fert. application (NPK)	38.7	55.0	80.2	81.0	2.9	2.4	1.41	83.41	88.69
T_7Application of FYM/Compost @ 10t/ha+ (Azotobacter+PSB)+50 % RDF	37.3	52.0	78.9	79.2	2.9	2.2	1.35	81.00	85.57
T_8Application of FYM/Compost @ 10t/ha+(Azotobacter+ PSB) + 100% RDF	39.0	55.5	80.4	82.8	3.1	2.4	1.51	86.65	93.04
T_9Application of FYM/Compost @ 10t/ha + Azotobacter + PSB + Soil test based fert application (NPK)	40.8	60.5	84.5	89.0	3.1	2.4	1.60	91.49	98.34
CD at 5 %	6.11	6.23	9.09	9.54	0.2	0.1	0.20	8.17	8.11

NORTH CENTRAL ZONE

18. PUSA

The experimental soil was calcareous, low in organic carbon (0.44%) and available N (221.4 kg/ha) & K (74.1 kg/ha) and medium in P (11.6 kg/ha). BO 154, mid-late variety of sugarcane, was planted on 07.02.2017 and harvested on 05.03.2018.

The results indicated that number of tillers & millable cane, single cane weight (SCW) and cane yield was significantly affected due to different treatments but effect on germination and plant height and girth was non- significant. The maximum number of tillers at 120 & 150 DAP (127670 &149930/ha) and NMC (108530/ha) were recorded in T6 receiving fertilizer on soil test basis along with organics @ 20 tonnes/ha and lowest tillers at 120 & 150 DAP (78330 & 90670/ha) and NMC (68530/ha) in T1 receiving only 50% RDF. The cane yield was significantly higher in treatments T2 (67.65 t/ha) and T3 (80.73 t/ha) receiving RDF and application of fertilizer on soil test basis over T1 (49.65) having 50% RDF(**Table AS 68.17.1**).

Addition of organics @ 10 & 20 t/ha along with fertilizers further increased the cane yield. The highest cane yield (85.06 t/ha) was recorded in treatment T6 receiving fertilizer on soil test basis along with FYM @ 20 tonnes /ha which was significantly superior over T4 (53.74 t/ ha) receiving 50% RDF along with FYM @ 20 t/ha. The cane juice quality viz. brix, sucrose and purity percent was not affected due to different treatments. However, Sugar yield and uptake of nutrients (N, P and K) by sugarcane plant followed the similar trend of cane yield. The maximum uptake of N, P and K (308.25, 25.27 and 246.63 kg/ ha) by plant crop was recorded in T6 receiving fertilizer on soil test basis along with FYM @ 20 tonnes /ha and minimum in control (T1 – 150.25, 11.70 and 126.30 kg/ha)). The post-harvest soil showed significant improvement in available soil nutrients viz. N, P, K, treated plots over control. The available N, P, K ranged from 217.2 -285.6, 11.2 – 22.7, and 60.6 – 78.4.33 kg/ha. The highest N, P, K was recorded in T6 and lowest in control. Integration of nutrients with compost @ 10 & 20 t/ha significantly improved the organic carbon status of the post-harvest soil. The organic carbon in FYM treated plots ranged from 0.506 - 0.553%. However, the integration of nutrients had not significant effect on pH and EC.

Summary: Integrated application of nutrients was found effective in improving soil fertility and cane yield. The application of fertilizers on soil test i.e. 200 kg N, 100 kg P_2O_5 and 100 kg K_2O along with organics @ 20 t/ha was found suitable for boosting cane yield and maintaining soil fertility in calcareous soil of Bihar.

Table AS 68.18.1: Performance of sugarcane plant crop as influenced due to nutrient management in plant-ratoon system at Pusa

Treatment	Germination (%)	Tillers (x 10^3/ha)		NMC (x 10^3/ha)	Girth (cm)	SCW (kg)	Cane yield (t/ha)	Sucrose (%)
		120 DAP	150 DAP					
T_1	35.33	78.33	90.67	68.53	2.13	0.722	49.65	17.43
T_2	37.63	95.67	133.66	89.60	2.07	0.755	67.65	17.89
T_3	40.44	106.00	143.67	104.13	2.10	0.778	80.73	17.39
T_4	35.63	94.00	103.00	77.00	2.13	0.739	53.74	17.21
T_5	38.89	119.67	140.55	95.67	2.03	0.750	71.58	17.10

T_6	39.11	127.67	149.93	108.53	2.03	0.783	85.06	17.37
T_7	33.85	101.33	111.34	77.87	2.10	0.700	54.57	17.02
T_8	34.30	120.67	140.91	93.60	2.07	0.750	70.21	17.51
T_9	39.41	120.33	147.98	105.27	2.13	0.801	84.52	17.87
SEm ±	2.18	6.25	5.70	5.93	0.04	0.029	4.95	0.39
CD (P=0.05	N.S.	18.91	17.25	17.93	N.S.	N.S.	14.98	N.S.

19. SEORAHI

The experimental field contained 0.84 per cent organic carbon, 13.14 kg/ha available phosphorus and 102.16 kg/ha potash with pH 8.13. Sugarcane crop was planted on 25 -02-2017 and harvested on 22-03-2018. Application of FYM@ 10 t/ha+ Bio-fertilizers (Azotobacter+PSB) + soil test basis (NPK Application) treatment resulted in significantly higher NMC (147.22 thousand /ha) and cane yield (98.68 t/ha) as compared to other treatments but at par with the treatments T6 and T8. Germination percent (60.76) and shoot population (196.03) were noted significantly higher in application of FYM @ 10 t/ha+ Bio-fertilizer (Azotobacter + PSB) +100 per cent RDF treatment. Sucrose percent was not affected significantly by the application of different doses of fertilizer and other sources (**Table AS 68.19.1**).

Summary: Application of FYM @ 10 t/ha+ Bio-fertilizer (Azotobacter+PSB) + soil test basis (NPK Application) gave significantly higher cane yield at par with FYM @ 10 t/ha+ Bio-fertilizer (Azotobacter+PSB) +100 per cent RDF and FYM @ 20 t/ha+ Inorganic nutrient application based on soil test. Sucrose percent was not affected significantly by different treatments.

Table AS 68.19.1: Performance of ratoon crop as influenced due to nutrient management in plant-ratoon system at Seorahi

Treatment	Germination %	Shoots (000/ha)	NMC (000/ha)	Cane Yield(t/ha)	Sucrose %
T1	46.06	149.87	119.71	61.90	16.61
T2	48.38	157.27	123.68	67.72	16.64
T3	48.96	160.18	127.78	72.35	16.95
T4	49.07	159.26	131.61	65.87	16.29
T5	54.86	177.38	130.02	81.88	17.03
T6	50.23	190.61	145.63	94.18	17.17
T7	59.03	162.17	142.99	79.36	17.08
T8	60.76	196.03	146.56	97.75	17.36
T9	59.14	190.87	147.22	98.68	17.40
SEm±	1.36	4.25	2.94	4.46	0.42
CD(P=0.05)	4.12	12.85	8.89	13.47	NS

IMPORTANT OBSERVATIONS:

The experiment was carried out at 19 stations out of allotted 24. Following salient points emerged from findings:

- Combined application of organic and inorganic sources of nutrients was found conspicuously better over the use of fertilizers alone across the centres located in different agro-climatic conditions.
- Sugarcane trash used as mulch in ratoon crops has little contribution as a source of nutrients as organic amendments like FYM or compost recorded significant improvement in cane and sugar yield over that with trash mulching under the use of recommended dose of fertilizers across the locations.
- Use of organic sources of nutrients in plant ratoon system brings about substantial enhancement of soil health parameters in most of the sugarcane growing soils.

PROJECT No. : AS 69

Title: Use of plant growth regulators (PGRs) for enhanced yield and quality of sugarcane

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

Year of Start	**:**	2015-16
Year of Completion	**:**	2017-18
Participating centres	**:**	All centres

Treatments*(8) **:**

1. Conventional planting/ Farmers' practice (3-bud setts)
2. Planting of setts after overnight soaking in water
3. Planting of setts after overnight soaking in 50 ppm ethrel solution
4. Planting of setts after overnight soaking in 100 ppm ethrel solution
5. T_1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP
6. T_2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP
7. T_3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP
8. T_4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP

Design **:** Randomized Block Design

Replication **:** 3

Observations to be recorded **:**

1. Germination count at 10 days interval starting from 10 DAP and up to 50 DAP
2. Monthly tiller/ shoot count beginning 90 DAP
3. Leaf area and biomass accumulation (above ground plant dry weight) at monthly interval starting from 90 DAP
4. Plant height at monthly interval
5. Root dry weight at 50, 120 and 180 DAP
6. Yield attributes and yield
7. Juice quality and CCS parameters

SUMMARY OF RESULTS OBTAINED DURING LAST YEAR (2016-17)

The trial was initiated during 2015-16 with an objective to assess the response of sugarcane crop to plant growth regulators for improvement in germination, growth and yield of the crop. The trial was allocated to all the centres however, only 21 centres conducted the trial. Centre wise summary is given below.

NORTH WEST ZONE

1. FARIDKOT

Germination of sugarcane (Co 118) was better with treating the seed by 50 and 100 ppm ethrel solution than control. Ethrel helped in advancing the germination process helping in higher germination at early stage. The highest cane yield (107.6 t/ha) was observed in T8 (planting of setts after overnight soaking in 100 ppm ethrel solution and GA3 (35 ppm) spray at 90, 120 and 150 DAP) which was significantly better than T1, T2 and T5.

2. KOTA

Among treatment combination of PGR, planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 spray at 90,120,150 DAP treatment was found excellent for increasing DMA, leaf area, root dry weight, NMC, cane weight, cane yield ,o Brix, sucrose , CCS % , CCS yield and purity , GR and NR which was significantly superior over T1 and T2 treatments and at par with rest of treatments. Whereas, significant enhancement in germination at 10, 30, 40, and 50 DAP, recorded with the planting of setts after overnight soaking in 50 ppm ethrel solution over T1, T2, T5 and T6 and at par with the rest of treatments during both the years.

3. KAPURTHALA

Germination of sugarcane under the treatments, where setts were soaked in water and ethrel solution, was significantly better than the treatment where no soaking was done. There was improvement in germination when soaked in ethrel solution than soaking water but the differences were non-significant. The highest cane yield (97.8 t/ha) was observed in T8 (planting of setts after overnight soaking in 100 ppm ethrel solution and GA3 (35 ppm) spray at 90, 120 and 150 DAP) which was significantly better thanT1, T2 & T5 and was at par with others). The number of shoots (121.5 thousands/ha), millable canes (95.8 thousand /ha) and single cane wt. (1467 g) was also higher in T8 than other treatments.

4. LUCKNOW

The findings during 2016-17 revealed that planting of three budded cane setts after overnight soaking in 100 ppm ethrel solution and three GA3 (35 ppm) spay at 90, 120 and 150 DAP resulted early cane setts germination and enhanced the cane yield to 98.17 t/ha over the conventional planting treatment cane yield 80.67 t/ha without affecting the cane juice quality.

5. PANTNAGAR

Higher germination, higher shoot population, higher NMC, higher cane weight and longer canes were recorded in the treatment T4 (soaking of setts in ethrel 100 ppm solution) and T8 (T4 + GA3 35 ppm spray at 90, 120 and 150 DAP). Germination also improved through overnight sett soaking with water.

6. SHAHJAHANPUR

Germination (%) recorded under overnight soaking in 100 ppm ethrel solution was at par with overnight soaking in 50 ppm ethrel solution and it was significantly superior to conventional and overnight soaking in water. Planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 (35 ppm) resulted significantly higher number of shoots, millable canes and cane yield than those of other treatments.

7. UCHANI

Overnight soaking of setts in 50 ppm and 100 ppm ethrel being at par recorded significantly higher germination at 20, 30, 40 and 50 DAP as compared to control and water soaked treatments. Soaking of setts in 50 ppm ethrel+ GA3 spray (T7) and 100 ppm ethrel+GA3 (T8) being at par recorded significantly higher number of tillers, NMC, cane yield and sugar yield as compared to soaking of setts in ethrel at 50 and 100 ppm ethrel alone, conventional practices with and without GA3 and water soaking treatments with and without GA3 spray at 90, 120 and 150 Days after planting.

8. SRIGANGANAGAR

Soaking of sugarcane setts in water or 50 ppm or 100 ppm ethrel solutions resulted in significant increase in sugarcane germination. Overnight soaking of setts in 50 ppm or 100 ppm ethrel being at par resulted significantly improvement in sugarcane germination as compared to farmers' practice and water soaked treatments. The highest cane yield (98.4 t/ha) was recorded in T8 (planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 (35 ppm) spray at 90, 120 and 150 DAP) which was significantly better than T1, T2 and T5 but at par with T3, T4, T6 & T7.

PENINSULAR ZONE

9. PADEGAON

Germination was found significantly higher with planting of setts after overnight soaking in 50 ppm ethrel solution while it was found at par with treatments T7, T4, T8 and T6 at 30, 40, and 50 DAP. The planting of setts after overnight soaking in 50 ppm ethrel solution with GA3 spray (35 ppm) at 90, 120 and 150 DAP recorded significantly the highest cane while CCS yield was not affected significantly by different treatments. However, it was at par with planting of setts after overnight soaking in 100 ppm ethrel solution and GA3 spray (35 ppm) at 90, 120 and 180 DAP, Planting of setts after overnight soaking in water with GA3 spray (35 ppm) at 90, 120 and 150 DAP, planting of setts after overnight soaking in 50 ppm ethrel solution and planting of setts after overnight soaking in 100 ppm ethrel solution. All quality parameters like, brix (c), sucrose (%), purity (%) and CCS% were not affected by different treatments.

10. NAVSARI

Germination (%) at 20, 40 and 50 DAP were recorded significantly highest with T3 (planting of setts after overnight soaking in 50 ppm ethrel solution) over other treatments and remained at par with T4, T7 and T8. Significantly highest cane yield (127.27 t/ha) was noticed with treatment T8 (planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 (35 ppm) spray at 90, 120 and 150 DAP) but remained at par with T3, T4, and T7 over T1. CCS yield was not significantly influenced due to various treatments. Various quality parameters were not significantly influenced.

11. MANDYA

Overnight soaking of setts in 50 or 100% ethereal solution followed by 35ppm GA3 spray at 90, 120 and 150 DAP found to enhance the germination percentage and cane yield.

12. POWARKHEDA

The cane yield increased significantly due to planting of setts after overnight soaking in 50 ppm ethrel solution (125.93 t/ha) as compared to T2 + GA3 (35 ppm) spray at 90, 120 and 150 DAP (117.08 t/ha), planting of setts after overnight soaking in water (117.80 t/ha), T1 + GA3 (35 ppm) spray at 90, 120 and 150 DAP (118.11 t/ha) and conventional planting/Farmers practice (3- bud setts) (118.83 t/ha). The cane yield obtained at par in between T7 (T3 + GA3 (35 ppm) spray), T3 (planting of setts after overnight soaking in 50 ppm ethrel solution), T4 (planting of setts after overnight soaking in 100 ppm ethrel solution) and T8 (T4 + GA3 (35 ppm) spray).

13. PUNE

The results of the second year trial indicated that, highest germination (70.40%) at 30 DAP, tillering (1.41 lac/ha) at 120 DAP, NMC (0.76 lac/ha),cane girth (11.25 cm), cane yield (158.67 t/ha) and B:C ratio (2.71) was recorded when the setts were overnight soaked in 50 ppm ethrel before planting and foliar spray of GA3 (35ppm) at 90,120 and 150 DAP followed by cane yield of 155.67 t/ha in overnight soaking of setts in 100 ppm ethrel and spraying of GA3 (35ppm).

14. THIRUVALLA

The highest germination percentage and tiller population were recorded by T8 (T4 +GA3 spray (35ppm) at 90,120 and 150 DAP) and the lowest value for the above parameters were recorded by T2 (planting of setts after overnight soaking in water). The highest cane length (261.76 cm), MCC (93180/ ha), cane yield (118.11 t/ha) were recorded under T8. Sugar yield also showed same trend and recorded significantly higher value (13.24 t/ha) for the very same treatment (T8). The highest BC ratio of 1.32 was also recorded by T8.

15. SANKESHWAR

The treatment variation due to use of growth regulators was not conspicuous owing to occurrence of drought during both years. However, T3 (Planting of setts after overnight soaking in 50 ppm ethrel solution) recorded few of the growth (germination and tiller number). Yield (NMC) and quality parameters (juice purity) significantly higher.

EAST COAST ZONE

16. ANAKAPALLE

The experimental results indicated that significantly higher cane yield was recorded in planting of setts after overnight soaking in 100 ppm (88.1 t/ha) or 50 ppm ethrel solution (85.8 t/ha) followed by spraying of GA3 at 90,120 and 150 days after planting. Conventional 3 budded sett planting recorded significantly lower cane yield of 73.3 t/ha.

17. CUDDALORE

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 highest millable cane (172650/ha), cane yield (145.36 t/ha), CCS (12.75) and sugar yield (18.53).

18. NAYAGARH

Planting of setts after soaking in 100 ppm ethrel solution along with GA3 spray at 90, 120 and 150 DAP proved to be the best with highest number of millable canes (81200/ha), cane (121.4 t/ha) and CCS yield (12.82.t/ha. Planting of setts after overnight soaking in water along with GA3 spray at 90, 120 & 150 DAP produced NMC of 74330/ha, cane and CCS yield of 115.5 and 12.18 t/ha, respectively.

NORTH CENTRAL ZONE

19. PUSA

Planting of setts after overnight soaking in 50 ppm ethrel solution + GA3 spray (35 ppm) at 90, 120 and 150 DAP (T7) produced higher cane yield (98.6 t/ha) followed in order by planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 spray (35 ppm) at 90, 120 and 150 DAP (T8).

20. BETHUADHARI

The trial was initiated during the year with sugarcane planting on 03.02.2016 (CoB 99161). There was significant improvement in germination at 40 and 50 DAP under soaking of setts in ethrel solution (50 or 100 ppm). Significant increase in cane yield was also recorded under these treatments. Spray of GA3 registered increase in cane yield but that was not significant over T4.

NORTH EASTERN ZONE

21. BURALIKSON

Planting of setts after overnight soaking in water (T2), Planting of setts after overnight soaking in 50 ppm ethrel solution (T3), planting of setts after overnight soaking in 100 ppm ethrel solution (T4) significantly increased the germination over conventional planting (T1). Likewise, in terms of cane yield planting of setts after overnight soaking in 100 ppm ethrel solution followed by spraying of GA3 (35ppm) at 90,120 and 150 DAP i.e. T8 recorded significantly the highest cane yield (57.75t/ha) which is statistically at par with the cane yield recorded by the treatments T6 (54.80 t/ha), T7 (53.21 t/ha), respectively.

Important Observations:

- There was significant improvement in the rate and extent of germination of sugarcane due to overnight soaking of setts in ethrel solution.
- The effective concentration of ethrel solution for germination improvement was found to be 100 ppm in north western zone and east coast zone and 50 ppm in peninsular, north central, north eastern zones.
- Foliar spray of GA_3 during tillering phase could not improve the cane yield significantly over sett soaking in ethrel solution at most of the centres.

CURRENT YEAR (2017-18) REPORT

NORTH WESTERN ZONE

1. FARIDKOT

Germination of sugarcane was better with treating the seed by 50 &100 ppm ethrel solution than no treatment(**Table AS 69.1.1**). Ethrel helped in advancing the germination process helping in higher germination at early stage. The highest cane yield (94.7 t/ha) was observed in T8 (planting of setts after overnight soaking in 100 ppm ethrel solution and GA3 (35 ppm) spray at 90, 120 and 150 DAP) which was significantly better than T1, T2, T3 and T5 (**Table AS 69.1.2**).

Table AS 69.1.1: Influence of PGR on germination in sugarcane at Faridkot

Treatment	20 DAP	30 DAP	40 DAP	50 DAP
T_1	1.2	7.5	20.5	38.0
T_2	6.3	26.4	33.7	41.7
T_3	14.7	35.8	40.6	48.6
T_4	17.0	38.0	40.1	48.4
T_5	0.8	7.8	20.5	35.9
T_6	8.2	25.9	32.0	36.8
T_7	14.0	38.0	39.6	50.0
T_8	14.3	38.0	40.4	51.6
CD (5%)	2.2	5.0	5.9	4.6

Table AS 69.1.2: Influence of PGR on sugarcane growth and yield at Faridkot

Treatment	No. of Shoots 000/ha	NMC 000/ha	Cane length (cm)	Cane diameter (cm)	Single cane wt. (g)	Cane yield (t/ha)	Sucrose (%)
T_1	135.6	95.6	229	2.81	1369	67.1	16.18
T_2	152.8	102.5	252	2.83	1519	75.8	16.25
T_3	177.5	120.3	255	2.82	1627	80.2	16.48
T_4	180.6	123.9	266	2.82	1614	85.2	16.31
T_5	136.1	95.6	249	2.83	1443	78.7	16.08
T_6	157.5	105.6	260	2.77	1526	89.6	16.84
T_7	179.4	121.7	272	2.81	1627	92.7	16.89
T_8	185.0	130.3	274	2.73	1719	94.7	16.56
CD (5%)	30.0	16.3	NS	NS	NS	12.0	NS

2. KOTA

A field experiment was planted on 10th March, 2017. Sugarcane variety CoPk 05191 was planted at 75 cm row distance, keeping 3 budded 4 setts per meter row length. Significant variation in germination was observed at all the germination stages with the use of Ethrel. Significant enhancement in germination (%) at 10, 20, 30, 40, and 50 DAP was recorded with overnight soaking of setts in 50 ppm ethrel solution over T1, T2, T5 and T6 and at par with the rest of treatments. Tillers count significantly increased at all the stages under the overnight soaking of setts in 100 ppm ethrel solution + GA3 spray @ 35 ppm at 90,120,150 DAP over T1, T2, T5 and T6 and at par with the rest of treatments. Gibberellic acid stimulated cane growth when it was sprayed during actively growing period. This treatment had also significant effect on leaf area (cm^2/plant) at 90, 120, 150 and 180 DAP over that of T1, T2, T3 and T4 and at par with rest of the treatments. Whereas, significantly higher leaf area at harvest (391.07 cm^2/plant) was also observed under the same treatment. Significantly higher root dry weight at 180 DAP, recorded under the same treatment over T1, T2, T3, andT4 and at par with rest of the treatments, while at harvest stage root dry weight significantly increased by the overnight soaking in 100 ppm ethrel solution + GA3 spray at 90,120,150 DAP over T1, T2, T3, T5 and T6 and at par with rest of the treatments. Data presented in table **AS 69.2.1**revealed that significantly higher NMC (148.63 thousand/ha), cane weight (857 g/plant), cane yield (99.70 t/ha), Brix (21.50 %), sucrose (19.00 %), CCS (13.14 %), CCS yield (13.10 t/ha) and purity (88.3%) were obtained with the overnight soaking in 100 ppm ethrel solution + GA3 spray at 90,120,150 DAP over those of T1 and T2 treatments and at par with rest of treatments.

Data presented in table **AS 69.2.2** revealed that there were differences in cost of cultivation, GR, NR owing to different treatment cost. The higher GR and NR recorded with application of T8 treatment which was significantly higher over T1 and T2 and at par with rest of treatments. Significantly the highest BC ratio recorded in T4 treatment over T1, T2, T 5 and T6 and at par with rest. However, maximum cane production cost (Rs1, 15,450 /ha) recorded in T8 treatment owing to higher cost of GA3 including spray labour cost. Whereas, lowest production cost, GR and NR recorded in T1

Summary: Based on three years data,combination of PGR, planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 spray at 90,120,150 DAP was found effective for increasing plant growth characters viz., plant height, tillers, leaf area, root dry weight, number of millable cane, cane weight, cane yield and also quality parameters i.e. Brix, Sucrose (%), CCS (%) CCS yield, purity (%), GR and NR which was significantly superior over T1 and T2 treatments and at par with rest of treatments .followed by T 7- Planting of setts after overnight soaking in 50 ppm ethrel solution + GA3 (35 ppm) spray at 90, 120 and 150 DAP treatment also same trend.

Table AS 69.2.1: Influence of PGR on germination in sugarcane at Kota

Treatment	Germination (%)				
	10 DAP	20 DAP	30 DAP	40 DAP	50 DAP
T_1 : Conventional planting / Farmers' practice (3-bud setts)	5.20	18.08	37.65	43.15	46.85
T_2 : Planting of setts after overnight soaking in water	5.54	18.60	39.28	43.78	47.18
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel Solution	6.52	20.28	43.65	47.82	53.77
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel Solution	7.00	20.40	43.68	47.53	53.03
T_5 : T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	5.86	19.39	39.10	43.60	47.87
T_6 : T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	5.91	19.72	39.17	43.40	48.20
T_7 : T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	7.30	21.90	44.40	49.28	56.02
T_8 : T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	7.04	21.78	44.28	48.85	55.25
SEm ±	0.52	0.73	1.55	1.50	2.27
CD (P=0.05)	1.57	2.21	4.70	4.52	6.87

Table AS 69.2.2: Influence of PGR on sugarcane growth and yield at Kota

Treatment	NMC (000/ ha)	Cane weight (g)	Cane yield (t/ha)	Sucrose (%)	CCS (t/ha)
T_1 : Conventional planting/ Farmers' practice (3-bud setts)	125.10	699.93	79.30	16.73	9.12
T_2 : Planting of setts after overnight soaking in water	125.97	703.73	80.57	16.73	9.26
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	137.13	819.47	91.97	17.83	11.31
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	140.33	825.27	93.03	17.87	11.46
T_5 : T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	137.77	799.50	91.13	18.10	11.38
T_6 : T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	139.37	810.60	92.23	18.34	11.67
T_7 : T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	146.23	852.50	98.03	18.59	12.58
T_8 : T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	148.63	857.13	99.70	19.00	13.10
SEm ±	4.70	35.13	3.89	0.48	0.64
CD (P=0.05)	14.23	106.31	11.78	1.44	1.95
CV	5.92	7.64	7.43	4.61	9.91

Table AS 69.2.3: Influence of PGR on sugarcane production economics at Kota

Treatment	Treatment cost (Rs/ha)	Production cost (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B: C ratio
T_1 : Conventional planting/ Farmers' practice (3-bud setts)	0	1,01,804	202215	100411	1.97
T_2 : Planting of setts after overnight soaking in water	1,970	1,03,774	205445	101671	1.99
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	2,123	1,03,927	234515	130588	2.26
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	2,276	1,04,080	237235	133155	2.28
T_5 : T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	11,370	1,13,170	232390	119220	2.05
T_6 : T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	13,340	1,15,144	235195	120051	2.04
T_7 : T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	13,493	1,15,297	249985	134688	2.13
T_8 : T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	13,646	1,15,450	254235	138785	2.16
SEm ±	-	-	9931	9931.26	0.07
CD (P=0.05)	-	-	30052	30051.6	0.20

3. KAPURTHALA

Planting cane setts after overnight soaking either in water and ethrel solution significantly improve the germination over conventional planting of cane setts without soaking at 20,40 and 50 DAP. Cane setts soaking with water, 50ppm and 100ppm recorded similar germination % which were significantly better over conventional planting without soaking. Number of shoots and plant heights at periodic stages of 120 and 150 DAS were not significantly influenced by different treatments but their higher numerical values were observed in plots planted after pre-soaking treatment followed by plant hormones application in comparison conventionally planted plots.

Planting cane pre-soaked with 100 ppm ethrel solution followed by GA3 (35 ppm) spray at 90, 120 and 150 DAP produced significantly higher number of millable canes which were statistically similar to millable canes produced under treatment T7 i.e setts treatments with 50 ppm ethrel solution followed by GA3 (35 ppm) spray at 90, 120 and 150 DAP and T3 (overnight soaking in 50 ppm ethrel solution) but were significantly higher than millable canes produced under remaining treatments which were statistically similar in production of millable cane (Table 69.2). Overnight setts soaking in water and pre-soaked cane with 100 ppm ethrel solution followed by GA3 (35 ppm) spray at 90, 120 and 150 DAP produced cane

statistically similar single cane weight but it was significantly higher over the single cane weight of rest of treatments. Cane yield under treatment T8 was significantly higher than the cane yield under all other treatment which was followed by cane yield under treatment T7 and T4. The conventional planting of sugarcane produced lowest cane yield among all treatments (**Table AS 69.3.1**).

Cane qualities parameters like brix%, POL %, Purity % and CCS% although were not significantly influenced by different treatments but CCS varied significantly with treatments. CCS under treatment T8 was highest among the treatments that was similar to CCS in T4, T6 and T7 but it was significantly better over CCS produced in other treatments. CCS in treatment T1, T2, T3 and T5 were also statistically similar among each other.

Table AS 69.3.1: Germination (%) of sugarcane under various treatments at Kapurthala

Treatment	Germination (%)			No. of Shoots 000/ha		Plant height (cm)	
	20 DAP	40 DAP	50 DAP	120 DAS	150 DAS	120 DAS	150 DAS
T_1	8.2	24.8	40.0	102.6	105.5	152.2	223.3
T_2	12.6	37.6	41.6	101.0	98.0	156.3	234.0
T_3	9.8	29.5	43.0	112.4	114.0	161.7	228.0
T_4	10.2	30.7	44.3	101.9	102.0	155.1	234.0
T_5	6.4	20.3	43.4	99.8	97.5	156.7	233.0
T_6	12.9	38.6	43.0	108.2	103.1	155.5	235.0
T_7	12.1	36.2	45.8	106.2	109.8	163.5	239.3
T_8	12.9	38.8	47.4	108.5	114.2	157.5	234.3
CD (P=0.05)	1.5	3.9	4.1	NS	NS	NS	NS

Table AS 69.3.2: Growth, yield and quality of Sugarcane under various treatments at Kapurthala

Treatment	NMC 000/ha	Cane length (cm)	Cane diameter (cm)	Single cane wt. (g)	Cane yield (t/ha)
T_1	102.6	216.0	2.37	1126.0	103.0
T_2	112.2	224.3	2.50	1140.0	109.5
T_3	119.3	218.3	2.49	1003.3	113.0
T_4	108.3	217.0	2.32	1050.7	122.7
T_5	110.5	217.0	2.27	1044.3	108.4
T_6	109.4	225.3	2.48	1032.7	115.7
T_7	115.9	231.7	2.42	1096.3	128.9
T_8	122.1	232.0	2.29	1291.3	132.6
CD (P=0.05)	9.7	NS	NS	153.4	1.3

4. LUCKNOW

Cane sett bud germination was recorded at10, 20, 30, 40 and 50 days after planting. The cane sett bud germination data showed significantly higher germination in treatment overnight soaked with 100 ppm ethrel solution (**Table AS 69.4.1**). However 50 ppm ethrel solution overnight soaked treatment germination was statistically at par with 100 ppm ethrel solution overnight soaked sett treatment at 20, 30, 40 and 50 days after planting. The data pertaining to yield, yield contributing attributes and juice quality are presented in table **AS 69.4.2** revealed significant higher single cane weight (1200.7 g) number of millable canes (137.19 thousand/ha) and yield (98.90 t/ha) in planting of setts after overnight soaking in 100 ppm ethrel solution and three GA3 spray (35 ppm) at 90, 120 and 150 days after planting treatment. The cane yield was statistical at par in treatment either alone overnight soaked setts with either 50 or 100 ppm ethrel solution soaked treatment or along with three GA3 spray(35 ppm) at 90, 120 and 150 days after planting. The cane length, diameter and sucrose per cent were not affected significantly due to either overnight soaking of cane setts before planting nor with foliar application of GA3 solution.

Summary: The finding of the AICRP on sugarcane experiment use of plant growth regulators (PGRs) on yield and quality of sugarcane conducted during 2017-18 at ICAR-IISR, Lucknow revealed significantly higher cane bud germination in overnight ethrel soaked setts treatment over conventional and water soaked treatment however 50 and 100 ppm overnight ethrel solution soaked treatments germination per cent was statistically at par. The higher cane yield (98.90 t/ha) was recorded in the planting of setts after overnight soaking in 100 ppm ethrel solution and three GA3 spray (35 ppm) at 90, 120 and 150 days after planting.

Table AS 69.4.1: Germination (%) of sugarcane under various treatments at Lucknow

Treatment	Germination (%)				
	10 DAP	20 DAP	30 DAP	40 DAP	50 DAP
Conventional planting	0.0	1.26	9.07	20.20	30.02
Planting of setts after overnight soaking in water	0.0	12.16	19.23	25.03	32.50
Planting of setts after overnight soaking in 50 ppm ethrel solution	0.0	18.69	29.37	32.53	39.31
Planting of setts after overnight soaking in 1000 ppm ethrel solution	0.0	18.03	28.97	32.83	39.67
T1 + GA3 Spray (35ppm) at 90, 120 and 150 DAP	0.0	1.59	9.33	20.32	31.20
T2+ GA3 Spray (35ppm) at 90, 120 and 150 DAP	0.0	10.44	20.07	25.50	33.07
T3 + GA3 Spray (35ppm) at 90, 120 and 150 DAP	0.0	18.75	29.20	32.40	39.76
T4 + GA3 Spray (35ppm) at 90, 120 and 150 DAP	0.0	19.79	29.70	34.33	40.23
CD (P=0.05)	NS	3.95	3.99	5.20	5.40

Table AS 69.4.2: Growth, yield and quality of Sugarcane under various treatments at Lucknow

Treatment	Cane length (cm)	Cane diameter (cm)	Single cane weight (g)	NMC ($x10^3$ ha^{-1})	Cane yield (t/ha)	Sucrose (%)
Conventional planting /farmers practice	252.27	2.22	953.3	108.75	80.43	17.35
Planting of setts after overnight soaking in water	253.93	2.27	965.3	112.69	85.06	17.32
Planting of setts after overnight soaking in 50 ppm ethrel solution	262.80	2.38	1183.5	133.47	95.11	17.68
Planting of setts after overnight soaking in 100 ppm ethrel solution	264.33	2.41	1186.7	134.73	95.50	17.74
T1+ GA3 Spray (35 ppm) at 90, 120 and 150 DAP	261.60	2.24	995.7	113.10	83.03	17.37
T2+ GA3 Spray (35 ppm) at 90, 120 and 150 DAP	262.53	2.31	1002.8	115.41	86.92	17.49
T3+ GA3 Spray (35 ppm) at 90, 120 and 150 DAP	267.07	2.39	1193.7	136.63	98.77	17.73
T4+ GA3 Spray (35 ppm) at 90, 120 and 150 DAP	270.33	2.43	1200.7	137.19	98.90	17.77
CD (P<0.5)	NS	NS	103.33	12.38	8.81	NS

5. PANTNAGAR

Germination was enhanced significantly in the treatment T4 - overnight soaking of setts in 100 ppm ethrel (Ethephon) and T8 – (T4 + GA3 spray @ 35 ppm at 90, 120 and 150 DAP) over rest of the treatments even at 20 days after sugarcane planting. Germination % was however started at 20 days after sugarcane planting in conventional (no treatment) but was very low 2.1 % only against T4 and T8 (14.4 %). At final stage (50 DAP) germination % was almost 10 % higher in T4 – (Ethrel 100 ppm overnight soaking) over conventional (**Table AS 69.5.1**). Germination % was not influenced due to GA3 spray @ 35 ppm because GA3 was sprayed 90, 120 and at 150 DAP. Germination % was also higher in overnight soaking of setts in water over conventional (no treatment).

Highest cane yield (105.3 t/ha) in T4 and 107.8 t/ha was recorded in T4 and T8 respectively which was significantly higher over rest of the treatments except T7 in which GA3 was sprayed @ 35 ppm at 90, 120 and 150 DAP along with ethrel spraying @ 50 ppm. Higher cane yield was the cumulative effect of higher and hasten germination % of setts, resulted higher shoot population at all the stage of crop growth, cane girth, length of stalk and ultimately heavier cane (higher cane weight in individual cane). NMC were also recorded higher in these treatments T4, T8 and T7.Commercial cane yield (CCS ton/ha) was also recorded significantly higher in T4 which was significantly higher over rest of the treatments

except T6, T7 and T8. Higher CCS in T4, T8 and T7 was the result of higher sucrose % and cane weight in this treatment. (**Table AS 69.5.2**).

Summary: Germination%, higher shoot population, higher NMC, higher cane weight, length of the cane were recorded in the treatment T4 and T8 of ethrel soaking of setts @ 100 ppm which was triggered by GA3 application 35 ppm applied at 90, 120 and 150 DAP. Higher cane yield in T6 was the result of heavier cane (individual cane), higher NMC, cane length and cane girth. Initial plant population however was lower than T7 and T5 but due to better fertility status of the soil shoot population was higher at 120, 150 and 180 DAR.CCS yield and sucrose % were also higher in T6 followed by T5 and found at par. Juice cane yield, CCS yield and sucrose % at harvest were higher in T5 and T6 so available sugar % at harvest was highest in T6 followed by T5.

Table AS 69.5.1: Germination (%) of sugarcane under various treatments at Pantnagar

Treatment	Germination % (DAP)				
	10	**20**	**30**	**40**	**50**
T_1-Conventional	0.0	2.1	23.9	37.7	38.5
T_2-Overnight soaking of setts in water	0.0	10.9	25.4	42.0	42.1
T_3- Overnight soaking of setts in 50 ppm Ethrel	0.0	11.6	29.4	41.2	42.8
T_4- Overnight soaking of setts in 100 ppm Ethrel	0.0	14.4	33.4	42.1	46.5
T_5- $T_1 + GA_3$ spray @35 ppm 90, 120, 150 DAP	0.0	2.7	23.8	36.9	38.8
T_6- $T_2 + GA_3$ spray @35 ppm 90, 120, 150 DAP	0.0	11.1	27.2	42.9	40.8
T_7- $T_3 + GA_3$ spray @35 ppm 90, 120, 150 DAP	0.0	12.7	31.7	41.0	44.0
T_8- $T_4 + GA_3$ spray @35 ppm 90, 120, 150 DAP	0.0	13.5	32.4	44.0	45.7
SEm±	-	0.9	2.3	3.0	3.1
CD at 5 %	-	2.9	7.2	9.0	9.5

Table AS 69.5.2: Growth, yield and quality of Sugarcane under various treatments at Pantanagar

Treatment	NMC (000/ha)	Cane length (cm)	Cane girth (cm)	Individual cane weight (g)	Cane yield (t/ha)	Sucrose (%)	CCS (t/ha)
T_1-Conventional (No treatments)	63.2	347	10.0	1000	79.4	15.0	11.4
T_2-Overnight soaking of setts in water	74.7	360	10.0	1300	85.0	16.3	11.6
T_3- Overnight soaking of setts in 50 ppm Ethrel	68.3	349	11.0	1380	93.7	16.6	13.0
T_4- Overnight soaking of setts in 100 ppm Ethrel	75.9	374	11.0	1400	105.3	16.9	14.9
T_5- T_1 + GA_3 spray @35 ppm 90, 120, 150 DAP	66.5	350	9.0	1090	87.7	16.3	11.5
T_6- T_2 + GA_3 spray @35 ppm 90, 120, 150 DAP	67.3	343	9.3	1230	92.7	16.4	12.7
T_7- T_3 + GA_3 spray @35 ppm 90, 120, 150 DAP	71.7	325	9.3	1400	98.9	16.4	13.4
T_8- T_4 + GA_3 spray @35 ppm 90, 120, 150 DAP	75.2	346	10.0	1500	107.8	16.6	14.7
SEm±	3.7	11.0	0.4	85	2.7	0.1	0.5
CD at 5 %	11.5	33.0	1.3	255	8.7	0.3	1.5

6. SHAHJAHANPUR

Sugarcane (CoS 03251) was planted at 75 cm row to row distance. The soil of the experimental field was sandy loam in texture, low in organic carbon (0.39%), low in phosphorus (9.2 kg/ha) and medium in potassium (176kg/ha) with soil pH 6.8. The experimental crop was planted on 18.02.2017 and harvested on 08.03.2018. The experimental results (Table AS 69.6.1) showed that germination % recorded under overnight soaking in 100 ppm ethrel solution was significantly superior to conventional and overnight soaking in water. Planting of setts after overnight soaking in 100 ppm ethrel solution + Gibberellic acid (35 ppm) spray at 90, 120, and 150 DAP produced significantly higher number of shoots, millable canes and cane yield than those of other treatments. CCS% in cane was not significantly affected with various treatments.

Summary: Germination % recorded under overnight soaking in 100 ppm ethrel solution was at par with overnight soaking in 50 ppm ethrel solution and it was significantly superior to conventional and overnight soaking in water. Planting of setts after overnight soaking in 100 ppm etheral solution + Gibberellic acid (35 ppm) resulted significantly higher cane yield (90.00t/ha) than those of other treatments.

Table AS 69.6.1: Germination (%) of sugarcane under various treatments at Shahjahanpur

Treatment	Germination %				NMC (000/ha)	Cane yield (t/ha)	CCS%
	20 DAP	30 DAP	40 DAP	50 DAP			
T_1- Conventional planting/ farmers practice (3 budded setts)	4.96	7.74	14.19	25.30	106.48	63.20	12.1
T_2 – Planting of 2 Budded setts after overnight soaking in water.	5.95	8.53	18.15	32.24	113.12	65.70	12.7
T_3- Planting of 2 Budded setts after overnight soaking in 50 ppmethrel solution.	7.24	17.85	29.76	38.29	121.53	74.40	12.9
T_4- planting of 2 Budded setts after overnight soaking in 100 ppmethrel solution	6.84	20.83	35.02	45.83	125.46	81.20	12.7
T_5 – T_1 + GA_3 spray (35 ppm) at 90,120 and 150 DAP.	5.95	9.62	17.06	30.85	109.95	68.70	12.3
T_6– T_2 + GA_3 spray (35 ppm) at 90,120 and 150 DAP	6.05	9.92	19.74	32.44	117.82	72.50	12.0
T_7 – T_3 + GA_3 spray (35 ppm) at 90,120 and 150 DAP	9.52	14.88	27.28	37.80	135.42	83.60	12.2
T_8 – T_4 + GA_3 spray (35 ppm) at 90,120 and 150 DAP	11.11	21.63	32.54	42.56	139.24	90.00	12.4
SE±	0.91	0.58	0.56	0.40	2.90	1.40	0.22
CD	1.95	1.24	1.21	0.86	6.22	3.00	NS

7. UCHANI

Sugarcane variety CoH 167 (mid late) was planted at 75 cm row spacing in spring season on March31, 2017. The soil was loam in texture having pH 8.1, EC 0.4 dSm^{-1}, organic carbon 0.35, available P 11.7 kg/ha and available K 184 kg/ha. The crop was raised as per package of practices for the Haryana state. The crop was harvested on March 25, 2018.

Lowest germination was recorded in conventional practices i.e. T1 and T5 treatments. Dipping of setts in 50 ppm and 100 ppm ethrel being at par recorded significantly higher germination at 20, 30, 40 and 50 DAP as compared to control and water soaked treatments. Germination was hastened with soaking of setts in 50 ppm and 100 ppm ethrel treatments. Even at 20 days after planting, 14.68-15.93 % germination was recorded in soaking of setts in 50 ppm and 100 ppm ethrel treatments (**Table AS 69.7.1**).

Soaking of setts in 50 ppm ethrel+ GA3 spray (T7) and 100 ppm ethrel+GA3 (T8) being at par recorded significantly higher number of tillers, NMC, cane yield (98.8 and 100.4 t/ha) and sugar yield as compared to soaking of setts in ethrel at 50 and 100 ppm ethrel alone, conventional practices with and without GA3 and water soaking treatments with and without GA3 spray at 90, 120 and 150 Days after planting (**Table AS 69.7.2**).

Summary: Dipping of setts in 50 ppm and 100 ppm ethrel being at par recorded significantly higher germination at 20, 30, 40 and 50 DAP as compared to control and water soaked treatments. Soaking of setts in 50 ppm ethrel+ GA3 spray (T7) and 100 ppm ethrel+GA3

(T8) being at par recorded significantly higher number of tillers, NMC, cane yield and sugar yield as compared to soaking of setts in ethrel at 50 and 100 ppm ethrel alone, conventional practices with and without GA3 and water soaking treatments with and without GA3 spray at 90, 120 and 150 Days after planting.

Table AS 69.7.1: Germination and shoot count of sugarcane under various treatments at Uchani

Treatment		Germination (%)					Shoot population (000/ha)			
		10 DAP	20 DAP	30 DAP	40 DAP	50 DAP	90 DAP	120 DAP	150 DAP	180 DAP
1	Conventional planting/ (3-bud setts)	0.32	3.84	23.01	38.66	39.54	97.0	132.6	129.9	110.9
2	Planting of setts after overnight soaking in water	0.60	8.70	28.52	42.87	45.46	113.5	148.7	142.5	118.4
3	Planting of setts after overnight soaking in 50 ppm ethrel solution	3.33	14.77	33.56	49.68	52.69	132.3	176.7	170.4	135.4
4	Planting of setts after overnight soaking in 100 ppm ethrel solution	3.98	15.93	36.34	54.21	55.79	137.1	181.3	175.2	139.4
5	T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0.46	3.75	22.92	38.29	40.51	104.5	136.3	132.3	113.0
6	T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0.65	8.38	28.10	43.33	45.37	113.4	154.3	147.8	120.4
7	T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	3.24	14.68	34.10	50.42	52.87	133.2	179.3	173.5	138.6
8	T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	4.21	15.97	37.00	53.43	56.25	138.3	186.3	179.5	142.7
	CD at 5%	0.40	1.14	2.34	6.23	5.27	7.6	10.7	13.6	15.2

Table AS 69.7.2: Growth and yield of sugarcane under various treatments at Uchani

Treatment	NMC (000/ha)	Single cane weight (g)	Cane yield (t/ha)	CCS (%)	Sugar yield (t/ha)
1	106.2	742	75.5	11.81	8.92
2	113.4	751	81.5	11.84	9.65
3	129.3	760	94.1	11.95	11.25
4	132.3	758	96.0	12.05	11.58
5	108.2	770	79.7	11.90	9.48
6	115.2	782	86.2	11.98	10.32
7	132.3	780	98.8	11.91	11.76
8	135.4	775	100.4	11.81	11.86
CD at 5%	12.7	NS	4.6	NS	0.98

8. SRIGANGANAGAR

The field experiment was conducted to study the response of plant growth regulators (PGRs) for enhancing cane yield and quality of sugarcane. The soil of the experimental field being sandy loam in texture, alkaline in reaction (8.3), tested low in organic carbon (0.28%), medium in available P_2O_5 (22 kg/ha) and high in available K_2O (384 kg/ha). The experiment was conducted on early maturing variety Co 6617. The data presented in table **AS 69.8.1**

indicated that soaking of sugarcane setts in water or 50 ppm or 100 ppm ethrel solutions resulted in significant increase in sugarcane germination. Dipping of setts in 50 ppm or 100 ppm ethrel being at par resulted significant improvement in sugarcane germination as compared to farmers practice and water soaked treatments. The highest cane yield (99.7 t/ha) was recorded in T8 (planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 (35 ppm) spray at 90, 120 and 150 DAP which was significantly better than T1, T2 and T5 but at par with T7 - T3 + GA3 (35 ppm) spray at 90, 120 and 150 DAP (98.8 t/ha), T4 - Planting of setts after overnight soaking in 100 ppm ethrel solution (95.7 t/ha), T6 - T2+ GA3 spray (35 ppm) at 90, 120 and 150 DAP (94.6 t/ha) and T3 - Planting of setts after overnight soaking in 50 ppm ethrel solution (94.4 t/ha).

Table AS 69.8.1: Growth, yield and quality of Sugarcane under various treatments at Sriganganagar

Treatment		Germination (%)	NMC (000/ha)	Single cane weight (g)	Cane yield (t/ha)	CCS (%)
1	Conventional planting/ (3-bud setts)	35.2	94.7	971	85.1	11.92
2	Planting of setts after overnight soaking in water	40.1	97.1	994	90.2	11.99
3	Planting of setts after overnight soaking in 50 ppm ethrel solution	45.3	100.1	1018	94.4	12.01
4	Planting of setts after overnight soaking in 100 ppm ethrel solution	46.8	102.8	1025	95.7	12.08
5	T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	35.9	97.9	996	89.4	11.99
6	T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	41.8	100.1	1019	94.6	12.04
7	T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	45.66	103.9	1042	98.8	12.14
8	T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	47.9	104.2	1051	99.7	12.17
	CD at 5%	4.8	5.1	42	8.2	NS

PENINSULAR ZONE

9. PADEGAON

The data revealed the effect due to different treatments on germination to be non-significant at 10 &20 DAP. The germination was found significantly higher with planting of setts after overnight soaking in 50 ppm ethrel solution at par with T2 and T6 at 30 DAP and with T3, T5, T6 and T8 at 40DAP. At 50 DAP, treatment T7 recorded significantly higher germination (70.59%) and it was found at par with T8 and T4.

Significantly highest millable cane height was recorded under T7 (215.67cm, 224.0 cm, 229.33cm, 235.67cm, 239.67cm, 243.00cm, and 245.33cmat 180, 210, 240, 270, 300, 330 and harvest, respectively). The millable heights in treatment T3, T4 and T6 were found at par with T7 at 180, 210, 240,270, 300, 330 DAP, and at harvest. Significantly higher number of millable cane (99333/ha) was recorded under T7 treatment at harvest and was found at par with planting T6, T4 and T3. Effect of different treatments on girth, number of internodes and average cane weight found to be non-significant. Planting of setts after overnight soaking in 50 ppm ethrel solution followed with GA3 spray (35 ppm) at 90, 120 and 150 DAP (T7) recorded significantly the highest cane yield (114.48 t/ha). However, it was found at par with overnight soaking in water with GA3 spray (35 ppm) (T6) (113.85 t/ha),overnight soaking in 100 ppm ethrel solution with GA3 spray (35 ppm) (T8) (109.17 t/ha), treatment T5 (108.65 t/ha), planting of setts after overnight soaking in 50 ppm ethrel solution- T3 (106.88 t/ha) and after overnight soaking in water - T2 (105.73 t/ha). The CCS yield was found to be statistically non-significant due to different treatments.

The data regarding juice quality parameters revealed that all quality parameters like brix, sucrose (%), purity (%) and CCS% were found to be non-significant.

Summary: The germination was found significantly higher with planting of setts after overnight soaking in 50 ppm ethrel solution followed with GA3 spray (T7) and it was found at par with treatments T3, T5, T6 and T8 at 40 DAP and with T4 and T6 at 50 DAP. The planting of setts after overnight soaking in 50 ppm ethrel solution with GA3 spray (35 ppm) at 90, 120 and 150 DAP (T7) recorded significantly the highest cane yield while CCS yield was not affected significantly by different treatments. All quality parameters like, brix, sucrose (%), purity (%) and CCS (%) were not affected by different treatments.

Table AS 69.9.1: Germination (%) of sugarcane under various treatments at Padegaon

Treatment	Germination (%) (DAP)				
	10	20	30	40	50
T_1 : Conventional planting/ farmers' practice (3-bud setts)	0	13.41	23.34	41.09	55.14
T_2 : Planting of setts after overnight soaking in water	0	14.28	31.81	45.54	57.60
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	0	11.82	25.15	48.79	57.12
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	0	11.58	21.74	43.47	63.70
T_5 : T_1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0	14.52	28.08	50.93	60.85

T_6 : T_2 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0	12.61	31.42	49.50	59.42
T_7 : T_3+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0	11.50	39.58	52.80	70.59
T_8 : T_4+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0	13.65	24.75	51.80	69.73
SE+	0	1.08	2.74	2.12	2.45
C.D at 5%	0	NS	8.31	6.44	7.43

Table AS 69.9.2: Growth, yield and quality of Sugarcane under various treatments at Padegaon

Treatment	Cane yield (t/ha)	CCS yield (t/ha)	NMC ('000/ha)	Sucrose (%)
T_1 : Conventional planting/ Farmers' practice (3-bud setts)	97.08	15.73	97056	18.80
T_2 : Planting of setts after overnight soaking in water	105.73	17.40	97500	19.06
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	106.88	17.37	99056	18.48
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	102.60	17.97	99222	18.36
T_5 : T_1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	108.65	15.71	95944	18.59
T_6 : T_2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	113.85	18.67	98500	19.32
T_7 : T_3+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	114.48	17.37	99333	19.14
T_8 : T_4+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	109.17	18.09	97889	19.03
SE+	3.15	0.85	400.14	0.24
C.D at 5%	9.55	NS	1213.70	NS

10. NAVSARI

Germination % was recorded significantly highest with T3 (planting of setts after overnight soaking in 50 ppm ethrel solution) over other treatments and remained at par with treatment T4, T6, T7 and T8 at 20, 30 and 40 DAP however at 10 and 50 DAP it was not significantly influenced due to different treatments (**Table AS 69.10.1**). Tiller population were not significantly influenced due to different treatment at 90 and 120 DAP; while at 150 and 180 DAP significantly highest number of tillers were observed with the treatment T7 over T1 and remained at par with T3, T4 and T8.

Leaf area index at 90, 120, 150, 180, 210, 300 and 360 DAP were recorded significantly highest with treatment T8 (T4 + GA3 (35 ppm) spray at 90, 120 and 150 DAP) and remained at par with the treatments T3, T4, T6 and T7 at almost all the growth stages. Leaf area index was not significantly influenced due to different treatments at 240, 270, 300 and 330 DAP.Biomass accumulation from 180 and 210 DAP were recorded significantly highest with treatment T7 and remained at par with the treatment T3 and T8, while at 240 DAP it was recorded significantly highest with the treatment T7 and remained at par with

treatment T3, T4, T6 and T8. While at other stages different growth treatments were failed to show any significant effect on biomass accumulation.Root dry weight at 50 and 120 DAP was not significantly influenced due to various treatments while at 180 DAP significantly highest root dry weight was recorded with T8 over other treatment and remained at par with T2 and T7.

NMC (112370/ha) was recorded significantly higher with T7 and remained at par the treatments T3, T4, T6 and T8. Cane length and cane diameter at harvest failed to show any significant effect due to different treatment. Single Cane weight was recorded significantly highest with treatment T7 over other treatment and remained at par with T3, T4 and T8. Significantly highest cane yield (121.48 t/ha) was noticed with treatment T8 (planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 (35 ppm) spray at 90, 120 and 150 DAP) but remained at par with T3, T4, and T7 over T1. CCS yield was recorded significantly highest with T4 and found at par with T3, T6, T7 and T8(**Table AS 69.10.2**).Various quality parameters were not significantly influenced due to different treatments.

Table AS 69.10.1: Germination (%) of sugarcane under various treatments at Navsari

Treatment	**Germination % at**				
	10 DAP	**20 DAP**	**30 DAP**	**40 DAP**	**50 DAP**
T_1	7.89	17.94	41.36	46.67	56.93
T_2	9.44	18.94	37.87	43.95	55.10
T_3	8.96	22.39	47.64	53.16	65.63
T_4	8.95	20.96	46.06	52.28	64.20
T_5	8.19	18.72	41.57	45.66	58.13
T_6	8.33	20.60	38.95	46.55	57.09
T_7	9.29	21.89	43.81	49.58	63.72
T_8	9.26	21.74	42.10	49.20	62.23
SEM.±	0.43	0.99	1.83	2.45	8.67
C.D. at 5%	NS	3.00	5.55	7.44	NS
C.V.%	8.43	8.40	7.48	8.78	8.20

Table AS 69.10.2: Growth, yield and quality of Sugarcane under various treatments at Navsari

Treatment	NMC (000 ha^{-1})	Cane length (cm)	Cane Diameter (cm)	Single cane wt. (kg)	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})
T_1	86.44	223.69	2.57	1.15	96.89	12.46
T_2	96.29	231.18	2.63	1.02	99.04	13.26
T_3	109.19	254.76	2.72	1.24	115.48	16.41
T_4	105.06	245.74	2.68	1.39	119.54	16.71
T_5	97.14	234.85	2.65	1.23	99.74	13.67
T_6	102.32	245.01	2.63	1.20	101.50	14.29
T_7	112.37	255.68	2.75	1.42	118.30	16.68
T_8	108.37	247.86	2.77	1.31	121.48	15.68
SEM.±	4.77	11.23	0.11	0.06	5.14	0.89
C.D. at 5%	14.47	NS	NS	0.18	15.59	2.70
C.V.%	8.09	8.03	6.81	8.08	8.17	10.34

11. MANDYA

The results of the third year study indicated that, planting of setts after overnight soaking in 100 ppm ethrel solution resulted in significantly higher germination percentage (74.07 to 74.50 at 50 DAP) as compared to other treatments, but was on par with overnight soaking of setts in 50 ppm ethrel solution (65.79 to 67.13%). The sett treatment with 50 or 100 ppm ethrel solution accelerate the germination of cane buds and recorded more than 40% of germination in 30 DAP itself as compared to control (water spray) recorded 40% germination at 40 DAP (**Table AS 69.11.1**). The cane yield was significantly higher in the treatment receiving overnight soaking of cane setts in 100 ppm ethrel solution followed by 35 ppm GA3 spray at 90, 120 and 150 DAP (160.2 t/ha) as compared to other treatments (**Table AS 69.11.2**). However, it was on par with overnight soaking of setts in 50 ppm ethrel solution followed by 35 ppm GA3 spray at 90, 120 and 150 DAP (153.5 t/ha) and planting of setts after overnight soaking in 10 ppm ethrel solution (154.0 t/ha). Increased cane yield in above treatment was mainly attributed to increase in yield parameters viz., single cane weight, cane length, cane girth, No. of internodes and No. of millable cane (2.11 kg, 2.48 m, 3.64 cm, 24.80 and 105.6 thousand/ha, respectively in 100 ppm ethrel solution followed by 35 ppm GA3 spray at 90, 120 and 150 DAP; 1.91 kg, 2.36 m, 3.54 cm, 23.64 and 96.5 thousand/ha, respectively in overnight soaking of setts in 50 ppm ethrel solution followed by 35 ppm GA3 spray at 90, 120 and 150 DAP and 2.02 kg, 2.29 m, 3.48 cm, 23.72 and 104.2 thousand/ha, respectively in overnight soaking of setts in 100 ppm ethrel solution).

The economic analysis revealed that overnight soaking of setts in 100 ppm ethrel solution followed by 35 ppm GA3 spray at 90, 120 and 150 DAP found economically superior with higher net returns (₹ 129800=00) and B:C ratio (1.72) but, this was closely followed by overnight soaking of setts in 100 ppm ethrel solution only (₹ 113900=00 and 1.64)

Summary: Overnight soaking of setts in 100 ppm ethrel solution followed by 35 ppm GA3 spray at 90, 120 and 150 DAP found to enhance the germination percentage and cane yield. However, at par yield to above treatments was also recorded in overnight soaking of setts in 100 ppm ethrel solution.

Table AS 69.11.1: Germination (%) of sugarcane under various treatments at Mandya

Treatment	Germination %				
	10 DAP	20 DAP	30 DAP	40 DAP	50 DAP
T_1: Conventional planting/ Farmers' practice (3-bud setts)	1.39	5.56	21.76	39.81	60.19
T_2: Planting of setts after overnight soaking in water	6.48	11.11	27.31	52.78	65.28
T_3: Planting of setts after overnight soaking in 50 ppm ethrel solution	8.80	19.44	43.98	60.65	67.59
T_4: Planting of setts after overnight soaking in 100 ppm ethrel solution	14.81	26.39	50.00	65.74	74.07
T_5: T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	2.31	4.17	25.93	43.06	55.56
T_6: T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	8.80	13.89	36.11	51.85	58.06

T_7: T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	11.57	20.83	45.83	62.50	67.13
T_8: T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	15.74	28.24	50.00	70.37	74.50
S.Em. ±	1.40	1.05	1.97	3.50	3.12
CD@5%	4.24	3.19	5.98	10.61	9.47

Table AS 69.11.2: Growth, yield and quality of Sugarcane under various treatments at Mandya

Treatment	Single cane weight (kg)	Cane length (m)	Cane girth (cm)	No. of internodes	Millable cane ('000/ha)	Cane yield (t/ha)	Sucrose %	CCS (t/ha)
T_1	1.53	1.86	2.80	18.01	76.5	120.9	18.5	15.8
T_2	1.71	2.08	3.17	20.10	82.3	125.3	19.3	18.3
T_3	1.81	2.27	3.40	23.05	87.7	136.8	18.9	19.6
T_4	2.02	2.29	3.48	23.72	104.2	154.0	19.1	20.9
T_5	1.61	1.93	3.07	19.18	78.7	125.9	19.4	17.3
T_6	1.79	2.13	3.29	20.64	83.3	138.0	20.1	19.6
T_7	1.91	2.36	3.54	23.64	96.5	153.5	18.6	20.3
T_8	2.11	2.48	3.64	24.80	105.6	160.2	19.5	22.1
SEm±	0.08	0.07	0.08	0.99	3.41	6.72	0.54	1.18
CD @ 5%	0.23	0.20	0.26	3.00	10.33	20.37	NS	3.57

Table AS 69.11.3: Effect of various PGR treatments on sugarcane economics at Mandya

Treatment	Cane yield (t/ha)				COC (₹/ha)	Net return (000' ₹/ha)	B:C ratio
	2015-16	2016-17	2017-18	Mean			
T_1	119.6	69.1	120.9	103.2	175000	62400	1.36
T_2	125.7	73.4	135.3	111.5	176000	80500	1.46
T_3	141.3	75.9	146.8	121.3	176500	102500	1.58
T_4	148.0	77.1	154.0	126.4	176800	113900	1.64
T_5	123.4	71.3	125.9	106.9	178200	67700	1.38
T_6	130.1	75.6	138.0	114.6	179200	84400	1.47
T_7	150.6	83.2	153.5	129.1	179700	117200	1.65
T_8	158.8	85.2	160.2	134.7	180000	129800	1.72
S Em ±	8.0	2.55	6.72	5.8	-	-	-
CD@5%	24.4	7.72	20.37	17.5	-	-	-

12. PUNE

Experiment was carried out by planting sugarcane (variety VSI 08005) on 22.12.2016 harvested on 03.01.2018. Maximum germination at 30DAP (62.94 %), number of millable canes (0.81 lakh/ha), cane girth (11.60 cm), single cane weight (2.39 kg), number of internodes on cane (25) and total plant height (320 cm) were obtained in the treatment comprising planting of setts after overnight soaking in 100 ppm ethrel solution and spraying of GA3 35ppm at 90,120 and 150 days of planting, Whereas, tillering at 120 DAP (1.34 lakh/ha) were obtained in the treatment, planting of setts after overnight soaking in 50 ppm Ethrel solution and spraying of GA3 35ppm at 90,120 and 150 DAP (**Table AS 69.12.1**).

Cane yield t/ha was significantly affected due to various treatments The pooled data (03 years)showed that the highest cane yield (167.22 t/ha) was obtained in planting of setts after overnight soaking in 100 ppm ethrel solution and spraying of GA3 35ppm at 90,120 and 150 days of planting. This was followed by (165.23 t/ha) with the planting of setts after overnight soaking in 50 ppm ethrel solution and spraying of GA3 35ppm at 90,120 and 150 days of planting. Minimum cane yield of 124.82 t/ha was obtained in conventional practice where no ethrel and GA was sprayed.Sugar yield was significantly higher (21.37 t/ha) in planting of setts after overnight soaking in 100 ppm ethrel solution and spraying of GA3 (35ppm) at 90,120 and 150 days of planting, followed by (21.15 t/ha) under the planting of setts after overnight soaking in 50 ppm ethrel solution and spraying of GA3 35ppm at 90,120 and 150 days of planting. Benefit cost ratio was affected due to various treatments. It was maximum (1:3.17) when setts were planted after overnight soaking in 100 ppm ethrel solution and spraying of GA3 35ppm at 90,120 and 150 days of planting. This was followed by (1:3.12) planting of setts after overnight soaking in 50 ppm Ethrel solution and spraying of GA3 35ppm at 90,120 and 150 DAP.

The observations on leaf area, biomass accumulation and root dry weight exhibited differences due to various treatments to be significant. Maximum leaf area 24.98 cm2/m2 and 54.40 cm2/m2 at 90 and 180 days after planting respectively, maximum biomass accumulation 14.76 gm/m2 was recorded in the treatment when setts were planted after overnight soaking in 100 ppm Ethrel solution and spraying of GA3 35 ppm at 90, 120 and 150 days after planting and maximum root dry weight (6.32 gm/m2) was observed in treatment overnight soaking in 50 ppm Ethrel solution and spraying of GA3 35 ppm at 90, 120 and 150 DAP.

Summary: The pooled results of the three plant crops indicated that, maximum germination (62.94%) at 30 DAP, NMC (0.81 lakh/ha), cane girth (11.60 cm), cane yield (167.22 t/ha) and B:C ratio (1:3.17) was recorded when the setts were overnight soaked in 100 ppm Ethrel before planting and foliar spraying of Gibberlic acid 35ppm at 90,120 &150 DAP. The maximum tillering (1.34 lac/ha) at 120 DAP was found in overnight soaking of setts in 50 ppm Ethrel and spraying of G.A. (35ppm).

Table AS 69.12.1: Growth, yield and quality of Sugarcane under various treatments at Pune

Treatment	Cane Yield (t/ha)	B:C Ratio	CCS T/ha	NMC (lac/ha)	Germination % DAP			
					10	20	30	50
T1- Conventional planting/ Farmers practice (2 bud setts)	124.8	2.44	17.4	0.68	11.39	38.9	53.9	55.58
T2 - Planting of setts after overnight soaking in water	128.5	2.51	16.7	0.70	11.34	36.0	57.0	59.16
T3 - Planting of setts after overnight soaking in 50 ppm ethrel solution	136.3	2.69	18.2	0.71	14.31	38.6	59.9	64.08
T4 - Planting of setts after overnight soaking in 100 ppm ethrel solution	145.1	2.62	19.0	0.74	12.93	38.0	60.8	69.21
T5 - T1 + GA_3 spray (35ppm) at 90,120 and 150 DAP	131.0	2.59	18.4	0.73	12.00	36.7	55.6	57.20
T6 - T2 + GA_3 spray (35ppm) at 90,120 and 150 DAP	152.87	2.89	20.4	0.77	13.15	39.2	57.5	59.47
T7 - T3 + GA_3 spray (35ppm) at 90,120 and 150 DAP	165.23	3.12	21.1	0.81	17.30	38.1	61.8	64.73
T8 - T4 + GA_3 spray (35ppm) at 90,120 and 150 DAP	**167.2**	**3.17**	**21.3**	**0.81**	14.78	38.9	**62.9**	71.42
S.E.	5.66	0.13	0.83	0.02	0.94	0.99	1.59	1.32
C.D.at 5 %	16.82	0.38	2.47	0.07	2.79	NS	4.73	3.91

13. THIRUVALLA

The crop was planted on 15.01.2017and was harvested on 11.01.2018. The results revealed that different treatments significantly influenced the germination percentage and tiller count. The highest germination percentage and tiller population were recorded by T8 (T4 +GA3 spray (35ppm) at 90,120 and 150 DAP) and the lowest value for the above parameters were recorded by T2 (planting of setts after overnight soaking in water).

Maximum cane length (260.33 cm), MCC (83180/ ha), cane yield (111.23t/ha) were recorded under T8. Sugar yield also showed same trend and recorded significantly higher value (11.60t/ha) for the very same treatment (T8). There was some variation in the soil fertility parameters prior to and after the conduct of the trial(**Table AS 69.13.1**). The highest BC ratio of 1.40 was also recorded by T8.

Table AS 69.13.1: Growth, yield and quality of Sugarcane under various treatments at Thiruvalla

Treatment	Germination (%) DAP		Tiller count (000/ha) DAP		Cane length (cm)	Cane diameter (cm)	Av. cane Wt. (kg)	MCC ('000 /ha)	Cane yield (t/ha)	Sugar yield (t/ha)	BC ratio
	30	**45**	**120**	**150**							
T_1 - Conventional planting/ Farmers' practice (3-bud setts)	59.8	65.1	97.0	91.0	243	2.95	1.46	74.11	106.6	10.74	1.20
T_2 - Planting of setts after overnight soaking in water	49.1	55.0	80.2	75.9	238	2.84	1.30	69.25	85.39	8.89	1.12
T_3 - Planting of setts after overnight soaking in 50 ppm ethrel solution	61.5	64.9	101	95.2	241	2.92	1.27	77.34	105.6	11.19	1.19
T_4 - Planting of setts after overnight soaking in 100 ppm ethrel solution	65.3	70.2	107	97.7	248	2.96	1.36	78.57	107.4	11.66	1.32
T_5 - T_1 + GA_3 spray (35ppm) at 90,120 and 150 DAP	62.1	66.1	102	95.9	240	2.87	1.41	70.64	94.96	9.53	1.22
T_6 - T_2 + GA_3 spray (35ppm) at 90,120 and 150 DAP	63.5	67.2	100	97.0	241	2.89	1.44	72.50	96.70	9.82	1.25
T_7 - T_3 + GA_3 spray (35ppm) at 90,120 and 150 DAP	59.8	63.7	98	92.2	213	2.60	1.45	79.05	103.1	10.97	1.28
T_8 - T_4 + GA_3 spray (35ppm) at 90,120 and 150 DAP	61.5	68.7	108	96.3	260	3.05	1.50	83.18	111.2	11.60	1.40
CD (0.05)	1.69	2.00	3.0	2.60	6.03	0.11	0.15	3.25	4.75	0.20	NS

14. SANKESHWAR

The yield and yield attributes recorded significant differences among the treatments. Significantly higher cane yield, CCS yield and cane girth was recorded in overnight soaking of setts in water and three sprays at 90,120 and 150 days after planting. The treatments with overnight soaking in 100 ppm ethrel solution, conventional planting with three sprays at 90, 120 and 150 days after planting and overnight soaking in 50 ppm ethrel solution with three sprays at 90,120 and 150 days recorded on par cane yield.

Significantly higher single cane weight (1.52 kg) was recorded in overnight soaking of setts in 50 ppm ethrel solution followed by 3 sprays at 90, 120 and 150 days. The lowest cane yield, NMC, cane girth and single cane weight was recorded in overnight soaking of setts in 100 ppm ethrel solution followed by three sprays at 90, 120 and 150 days.Significantly higher Brix, POL, CCS and purity percent was recorded in overnight soaking of setts in 100 ppm ethrel solution followed by three sprays at 90, 120 and 150 days, the lowest was recorded in overnight soaking of setts in 100 ppm ethrel solution alone(**Table AS 69.14.1**).

Summary: Overnight soaking of setts in water or 50 ppm ethrel solution followed by GA3 sprays at 90, 120 and 150 days after planting and overnight soaking of setts in 100 ppm solution alone without any sprays to the crop further has enhanced the germination percent, cane yield and yield attributes without impairing the quality parameters.

Table AS 69.14.1: Growth, yield and quality of Sugarcane under various treatments at Sankeshwar

Treatment	Cane yield (t/ha)	NMC (000/ha)	Cane girth (cm)	Single cane weight (kg)	CCS yield (t/ha)
1	132.87	47.40	2.80	1.16	15.50
2	127.20	53.93	2.78	1.41	13.90
3	132.82	59.90	2.80	1.36	14.42
4	143.09	62.00	2.78	1.43	14.48
5	148.99	59.93	2.87	1.37	15.97
6	165.47	60.80	2.92	1.45	16.92
7	143.97	59.70	2.86	1.52	15.86
8	126.23	44.23	2.71	0.98	14.73
Mean	140.08	55.99	2.81	1.33	15.22
Sem ±	10.06	2.26	0.07	0.08	1.26
CD 5%	30.50	6.86	0.22	0.24	3.82

15. KOLHAPUR

Sugarcane (Co 86032) planting was done on 30.12.2016 and the crop was harvested on 08.02.2018. All the treatments exhibited non-significant differences among themselves in respect of all the growth parameters studied(**Table AS 69.15.1**). However, the treatment T7 (T3+ GA3 spray (35 ppm) at 90, 120 and 150 DAP) recorded numerically higher germination (49.39 %), cane diameter (2.90 cm),cane height (236.00 cm) and average cane weight (1.38 kg). The treatment T2 (planting of setts after overnight soaking in water) recorded numerically higher number of tillers (87360 per ha) while treatment T5 (T1 + GA3 spray (35 ppm) at 90, 120 and 150 DAP) recorded numerically higher number of millable canes (81480/ha). T5 (T1 + GA3 spray (35 ppm) at 90, 120 and 150 DAP) recorded numerically higher cane yield (100.83 t/ha) whereas, treatment T3 (planting of setts after overnight soaking in 50 ppm ethrel solution) recorded numerically higher CCS yield (14.55 t/ha).

The quality parameters viz., Brix (°), Sucrose (%), CCS (%) and purity (%) were found similar in all treatments. However, the treatment T4 (planting of setts after overnight soaking in 100 ppm ethrel solution) recorded numerically higher Brix (21.48°), Sucrose (20.66%) and CCS (14.83 %), while the purity % (97.24 %) was higher in treatment T6.

Summary: The conventional planting of 2-bud sugarcane setts with GA3 spray (35 ppm) at 90, 120 and 150 DAP) recorded numerically higher cane yield (100.83 t/ha) whereas, planting of 2-bud setts after overnight soaking in 50 ppm ethrel solution recorded numerically higher CCS yield (14.55 t/ha).

Table AS 69.15.1: Effect of various PGR treatments on sugarcane germination, growth and yield at Kolhapur

Treatment	Germi-nation (%)	Tiller Count (120 days)	Dimeter (cm)	ACW (kg)	NMC (ha^{-1})	Cane yield (tha^{-1})	CCS yield ($t\ ha^{-1}$)	Sucrose (%)
T_1	39.35	85.36	2.50	1.19	73.03	86.50	12.17	19.67
T_2	41.44	87.36	2.60	1.23	75.25	90.67	13.03	19.94
T_3	43.35	83.49	2.60	1.35	74.38	99.00	14.55	20.54
T_4	44.34	75.36	2.67	1.29	66.36	84.63	12.56	20.66
T_5	45.11	87.07	2.60	1.32	81.48	100.83	14.54	20.17
T_6	44.98	79.21	2.83	1.29	68.77	85.73	12.42	20.08
T_7	49.39	81.33	2.90	1.38	72.22	98.97	14.36	20.26
T_8	47.71	82.17	2.73	1.33	75.62	94.99	13.86	20.28
SE(m) ±	2.55	4.38	0.19	0.08	5.57	6.88	0.98	0.24
CD @ 5%	NS	NS	NS	NS	NS	NS	NS	NS

EAST COAST ZONE

16. ANAKAPALLE

Sugarcane planting was done on 15.02.2017 and the experimental crop was harvested on 06.01.2018. At 20 DAP as well as 45 DAP significant differences were not observed due to different treatments with respect to germination per cent.Number of tillers and plant height at 120 days after planting was not influenced significantly due to different treatments. Significant differences were not observed in number of millable canes due to application of different plant growth regulators. Per cent juice sucrose values did not vary significantly due to application of PGRs.

During the year (2017-18) cane yield was not influenced due to different treatments. The yield levels in all the treatments was low because the crop was infested with YLD in spite of sprayings for vector control(**Table AS 69.16.1**). Commercial cane sugar was calculated treatment wise and presented in table-3. CCS% did not vary significantly due to different treatments.

Summary: During 2017-18 studies on use of plant growth regulators (PGRs) for enhanced yield and quality of sugarcane was studied at Regional Agricultural Research Station, Anakapalle and plant growth regulators influenced was not observed on growth as well as yield of sugarcane as the crop was affected due to yellow leaf disease. Pooled mean indicated that highest number of millable canes (69,728 /ha) and cane yield (75.3 t/ha) was noticed

with planting of setts after overnight soaking in 100 ppm ethrel solution +GA3 Spray (35 ppm) at 90,120 and 150 DAP.

Table AS 69.16.1: Growth, yield and quality of Sugarcane under various treatments at Anakapalle

Treatment	NMC/ha				Cane yield (t/ha)			
	2015-16	2016-17	2017-18	Mean	2015-16	2016-17	2017-18	Mean
T1:Conventional 3 bud sett planting	65972	67898	61343	65071	80.0	73.3	45.31	66.2
T2:Planting of setts after overnightsoaking in water	66,667	68182	59028	64626	81.6	74.4	43.32	66.4
T3:Planting of setts after overnightsoaking in 50 ppm ethrel solution	67708	69886	63657	67084	84.4	79.0	46.18	69.9
T4:Planting of setts after overnightsoaking in 100 ppm ethrel solution	68055	71023	59028	66035	85.1	79.5	42.53	69.0
T5:T1+GA_3 Spray (35 ppm) at 90, 120 and 150 DAP	68402	71875	62500	67592	86.1	81.5	45.57	71.1
T6:T2+GA3 Spray (35 ppm) at 90, 120 and 150 DAP	68750	72727	57870	66449	87.5	82.4	43.40	71.1
T7:T3+GA_3 Spray (35 ppm) at 90,120and 150 DAP	70486	74148	59028	67887	90.6	85.8	42.80	73.1
T8:T4+GA_3 Spray (35 ppm) at 90,120and 150 DAP	70833	75852	62500	69728	92.0	88.1	45.66	75.3
C.D (0.05)	2215	2847	NS	-	3.5	4.10	NS	-
C.V(%)	1.85	4.3	9.5	-	2.34	4.9	7.4	-

Table AS 69.16.2: Mean effect of plant growth regulators on sugarcane growth and yield at Anakapalle (2015-2018)

Treatment	Germination % at 20 DAP	Germination % at 45 DAP	NMC/ha	Juice sucrose (%)	CCS (%)	Cane yield (t/ha)
T1:Conventional 3 bud sett planting	56.0	67.6	61343	12.21	8.17	45.31
T2:Planting of setts after overnight soaking in water	57.6	72.0	59028	12.59	8.62	43.32
T3:Planting of setts after overnight soaking in 50 ppm ethrel solution	63.4	74.8	63657	13.48	9.20	46.18
T4-Planting of setts after overnight soaking in 100 ppm ethrel solution	53.2	65.1	59028	11.96	8.11	42.53
T5:T1+GA3 Spray (35 ppm)	57.0	70.4	62500	12.53	8.38	45.57

at 90,120 and 150 DAP						
T-6:T2+GA3 Spray (35 ppm) at 90,120 and 150 DAP	50.0	85.4	57870	11.09	7.39	43.40
T7-:T3+GA3 Spray (35 ppm) at 90,120 and 150 DAP	54.4	68.8	59028	11.98	8.15	42.80
T-8:T4+GA3 Spray (35 ppm) at 90,120 and 150 DAP	61.3	71.5	62500	12.11	8.22	45.66
CD @ 5 %	NS	NS	NS	NS	NS	NS
CV	8.2	8.8	9.5	18.5	23.3	7.4

17. CUDDALORE

During the year plant crop was raised on 27.02.2017 and harvested on 14.03.2018. The result indicated that, the highest germination was recorded with setts treated with ethrel 100 ppm solution, which recorded 7.65, 70.12, 86.35, 86.98 and 86.99 per cent on 10th,20th,30th, 40th and 50th days after planting respectively and which was closely followed by 50 ppm solution treated plots(**Table AS 69.17.1**). The same trend was also recorded on root bio mass from 50th to 180th DAP of sugarcane, which recorded 1.52, 5.21 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.The highest number of millable canes (175630/ha) and single cane weight (1.66 kg) were 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 canes (166530/ha) and single cane weight (1.56 kg).

The highest cane yield (148.65t/ha) and sugar yield (19.0 t/ha) were 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 (143.25 t/ha) and sugar yield (18.18 t/ha).The data revealed that all the quality parameters showed non-significant results(**Table AS 69.17.2**).

The post-harvest soil samples indicated contents of available N (254.32 kg/ha), available P (58.69 kg/ha), available K (189.65 kg/ha), OC (0.57 %), bulk density (1.47 g/cc), infiltration rate (1.36 cm/hr).

The maximum B:C ratio of 3.64 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 3.53.

Summary: 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 canes (1,75,630/ha), cane yield (148.65 t/ha), CCS (12.78 %) and sugar yield (19.00 t/ha).

Table AS 69.17.1: germination and root dry weight of Sugarcane under various treatments at Cuddalore

Treatment	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	2.56	51.23	70.12	70.21	70.13	1.02	4.36	6.12
T_2: ONSW	3.12	53.65	76.23	76.89	76.90	1.12	4.65	6.54
T_3: ONSE 50	6.23	59.32	82.23	82.78	82.76	1.24	4.76	6.98
T_4: ONSE 100	6.98	68.53	85.46	85.65	85.66	1.32	4.85	6.88
T_5: T_1+GA spray	3.56	52.32	72.35	73.21	73.23	1.22	4.45	6.12
T_6: T_2+GA spray	3.98	55.26	74.65	75.23	75.24	1.25	4.49	6.32
T_7: T_3+GA spray	7.42	64.23	80.21	81.11	81.12	1.46	5.11	7.45
T_8: T_4+GA spray	7.65	70.12	86.35	86.98	86.99	1.52	5.21	7.68
CD (p=0.05)	0.33	4.51	5.46	6.16	5.14	0.08	0.23	0.52

Table AS 69.17.2: Effect of treatments on growth and yield of sugarcane at Cuddalore

Treatment	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	20.38	12.88	88.15	1.22	133.25	129.35	12.02	15.55	3.14
T_2	20.57	12.96	89.32	1.24	142.21	130.21	12.21	15.90	3.18
T_3	20.85	12.98	89.48	1.35	145.36	133.65	12.39	16.56	3.26
T_4	20.54	12.92	88.69	1.42	153.42	138.65	12.48	17.30	3.39
T_5	20.57	12.96	88.44	1.43	146.35	135.64	12.45	16.89	3.29
T_6	20.59	12.95	89.49	1.42	154.23	137.86	12.53	17.27	3.36
T_7	20.98	12.96	89.69	1.56	166.53	143.25	12.69	18.18	3.53
T_8	20.87	12.99	88.89	1.66	175.63	148.65	12.78	19.00	3.64
CD(p=0.05)	NS	NS	NS	NS	11.91	8.64	NS	1.23	

18. NAYAGARH

Out of the eight treatments, planting of setts after soaking in 100 PPM ethrel solution along with GA3 spray at 90, 120 & 150 DAP proved to be the best with highest number of net millable canes (90.11 thousand/ha), cane yield (102.97 t/ha) and CCS yield (12.82.t/ha). The treatment next in order was T7 where planting of setts after soaking in 50 PPM ethrel solution along with GA3 spray at 90, 120 & 150 DAP produced NMC of 89.41 ('000 /ha) with cane and CCS yield of 100.77 and 12.74 t/ha, respectively. Planting of setts after overnight soaking in water along with GA3 spray at 90, 120 & 150 DAP produced NMC of 88.15 ('000 /ha) cane and CCS yield of 98.69 and 12.18 t/ha, respectively. These three treatments were at par. The higher yield parameters i.e. number of shoots/ha, length and girth of

Table AS 69.18.1: Growth, yield and quality of Sugarcane under various treatments at Nayagarh

Treatment	Germination%			Plant height (cm)		No of shoots (000/ha)	
	20 DAP	30 DAP	40 DAP	120 DAP	180 DAP	120 DAP	180 DAP
T_1 - Conventional planting/ Farmers practice (3 bud setts)	11.06	38.87	49.30	124.87	220.30	78.63	82.33
T_2 - Planting of setts after overnight soaking in water	11.04	40.17	51.56	122.27	225.33	80.03	82.90
T_3 - Planting of setts after overnight solution in 50 PPM ethrel solution	11.18	43.93	54.67	126.93	230.37	78.13	82.43
T_4 - Planting of setts after overnight solution in 100 PPM ethrel solution	12.17	43.33	56.25	129.93	232.90	80.67	83.10
T_5 - T_1 + GA_3 spray at 90, 120 & 150 DAP	11.23	44.70	52.91	127.67	238.07	84.93	85.93
T_6 - T_2 + GA_3 spray at 90, 120 & 150 DAP	11.43	41.03	55.37	126.27	240.80	84.27	87.10
T_7 - T_3 + GA_3 spray at 90, 120 & 150 DAP	12.58	44.69	57.87	132.93	243.43	86.33	87.33
T_8 - T_4 + GA_3 spray at 90, 120 & 150 DAP	13.48	50.91	59.33	132.07	244.70	85.20	86.93
SEm±	0.423	2.173	1.657	2.170	2.906	1.754	1.342
CD at 5 %	1.284	6.591	5.025	6.580	8.815	5.319	4.072
CV%	6.23	8.66	5.25	2.94	2.15	3.69	2.74

Table AS 69.18.2: Effect of different treatments on sugarcane growth, yield and quality at Nayagarh

Treatment		Brix %	Sucrose %	NMC (000/ha)	Cane yield (t/ha)	CCS %	CCS (t/ha)
T_1	Conventional planting/ Farmers practice (3 bud setts)	18.20	16.80	83.60	90.89	11.20	11.76
T_2	Planting of setts after overnight soaking in water	18.09	17.00	83.86	91.17	11.04	11.54
T_3	Planting of setts after overnight solution in 50 PPM ethrel solution	18.09	17.50	83.84	93.73	11.60	12.12
T_4	Planting of setts after overnight solution in 100 PPM ethrel solution	18.22	17.80	84.14	92.36	11.03	12.58
T_5	T_1 + GA_3 spray at 90, 120 & 150 DAP	17.40	16.60	86.89	94.05	11.58	12.42
T	T_2 + GA_3 spray at 90, 120 &	18.11	16.80	88.15	98.69	11.57	12.18

T_6	150 DAP						
T_7	T_3 + GA_3 spray at 90, 120 & 150 DAP	18.82	17.50	89.41	100.77	11.73	12.74
T_8	T_4 + GA_3 spray at 90, 120 & 150 DAP	18.47	18.20	90.11	102.97	11.90	12.82
	SEm±	0.426	0.522	1.276	1.504	0.364	0.804
	CD at 5 %	NS	NS	3.869	4.563	NS	NS
	CV%	4.06	5.23	2.56	2.73	5.51	11.35

NORTH CENTRAL ZONE

19. PUSA

Significant differences were observed among the treatments with respect to germination, plant population, plant height, millable canes and cane yield (**Table AS 69.19.1**). Planting of setts after overnight soaking in 50 ppm ethrel solution (T3) recorded higher periodic germination percentage followed by planting of setts after overnight soaking in 50 ppm ethrel solution + GA3 spray at 90, 120 and 150 DAP. Higher plant population (2,29,700 /ha), plant height (324 cm), millable canes (1,53,100 / ha) and cane yield (101.8 t/ha) was obtained with planting of setts after overnight soaking in 50 ppm ethrel solution + GA3 spray @ 35 ppm at 90, 120 and 150 DAP (T8). Though, higher sucrose content in juice was obtained with planting of setts after overnight soaking in 50 ppm ethrel + GA3 spray @ 35 ppm at 90, 120 and 150 DAP (T7) followed by planting of setts after overnight soaking in 50 ppm ethrel solution (T3).

Summary: On the basis of economics, planting of setts after overnight soaking in 50 ppm ethrel solution was found optimum as it has resulted in statistically comparable yield (96.3 t/ha) and B : C ratio (1.26) over higher level of ethrel and GA3 application.

Table AS 69.19.1: Growth, yield and quality of Sugarcane under various treatments at Pusa

Treatment		Germination (%)					Millable canes ($x10^3$/ha)	Cane yield (t/ha)	B : C ratio	Sucrose (%)
		10 DAP	20 DAP	30 DAP	40 DAP	50 DAP				
T_1	Conventional planting/ Farmers practice (3-bud setts)	0.0	2.2	20.1	31.6	32.8	117.1	71.4	0.71	17.29
T_2	Planting of setts after overnight soaking in water	1.3	6.1	24.3	38.0	41.1	122.0	78.9	0.86	17.11
T_3	Planting of setts after overnight soaking in 50 ppm ethrel solution	3.5	15.8	40.7	52.4	56.1	148.6	96.3	1.26	17.49
T_4	Planting of setts after	2.3	9.3	38.3	50.7	54.3	146.2	94.5	1.21	17.45

	overnight soaking in 100 ppm ethrel solution									
T_5	T_1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0.0	1.6	22.0	30.9	34.2	123.3	77.6	0.79	17.15
T_6	T_2+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	1.5	6.2	28.2	37.1	39.3	126.2	83.5	0.91	17.02
T_7	T_3+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	3.2	14.8	40.2	52.2	55.7	153.1	101.8	1.32	17.52
T_8	T_4+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	2.8	13.1	39.4	51.3	54.8	150.5	98.7	1.24	17.40
SEm±		0.14	0.41	1.57	2.18	2.27	7.09	5.06	0.05	0.23
CD (P=0.05)		0.5	1.2	4.8	6.6	6.9	21.5	15.3	0.16	0.7
CV (%)		10.2	8.2	8.6	8.8	8.5	9.0	10.0	2.3	2.3

NORTH EASTERN ZONE

20. BURALIKSON

The crop was planted on 11th March, 2017 and harvested on 20th March, 2018. The experimental soil was clay loam in texture, medium in organic carbon (0.70 %) and low in available P (20.6 kg P2O5/ ha) and medium in available K (245 Kg K2O/ ha) with pH 5.04. The germination percentage counted at 10 days interval after planting revealed that there was significance difference in germination among all the treatments. Planting of setts after overnight soaking in water (T2), planting of setts after overnight soaking in 50 ppm ethrel solution (T3), planting of setts after overnight soaking in 100 ppm ethrel solution(T4) significantly increased the germination% over conventional planting (T1) (**Table AS 69.20.1**). However, planting of setts after overnight soaking in 100 ppm ethrel solution recorded higher germination % over other treatments. In case of cane yield planting of setts after overnight soaking in 100 ppm ethrel solution followed by spraying of GA3 spray (35ppm) at 90,120 and 150 DAP recorded the higher yield (71.1 t/ha) followed by planting of setts after overnight soaking in 50 ppm ethrel solution followed by spraying of GA3 spray (35ppm) at 90,120 and 150 DAP (68.5 t/ha). The same treatment also recorded also higher growth parameters than all other treatments.

Table AS 69.20.1: Germination (%) of sugarcane under various treatments at Buralikson

Treatment	Germination 20 DAP	Germination 30 DAP	Germination 40 DAP	Germination 50 DAP
T_1: Conventional planting	32.6	35.1	35.1	37.7
T_2: Planting of setts after Overnight soaking in water.	39.4	40.5	40.5	44.5
T_3: Planting of setts after overnight soaking in 50 ppm ethrel solution	46.1	48.6	48.6	50.0
T_4: Planting of setts after overnight soaking in 100 ppm ethrel solution'	46.7	49.7	49.7	52.2
T_5: T1+ GA_3 spray (35ppm) at 90,120 and 150 DAP	33.8	38	38.0	37.4
T_6: T2 + GA_3 spray (35ppm) at90,120 and 150 DAP	39.8	42.5	42.5	43.4
T_7: T3 + GA_3 spray (35ppm) at 90,120 and 150 DAP	45.1	47.5	47.3	49.3
T_8: T4 + GA_3 spray (35ppm) at 90,120 and 150 DAP	46.6	49.2	49.2	51.7
CD(0.05)	5.39	4.26	4.26	0.46

Table AS 69.20.2: Growth, yield and quality of Sugarcane under various treatments at Buralikson

Treatment	NMC (000/ha)	Cane diameter (cm)	Sucrose (%)	Cane yield (t/ha)	CCS (%)
T_1: Conventional planting	58.6	2.42	17.3	51.0	12.4
T_2: Planting of setts after overnight soaking in water	63.7	2.53	17.5	56.4	12.4
T_3: Planting of setts after overnight soaking in 50 ppm ethrel solution	74.4	2.52	17.3	60.1	12.6
T_4: Planting of setts after overnight soaking in 100 ppm ethrel solution	74.4	2.46	17.4	62.8	12.4
T_5: T1+ GA_3 spray (35ppm) at 90,120 and 150 DAP	66.1	2.40	17.7	52.6	12.6
T_6: T2 + GA_3 spray (35ppm) at 90,120 and 150 DAP	74.3	2.54	17.6	63.4	12.7
T_7: T3 + GA_3 spray (35ppm) at 90,120 and 150 DAP	78.2	2.56	17.6	68.5	12.7
T_8:T4 + GA_3 spray (35ppm) at 90,120 and 150 DAP	78.9	2.58	17.7	71.1	12.8
CD(0.05)	3.62	0.07		5.36	0.15

PROJECT NO.: AS 70

PROJECT TITLE: **Scheduling irrigation with mulch under different sugarcane planting methods**

Objectives : To enhance crop and water productivity in sugarcane

Year of Start **:** 2016-17

Year of Completion **:** 2019-20

Participating centres **:** All centres

Treatment (A) :

North West, North Central and North East Zones

Combination of planting methods and mulch practices

P_1: Conventional flat planting (75 cm row spacing) with organic mulching @ 6 t/ha (sugarcane trash/paddy straw/any other available crop residue)

P_2: Conventional flat planting (75 cm row spacing) without mulch

P_3: Paired row trench planting (30:120 cm row spacing) with organic mulching @ 6 t/ha.

P_4: Paired row trench planting (30:120 cm row spacing) without mulch.

Peninsular, East Coast Zones

Combination of planting methods, green manure and mulch practices

P_1: Furrow planting (120 cm row spacing) without mulching

P_2: Furrow planting (120 cm row spacing) with green manure (*dhaincha*/sunnhemp/cowpea) sowing at 30 DAP, mulching at 75 DAP and earthing-up at 110 DAP.

P_3: Furrow planting (120 cm row spacing) with alternate skip furrow irrigation* after earthing-up without mulching.

P_4: Furrow planting (120 cm row spacing) with alternate skip furrow irrigation* after earthing-up + green manure/brown mulching.

*First irrigation to be given in furrow nos. 1, 3, 5. Second irrigation to be given in furrow nos. 2 & 4. Similar schedule should be followed in successive irrigation.

Treatment (B) :

Irrigation schedule (IW/CPE)

I_1: 0.60
I_2: 0.80
I_3: 1.00

Irrigation water depth: 7.5 cm

Details of Methodology:

Recommended variety of sugarcane will be planted in spring season. Entire dose of N, P and K fertilizers as per recommendation of the region will be applied before onset of monsoon as per the recommendation.

Treatments (12):

Planting methods: 4
Irrigation regime: 3

Design **:** Strip plot design

Replication **:** 3

Plot size **:** 6m width x 8m length

Observations to be recorded:

A. Soil parameters

1. Initial and final soil fertility status as well as physical parameters (bulk density and infiltration rate)
2. Moisture (%) before each irrigation up to onset of monsoon
3. Quantity of water applied
4. Water use efficiency

B. Sugarcane:

1. Germination (%)
2. Periodic tiller population 90, 120, 180 DAP/DAR
3. Plant height at 90, 120, 180 DAP/DAR
4. Growth parameters i.e., NMC, cane length, diameter and cane weight
5. Juice quality (brix, pol % and purity %)
6. Cane and sugar yields (t/ha).

SUMMARY OF RESULTS OBTAINED DURING LAST YEAR (2016-17)

The trial was initiated during 2016-17. The trial was allocated to all the centres however, only 18 centres conducted the trial. Centre wise summary is given below.

NORTH WEST ZONE

1. FARIDKOT

Cane yield increased successively and significantly with increase in irrigation water application from 0.6 to 1.0 IW/CPE. Interaction effects between method of planting and irrigation schedules revealed highest cane productivity was obtained from paired row planting with mulching and irrigation at 1.0 IW/CPE, which was statistically at par with paired row planting with mulching and irrigation at 0.8 IW/CPE and paired row planting without mulching and irrigation at 1.0 IW/CPE but significantly higher than all other combinations. Thus, data manifested that trash mulching resulted in saving of 20 % evaporation equivalent and 26.6 % irrigation water input than no mulching in paired row trench planting.

2. KOTA

Based on the one year of study, it can be concluded that paired row trench planting (30:120 cm row spacing) with mulching (sugarcane trash 6 t/ha) was found better with respect to millable canes, cane yield and water use efficiency. It resulted in significantly higher net return over P1 and P2 planting methods. However, irrigation at IW: CPE ratio of 0.80 was found economical in sugarcane yield when compared with 0.60 and 1.00 IW: CPE ratios and also noted significant enhancement in economics with each successive increase in irrigation regimes from 0.60 to 0.80 IW: CPE ratio.

3. KAPURTHALA

Among the planting methods the highest cane yield was obtained under the paired row trench planting with trash mulching (100.1 t/ha) and significantly higher cane yield than other methods of planting. The cane yield increased significantly with trash mulching over that of without trash mulching irrespective of planting methods. The significant increase in cane yield was obtained with increase in irrigation water application from 0.6 to 1.0 IW/CPE. Interaction effects between methods of planting and irrigation schedules revealed maximum cane productivity was obtained from paired row planting with mulching and irrigation at 1.0 IW/CPE, which was statistically at par with paired row planting with mulching and irrigation at 0.8 IW/CPE and paired row planting without mulching and irrigation at 1.0 IW/CPE but significantly higher than all other combinations.

4. LUCKNOW

Paired-row trench planting with trash mulching (120.97 t/ha) being at par with conventional flat method of planting along with trash mulching (115.19 t/ha) resulted in significantly higher cane yield than that of conventional flat method of planting (109.86 t/ha). The higher cane yield under paired row trench planting was attributed to more number of millable cane (1.38 and 1.34 lakh / ha) than paired-row trench planting and conventional flat method of planting with no trash mulching. The trash application led to higher sugarcane yields irrespective of irrigation scheduling. The irrigation schedules though did not influence the cane yield significantly but the irrigation at IW: CPE 0.8 recorded 2.3 and 3.9 per cent higher cane yield compared to 0.6 and 1.0 IW: CPE ratio, respectively.

5. PANTNAGAR

On the basis of present study it was observed that cane yield and NMC were significantly higher in the treatment of paired row planting (30: 120) + trash mulching and at 1.0 IW/CPE ratio. Sucrose (%) was not influenced due to planting method or trash management and irrigation methods, though the CCS yield was highest in the treatment of paired row planting + mulch and was significantly higher over rest of the treatments. Cane yield was statistically similar in treatment 0.8 or 1.0 IW/CPE but were significantly higher over 0.6 IW/CPE.

6. SHAHJAHANPUR

Paired row trench planting (120: 30 cm row spacing) with organic mulch @ 6 t/ha produced higher cane yield (88.77 t/ha) and maximum water use efficiency (1138.08 Kg/ha-cm) than those of other planting methods and mulch practices. Irrigation schedule at 1.00 IW/CPE ratio (I3) resulted in significantly higher cane yield (89.57 t/ha) than that of rest irrigation schedule while, maximum water use efficiency (1806.89 Kg/ha-cm) was obtained at 0.60 IW/CPE ratio (I1) followed by 0.80 IW/CPE ratio (I2) with water use efficiency of 1396.17 Kg/ha-cm.

7. UCHANI

Significantly higher germination, tillers, NMC, cane weight, cane yield and sugar yield were recorded in paired row trench planting (30:120 cm) as compared to conventional planting at 75 cm row spacing. Trash mulching resulted in significantly higher cane and sugar yield as compared to without mulching treatments. CCS percent was not affected due to different planting methods and irrigation levels. Interaction between method of planting and irrigation levels was found non-significant. Total (Irrigation+ rainfall) water was calculated as 177.1, 192.1 and 207.1 cm in conventional and 152.1, 161.1 and 170.1 in paired row trench planting at 0.6, 0.8 and 1.0 IW/CPE irrigation schedule, respectively. Highest yield of cane produced/1000 litres of irrigation (11.23 kg) water was recorded in trench planting at 0.8 IW/CPE irrigation schedule.

PENINSULAR ZONE

8. PADEGAON

The furrow planting (120 cm row spacing) with green manure (sun hemp) sowing at 30 DAP, mulching at 75 DAP and earthing-up at 110 DAP (P2) and irrigation schedule with 1.00 IW/CPE was found significantly superior for cane yields. While CCS yield was not affected by different planting methods and irrigation schedules. The higher water use efficiency was recorded in Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing –up with green manure/brown mulching and irrigation schedule with 0.60 IW/CPE. All quality parameters were found to be non-significant.

9. POWARKHEDA

Results revealed that the cane yield was influenced significantly due to different planting methods. Furrow planting (120 cm row spacing) with green manure (cowpea) sowing at 30 DAP, mulching at 75 DAP and earthing -up at 110 DAP recorded higher cane yield of (105.83 t/ha) than furrow planting (120 cm row spacing) with alternate skip furrow irrigation, after earthing- up without mulching (98.45), but the cane yield recorded at par in between P4 (100.64), P1 (99.61) and P3 (98.45). Among irrigation schedules significantly

higher cane yield was obtained at I3 1.00 (103.50) as compared to cane yield recorded with I1 0.60 (98.24) but the cane yield recorded at par in between I3 1.00 (103.50) and I2 0.80 (101.36) and I2 0.80 (101.36) and I1 0.60 (98.24) irrigation schedules.

10. MANDYA

Furrow planting (120 cm row space) with alternate skip furrow irrigation after earthing up + *dhaincha* green manure mulching found to enhance the water use efficiency and gave at par yield as that of 120 cm row spaced furrow planting with *dhaincha* green manure with irrigation at IW/CPE ratio 1.0.

11. NAVSARI

Significantly highest cane (117.26 t/ha) and CCS (16.28 t/ha) yield was noticed with planting method P4 but remained at par with P2 over other methods. Significantly highest cane (122.12 t/ha) and CCS (16.68 t/ha) yield was observed with irrigation level I3 over I1 and I2. Among various quality parameters only CCS % and pol % cane were significantly influenced due to planting methods. Significantly highest CCS % and pol % cane were observed with planting method P4 and remained at par with P2 and P3 over P1. Quality parameters were not significantly influenced due to irrigation levels. Field water use efficiency was recorded highest (129.15 kg ha-1 mm-1) with irrigation level I1 followed by I2 (105.81 kg ha-1 mm-1) and I3 (101.77 kg ha-1 mm-1).

12. THIRUVALLA

The growth and yield attributes recorded in P4 (furrow planting at 120 cm spacing with alternate skip furrow irrigation after earthing up + green manure/ brown mulching was significantly superior to other planting methods and mulch practices tried. The maximum cane length (251.44 cm), cane girth (10.00 cm), single cane weight (1.60 kg), MCC (85000/ha), cane yield (105.42 t/ha), and sugar yield (11.59 t/ha) were recorded by P4. With regard to irrigation schedule, the highest value for cane length (253.15 cm), cane girth (10.10 cm), MCC (8702/ha), cane yield (108.50 t/ha), and sugar yield (11.94 t/ha) were recorded by I3 (IW/CPE ratio -1.00).

EAST COAST ZONE

13. ANAKAPALLE

Significantly higher cane yield (87.7 t/ha) was recorded in scheduling more number of irrigations at 1.0 IW/CPE (I3) as compared to scheduling irrigations at I1 (78.1 t/ha) and I2 (81.3 t/ha) treatments. Significant differences in cane yield were not observed due to different mulching treatments. However furrow irrigation with mulching recorded higher cane yield of 84.80t/ha. Scheduling irrigations at 0.6 IW/CPE registered highest water productivity of 1.38.

14. CUDDALORE

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.

15. NAYAGARH

Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing-up + brown mulching method produced significantly higher NMC (92930/ha) and

cane yield (103.93 t/ha) which is closely followed by furrow planting (120 cm row spacing) with brown mulching (NMC and cane yield 92.68 '000/ha and 103.36 t/ha, respectively) (Table AS 70.15.1). Irrigating the crop at IW/CPE ratio of 1.0 produced highest NMC and sugarcane yield of 96.22 '000/ha and 106.17 t/ha, respectively which is significantly different from irrigating the crop at IW/CPE ratio of 0.6 (NMC and cane yield 82.62'000/ha and 98.94 t/ha, respectively).

NORTH CENTRAL ZONE

16. PUSA

Paired row trench planting (30: 120 cm row spacing) with or without trash mulching is more productive and efficient water user compared to conventional flat planting (75 cm row spacing) with or without trash mulching. Application of irrigation water at 1.00 IW: CPE ratio is most effective for realizing higher productivity from sugarcane cultivation in Bihar.

17. SEORAHI

Among planting methods, Paired row trench planting (120:30 cm row spacing) with organic mulch @6t/ha (P3) treatment produced significantly higher shoot population, NMC and cane yield over Conventional flat planting (75 cm row spacing) with organic mulch @6t/ha (P1) and Conventional flat planting (75 cm row spacing) without mulch (P2) treatments but among the irrigation scheduling, IW/CPE 1.0 ratio was best. Cane yield increased with increase the IW/CPE ratio.

NORTH EASTERN ZONE

18. BURALIKSON

The highest cane yield was recorded by paired row trench planting (30:120 cm row spacing) with organic mulching @ 6 t/ha (53.72 t/ha) which is statistically at par with paired row trench planting (30:120 cm row spacing without mulch (50.22 t/ha) but superior over other two planting methods. Moreover, no significant differences were recorded in case of quality of sugarcane.

Important Observations: The experiment was initiated during the year (2016-17) and was allotted to all the centres, however only 18 centres carried out the trial as per the technical programme. Salient findings are enumerated below:

- Planting of sugarcane in paired rows (120: 30) with mulching of trash (6 t/ha) in the inter-row spaces out yielded the conventional flat method with or without mulch at all the centres in north western, north central and north eastern zones. Being in the climatic region of high evaporative demand sugarcane crop responded up to 1.0 IW/CPE irrigation regime in the zones, however similar yields have been recorded with 0.8 IW/CPE ratio at many centres. Trash mulching could effectively save 20-26% irrigation water over no-mulching.
- Sugarcane crop in peninsular and east coast zones responded to furrow planting (120 cm) and skip furrow irrigation combined with the use of leguminous crop as green manure till 75 DAP, as a mulch during tillering and thereafter residue incorporation. As far irrigation regimes, IW/CPE ratio 1.0 was found to result in higher cane productivity, however it can be restricted to 0.8 for getting higher water use efficiency in these zones.
- Use of mulch in sub-tropical zones and green manuring followed by mulching and residue incorporation resulted in tropical zones resulted in higher net return.

CURRENT YEAR (2017-18) REPORT

NORTH WEST ZONE

1. FARIDKOT

The experimental crop was planted on 16.02.2017. Paired row trench planting was significantly better in number of shoots and millable canes. Cane length and weight was better in flat planting. Among the planting methods paired row trench planting with trash mulching recorded maximum (100.7 t/ha) and significantly higher cane yield than all methods of planting. Trash mulching resulted in significantly higher cane yield than without trash mulching irrespective of planting methods. Cane yield increased successively and significantly with increase in irrigation water application from 0.6 to 1.0 IW/CPE. Apparent water productivity (AWP) and total water productivity (TWP) were significantly higher in paired row trench planting than conventional planting. Among irrigation schedules AWP decreased successively with increase in water input from 0.6 to 1.0 IW/CPE, differences were statistically at par between 0.8 and 0.6 IW/CPE.

Table AS 70.1.1: Effect of planting methods and irrigation regime on sugarcane growth and yield at Faridkot

Treatment	Germination %	No. of Shoots 000/ha	NMC 000/ha	Cane length (cm)	Cane diameter (cm)	Single cane wt. (g)	Sucrose (%)
Planting methods							
P1	36.2	122.1	91.7	231	2.85	1432	16.21
P2	35.6	101.5	84.8	212	2.79	1299	16.76
P3	34.1	136.9	102.4	207	2.73	1336	16.79
P4	33.4	119.3	95.3	192	2.76	1236	16.55
CD (5%)	NS	9	5.1	16	NS	NS	NS
Irrigation schedule (IW/CPE)							
I1: 0.60	34.9	116.8	90.2	207	2.77	1270	16.53
I2: 0.80	34.1	119.3	93.5	210	2.82	1325	16.42
I3: 1.00	35.4	123.7	96.9	215	2.76	1382	16.79
CD (5%)	NS	NS	4.2	NS	NS	NS	NS

Table AS 70.1.2: Cane Yield and water application under varying methods of planting and irrigation schedule

Planting methods / Irrigation schedule (IW/CPE)	Cane Yield (t/ha)				Irrigation water input(cm)				Total water input (cm)#			
	I1 (0.6)	I2 (0.8)	I3 (1.0)	Mean	I1 (0.6)	I2 (0.8)	I3 (1.0)	Mean	I1 (0.6)	I2 (0.8)	I3 (1.0)	Mean
P1	76.9	93.3	100.3	90.2	67.5	90.0	112.5	90	107.3	129.8	152.3	129.8
P2	71.9	78.3	83.9	78.0	67.5	90.0	112.5	90	107.3	129.8	152.3	129.8
P3	87.2	103.9	111.1	100.7	27.0	36.0	45.0	36	66.8	75.8	84.8	75.8
P4	71.4	98.9	102.8	91.0	27.0	36.0	45.0	36	66.8	75.8	84.8	75.8
Mean	76.9	93.6	99.5		47.3	63.0	78.8		87.1	102.8	118.6	
LSD (p=0.05	MOP=9.8; IS=6.6; Interaction=NS											

Table AS 70.1.3: Water productivity under varying methods of planting and irrigation schedule

Planting methods/ Irrigation schedule (IW/CPE)	Apparent water productivity (kg/m^3)				Total water productivity (kg/m^3)			
	I1 (0.6)	I2 (0.8)	I3 (1.0)	Mean	I1 (0.6)	I2 (0.8)	I3 (1.0)	Mean
P1	11.4	10.4	8.9	10.2	7.2	7.2	6.6	7.0
P2	10.7	8.7	7.5	9.0	6.7	6.0	5.5	6.1
P3	32.3	28.9	24.7	28.6	13.1	13.7	13.1	13.3
P4	26.5	27.5	22.9	25.6	10.7	13.0	12.1	11.9
Mean	20.2	18.9	16.0		9.4	10.0	9.3	
LSD (p=0.05)	MOP=2.2; IS=1.9; Interaction=NS				MOP=1.1; IS=NS; Interaction=NS			

2. KOTA

A field experiment was planted on 12th March, 2017 to enhance crop and water productivity in sugarcane. Sugarcane variety CoPk 05191 was planted at different row distance, keeping 3 budded 4 setts per meter row length. Significant variation in germination and tiller population at 90 DAP, 120 DAP and 180 DAP stages was observed due to paired row trench planting (30:120 cm row spacing) with organic mulching of sugarcane trash @ 6 t/ha. Paired row trench planting (30:120 cm row spacing) with organic mulching of sugarcane trash @ 6 t/ha had significant effect on plant height at different stages, cane length, NMC and cane weight over P1 and P2 and at par with the paired row trench planting (30:120 cm row spacing) without mulch treatments. Data presented in table **AS 70.2.1** revealed that significantly higher NMC (147030 /ha), cane weight (999.44 g/plant), cane yield (91.70 t/ha) were obtained with the paired row trench planting (30:120 cm row spacing) with organic

(trash)mulching @ 6 t/ha over P1 and P2 treatments and at par with P4 treatments. The effect of planting methods with and without mulch on quality parameters was not significant.

Data revealed that there were differences in cost of cultivation, GR, NR owing to different treatments. The higher GR (233835 Rs/ha) and NR (129031 Rs/ha) and B: C ratio (2.23) recorded with paired row trench planting (30:120 cm row spacing) with trash mulching @ 6 t/ha, which was significantly higher over P1 and P2 and at par with rest of treatments. The water use efficiency was significantly higher under paired row trench planting (30:120 cm row spacing) with mulching over P1 and P2 and at par with the paired row trench planting (30:120 cm row spacing) without mulch treatments. The lowest water use efficiency was recorded under conventional planting without mulching. This was mainly due to lower soil moisture contribution and water storage in the root zone depth leads to lower tonnage of in conventional planting method.

Irrigation regimes had significant impact on growth and yield attributes. Significantly higher germination tiller population, plant height NMC and cane weight recorded at IW: CPE ratio of 0.80 over IW: CPE ratio of 0.60 and at par with an IW: CPE ratio of 1.0. The higher cane yield and quality parameters were recorded at IW: CPE ratio of 0.80 over IW: CPE ratio of 0.60 but at par with an IW: CPE ratio of 1.00. The highest WUE was recorded at IW: CPE ratio of 0.80 which was significantly higher over IW: CPE ratio of 1.00 but statistically on par with an IW: CPE ratio of 0.60. The cost of production was higher (107204 Rs/ha) under irrigation regime of IW: CPE ratio of 1.00 than 0.60 (100004 Rs/ha).Thus, irrigation regime of IW: CPE ratio of 0.80 recorded significantly higher net return, gross return and B: C ratio than IW: CPE 0.60 and on par with IW: CPE 1.00. Economics increased significantly with each successive increase in irrigation regimes from 0.60 to 0.80 IW: CPE ratio. After that it did not increase proportionally with each successive increase in irrigation regimes from 0.80 to 1.00 IW: CPE ratio.

Summary: Based on the two year of study, it can be concluded that paired row trench planting (30:120 cm row spacing) with organic mulching sugarcane trash @ 6 t/ha was found better with respect to number of tillers, plant height, millable canes, cane yield, cane weight, brix (%) and water use efficiency, resulted in significantly higher net return over P1 and P2 planting methods. However, irrigation water at IW: CPE ratio of 0.80 was found economical in sugarcane yield when compared with 0.60 and 1.00 IW: CPE ratios and also noted significantly enhancement in economics with each successive increase in irrigation regimes from 0.60 to 0.80 IW: CPE ratio which was proportionally more than the increase in irrigation water i.e. IW: CPE ratio of 1.00.

Table AS 70.2.1: Effect of planting method, mulching and irrigation regime on growth and yield of sugarcane at Kota

Treatment	Tillers population (000/ha)			Germination (%)	Cane length (cm)	Cane yield (t/ha)
	90 DAP	120 DAP	180 DAP		45 DAP	
Combination of planting methods and mulch practices						
P_1 : Conventional flat planting (75 cm row spacing) with organic mulching sugarcane trash @ 6 t /ha	141.2	160.37	169.2	82.51	45.57	232.03
P_2 : Conventional flat planting (75 cm row spacing) without mulch	139.9	158.36	166.6	80.88	45.16	226.20
P_3 : Paired row trench planting (30:120 cm row spacing) with organic mulching sugarcane trash @ 6 t/ha	154.3	175.08	185.7	91.40	49.11	246.87
P_4 : Paired row trench planting (30:120 cm row spacing) without mulch	150.6	169.30	180.1	87.01	47.52	244.17
SEm ±	3.23	3.29	3.35	1.75	1.107	2.93
CD (P=0.05)	11.19	11.40	11.61	6.07	3.830	10.12
CV	6.624	5.96	5.74	6.16	7.089	3.70
Irrigation schedule (IW/CPE)						
I_1 : 0.60	139.4	158.68	167.8	78.39	42.28	231.14
I_2 : 0.80	151.2	170.45	181.0	90.22	50.47	241.25
I_3 : 1.00	149.0	168.19	177.5	87.74	47.77	239.56
SEm ±	2.09	1.74	2.45	1.44	0.775	0.77
CD (P=0.05)	8.22	6.83	9.62	5.64	3.044	3.01
CV	4.95	3.64	4.84	5.82	5.735	1.12

Table AS 70.2.2: Effect of treatments on water use efficiency and economics at Kota

Treatment	Total Irrigation water (mm)	No of irrigation	WUE (kg/ha-mm)	Treatment cost (Rs/ha)	Production cost (Rs/ha)	Gross returns (Rs/ha)	Net returns Rs/ha)	B: C ratio
Combination of planting methods and mulch practices								
P_1 : Conventional flat planting (75 cm row spacing) with organic mulching sugarcane trash @ 6 t /ha	900	12	43.52	17400	104204	211381	107177	2.03
P_2 : Conventional flat planting (75 cm row spacing) without mulch	900	12	42.61	15600	102404	207103	104699	2.02
P_3 : Paired row trench planting (30:120 cm row spacing) with organic mulching sugarcane trash @ 6 t/ha.	900	12	48.20	18000	104804	233835	129031	2.23

P_4 : Paired row trench planting (30:120 cm row spacing) without mulch.	900	12	45.87	16200	103004	222700	119696	2.16
SEm ±			0.92	0.00	0.00	4440	4440	0.04
CD (P=0.05)			3.19	0.00	0.00	15362	15362	0.14
CV			6.13	0.00	0.00	6	12	6.13
Irrigation schedule (IW/CPE)								
I_1 : 0.60	670	9	46.61	13200	100004	200791	100787	2.01
I_2 : 0.80	905	13	47.40	16800	103604	230913	127309	2.23
I_3 : 1.00	1128	15	41.14	20400	107204	224559	117355	2.09
SEm ±			0.79	0.00	0.00	3592	3592	0.03
CD (P=0.05)			3.10	0.00	0.00	14099	14099	0.13
CV			6.08	0.00	0.00	6	11	5.81

3. KAPURTHALA

Planting methods did not significantly affect the germination percentage. Plant height at 150 DAP, Cane length, cane diameter and single cane weight were also not responding significantly to planting methods. Irrespective of planting methods mulching improved the single cane weight and number of millable cane compared to plating without mulch. Paired row trench planting of sugarcane with mulch produced significantly higher number of millable canes that were at par with planting sugarcane in single row with mulch but significantly higher over panting sugarcane under both planting method without mulch (**Table AS 70.3.1**).

Paired row trench planting with mulch produced significantly higher cane yield than other planting methods (105.1 t/ha). Planting sugarcane in paired row without mulch (97.3 t/ha), in single row with mulch (95.6 t/ha) and without mulch (92.1 t/ha) produced statistically similar cane yield.

Irrigations scheduling did not significantly influence the germination %, plant height at 150 DAP and cane diameter whereas other parameters were significantly influenced by irrigation scheduling. Irrigation application at IW/CPE ratio 1.0 produced significantly higher no of shoots and that were at par with irrigation application at IW/CPE ratio 0.8 but these were significantly better over irrigation application at IW/CPE ratio 0.6. Single cane was also significantly higher in irrigation application at IW/CPE ratio 1.0 than rest of irrigation scheduling. At irrigation scheduling of IW/CPE ratio 0.8 and IW/CPE ratio 0.6 recorded significantly lower cane weight than IW/CPE ratio 1.0.

Number of millable canes were also significantly higher at IW/CPE ratio 1.0. Irrigation application at IW/CPE ratio 0.8 also produced significantly higher number of millable canes than IW/CPE ratio 0.6. Cane yield 102.0 t/ha was obtained with irrigation application at IW/CPE ratio 1.0 that was at par with IW/CPE ratio 0.8 but significantly higher over IW/CPE ratio 0.6.

Juice quality parameters like Brix%, POL%, Purity %, CCS% and CCS were not significantly influenced by either planting methods or irrigation scheduling in sugarcane.

Apparent water productivity (AWP) and Total water productivity (TWP) were significantly higher in paired row trench planting than conventional planting because of lesser water application in paired row trench planting (36.0 cm less water) irrespective of mulching

(**Table AS 70.3.3**). Apparent water productivity in paired row trench planting with mulch was highest and significantly higher over paired row trench planting without mulch and single row planting with and without mulch. Highest apparent water productivity was recorded in irrigation scheduling at IW/CPE ratio of 0.6 that was significantly higher over significantly irrigation scheduling at IW/CPE ratio of 0.8 and 1.0. Total water productivity followed the similar trend as of apparent water productivity except irrigation scheduling where total water productivity showed non-significant response.

Table AS 70.3.1: Effect of planting methods and irrigation regime on sugarcane at Kapurthala

Treatment	Germination %	No. of Shoots 000/ha 150 DAS	Plant height (cm) 150 DAS	Cane length (cm)	Cane diameter (cm)	Single cane wt.(g)	NMC (000/ha)	Cane yield (t ha^{-1})
Planting method								
P1	40.1	109.6	166.9	217.9	2.3	1066.2	93.1	95.6
P2	40.1	107.7	173.3	229.2	2.2	966.3	82.5	92.1
P3	45.0	122.8	162.7	218.0	2.3	988.5	96.3	105.1
P4	46.0	118.8	172.2	222.0	2.3	974.0	87.0	97.3
CD (5%)	NS	11.1	NS	NS	NS	NS	5.3	6.3
Irrigation schedule (IW/CPE)								
I_1: 0.60	43.9	102.2	163.7	215.3	2.3	963.6	80.5	91.4
I_2: 0.80	41.7	115.4	167.0	218.2	2.3	988.5	91.4	99.2
I_3: 1.00	42.9	122.1	175.4	231.8	2.2	1044.1	97.2	102.0
CD (5%)	NS	11.0	NS	8.0	NS	45.3	4.5	6.1

Table AS 70.3.2: Cane Yield and water applied under varying methods of planting and irrigation scheduling

Planting methods/ Irrigation schedule (IW/CPE)	Irrigation water input (cm)					Total water input (cm)#			
	I1 (0.6)	I2 (0.8)	I3 (1.0)	Mean		I1 (0.6)	I2 (0.8)	I3 (1.0)	Mean
P1	45.0	60.0	75.0	60.0		87.4	101.0	112.9	100.4
P2	45.0	60.0	75.0	60.0		87.4	101.0	112.9	100.4
P3	18.0	24.0	30.0	24.0		60.4	65.0	67.9	64.4
P4	18.0	24.0	30.0	24.0		60.4	65.0	67.9	64.4
Mean	31.5	42.0	52.5			73.9	83.0	90.4	

Table AS 70.3.3: Water productivity under varying methods of planting and irrigation scheduling

Treatments	Apparent water productivity (kg/m^3)	Total water productivity (kg/m^3)
Planting methods		
P1	16.5	9.5
P2	15.8	9.2
P3	45.4	16.3
P4	42.1	15.1
CD (5%)	2.2	1.0
Irrigation schedule (IW/CPE)		
I_1: 0.60	36.4	12.9
I_2: 0.80	29.3	12.6
I_3: 1.00	24.1	12.1
CD (5%)	1.4	NS

4. LUCKNOW

A field experiment was initiated during second week of February, 2017, to enhance crop and water productivity in sugarcane. The sugarcane variety was CoPk 05191. Two irrigations were applied at the time of planting and 35 days after planting (time of germination) and subsequent irrigations were scheduled on the basis of IW/ CPE ratio in the respective plots. Sugarcane yield (114.3 t/ha) was significantly higher under paired-row trench planting with trash mulching than conventional flat method of planting along with trash mulching (101.9 t/ha) followed by paired-row trench planting with no mulching (98.3 t/ha) and conventional flat method of planting with no mulching (95.9 t/ha). Number of millable canes were higher with paired-row planting with trash mulching (106.0 x 000/ha) and conventional flat method of planting with trash mulching (108.6 x 000/ha) than no mulch treatments (102.4 and 103.2 x 000's/ha, respectively), however, non-significant. The juice quality parameters brix, sucrose content and purity per cent, remained statistically at par among all the four methods of planting. The trash application led to higher sugarcane yields irrespective of irrigation scheduling. The irrigation scheduled at IW: CPE 0.8 recorded 7.5 and 1.4 per cent higher cane yield compared to 0.6 and 1.0 IW: CPE ratio, respectively.The WUE was found maximum under paired-row trench planting with trash mulching (0.982 t/ha-cm) followed by conventional flat method of planting with trash mulching (0.877 t/ha-cm) and paired-row trench planting (0.845 t/ha-cm). The cane yield and water use efficiency can be increased significantly by trash mulching.

Table AS 70.4.1: Effect of planting methods and irrigation scheduling on sugarcane at Lucknow

Treatment	Germination (%) (45 DAP)	NMC ('000/ ha)	Total Water used (cm)	Cane yield (t/ha)	WUE (t/ha-cm)	Juice quality parameters at harvest		
						°Brix	Sucrose (%)	Purity (%)
Planting method								
Conventional flat + no mulch (75 cm row spacing)	33.24	103.2	116.3	95.9	0.82	20.3	18.14	88.4
Conventional flat + trash mulch (75 cm row spacing)	33.76	108.6	116.3	101.9	0.87	20.4	18.10	88.5
Paired- row trench planting + no mulch (30:120 cm row spacing)	33.20	102.4	116.3	98.2	0.84	20.5	18.04	88.4
Paired- row trench planting + trash mulch (30:120 cm row spacing)	32.90	106.0	116.3	114.2	0.98	19.8	17.76	87.3
CD (P=0.05)	NS	NS	-	11.98	-	NS	NS	NS
Irrigation schedule (IW:CPE)								
0.60	33.02	105.6	103.8	98.19	0.94	20.2	17.71	87.5
0.80	33.44	105.8	118.8	105.55	0.88	20.2	17.87	88.0
1.00	33.34	103.8	126.3	104.0	0.82	20.2	17.69	87.4
CD (P=0.05)	NS	NS	-	NS	-	NS	NS	NS

5. PANTNAGAR

Three budded setts of sugarcane variety Co Pant 5224 were planted on 24.03.2017 as per treatment (method of planting - flat bed, conventional at 75 cm and paired row planting 30: 120 cm) and was harvested on 05.03.2018. Germination at 45 days after planting was not influenced due to planting method (flat or paired row) or irrigation scheduling (0.6, 0.8 and 1.0 IW/CPE). Highest cane yield was recorded in paired row planting over flat and with mulch over without mulch. The highest cane yield in paired row planting and mulch was the result of higher NMC which were influenced by number of shoots per hectare in these treatments. Sucrose % and CCS yield were also significantly higher in paired row planting with mulch over flat with and without mulch. Among irrigation scheduling cane yield was significantly higher in 1.0 IW/CPE over 0.6. Sucrose and CCS yield were not influenced due to irrigation scheduling (**Table AS 70.5.1**).

Summary: On the basis of present study it was observed that significantly higher cane yield and NMC were recorded in paired row planting (30: 120) with mulch over flat and with or

without mulch. However germination % at 45 DAP could not influenced due to method of sugarcane planting and use of mulch. Cane yield was highest in 1.0 IW/CPE ratio over 0.6 IW/CPE. Cane yield was statistically similar in 0.8 or 1.0 IW/CPE ratio.

Table AS 70.5.1: Effect of planting methods with or without mulch under different irrigation regimes on growth, yield and juice quality of spring planted Sugarcane at Pantnagar

Treatment	Germination (45 DAP)	No of shoots (000/ha)			NMC (000/ha)	Cane yield (t/ha)	Sucrose (%)	CCS (t/ha)
		120 DAP	150 DAP	180 DAP				
Planting method								
Flat planting with mulch	30.3	128.9	137.8	143.0	83.7	82.3	17.6	10.8
Flat planting without mulch	30.7	126.6	131.3	131.6	78.4	80.9	16.8	10.7
Paired row with mulch	28.2	130.2	143.0	147.9	61.2	89.8	18.0	12.2
Paired row without mulch	30.7	129.8	137.7	145.4	89.1	87.8	17.6	11.9
SEm±	-	0.6	0.9	1.8	0.9	1.1	0.1	0.4
CD at 5%	NS	1.8	2.7	5.5	2.7	3.3	0.3	1.2
Irrigation level								
0.6 IW/CPE	28.4	128.7	136.4	141.4	77.2	83.6	17.5	11.3
0.8 IW/CPE	29.3	128.9	137.5	141.8	78.0	85.8	17.5	11.5
1.0 IW/CPE	32.2	129.0	138.4	142.8	79.1	86.3	17.6	11.4
SEm ±	-	-	0.8	0.7	0.5	0.8	-	-
CD at 5%	NS	NS	2.4	2.1	1.5	2.4	NS	NS

Table AS 70.5.2: Effect of treatments on water productivity at Pantnagar

Method of planting	**Irrigation water applied (mm)**	**Total rainfall (mm)**	**Total water applied (mm)**	**Water productivity (q/ha/cm)**
Planting method				
Flat planting with mulch	300	1401	1701	4.8
Flat planting no mulch	300	1401	1701	4.7
Paired row with mulch	300	1401	1701	5.2
Paired row no mulch	300	1401	1701	5.1
Irrigation level				
0.6 IW/CPE	300	1401	1701	4.9
0.8 IW/CPE	375	1401	1776	4.8
1.0 IW/CPE	525	1401	1926	4.5

6. SHAHJAHANPUR

The soil of the experimental field was sandy loam in texture, low in organic carbon (0.39%), phosphorus (9.20 kg/ha) and medium in potassium (176 kg/ha) with 6.80 pH value. The experimental crop was planted on 20.02.2017 and harvested on 18.02.2018. The experimental results showed that germination percent was significantly higher in paired row trench planting than conventional flat planting. Conventional flat planting (75 cm row spacing) with organic mulch @ 6 t/ha gave significantly higher number of shoots (169600/ha) than that of paired row trench planting (30:120cm row spacing) whereas, significantly higher number of a millable canes (112200/ha) and cane yield (79.17 t/ha) were obtained in paired row trench planting (30:120cm row spacing) with organic mulching @ 6 t/ha than that of other treatment of planting methods and mulch practices. Maximum water use efficiency (1109.30 kg/ha- cm) was recorded in paired row trench planting (30:120cm row spacing) with organic mulching@ 6 t/ha followed by paired row trench planting (30: 120 cm row spacing) without mulching with water use efficiency of 1075.20 kg/ha- cm (**Table AS 70.6.1**).

Irrigation scheduled at 1.00 IW/ CPE ratio (I3) produced significantly higher number of shoots (152100/ ha), millable canes (112900/ha) and cane yield (79.80t/ha) than those of other irrigation schedules. Maximum water use efficiency (1712.55 kg/ha- cm) was obtained at 0.60 IW/CPE ratio (I1) followed by 0.80 IW/ CPE ratio (I2) with water use efficiency of 1228.25 kg/ha- cm. CCS percent was not affected significantly due to various planting methods and irrigation schedules.

Summary: Paired row trench planting (120:30 cm row spacing) with organic mulch@ 6 t/ha produced higher cane yield (79.17 t/ha) and maximum water use efficiency (1109.30 kg/ha cm) than those of other planting methods and mulch practices. Irrigation schedule at 1.00 IW/CPE ratio (I3) produced significantly higher cane yield (79.80t/ha) with minimum water use efficiency (1088.75) followed by 0.80 IW/CPE ratio (I2) with cane yield of 75.58 t/ha and water use efficiency (1228.25 kg/ha cm).

Table AS 70.6.1: Effect of planting methods and irrigation regimes on sugarcane at Shahajahanpur

Treatment	Germination (%)	Shoots (000/m)	NMC (000/ha)	plant height (m)	cane yield (t/ha)	CCS%	Water use efficiency (kg/ha - cm)
Combination of planting methods and mulch practices							
P_1 – Conventional flat planting (75 cm row spacing) with organic mulching@ 6 t/ha	41.00	169.60	109.30	2.40	75.03	12.39	887.63
P_2 – Conventional flat planting (75 cm row spacing) without mulch	40.50	162.40	103.80	2.35	73.03	12.26	911.33

P_3 - Paired row trench planting (30: 120cm row spacing) with organic mulching @ 6 t/ha	52.30	127.40	112.20	2.47	79.17	12.15	1109.30
P_4 – Paired row trench planting (30: 120cm row spacing) without mulch	50.50	123.50	106.30	2.38	75.83	12.14	1075.20
SE±	0.81	1.67	1.04	0.01	0.88	0.15	-
CD at 5%	1.98	4.09	2.55	0.03	2.15	NS	-
Irrigation schedule (IW/ CPE) with irrigation water depth 7.5 cm							
I_1 – 0.60	46.80	139.60	103.00	2.35	72.03	12.22	1712.55
I_2 – 0.80	46.40	145.40	108.6	2.39	75.58	12.30	1228.25
I_3 – 1.00	45.00	152.10	112.9	2.44	79.80	12.21	1088.75
SE±	0.57	1.36	0.80	0.01	0.81	0.11	-
CD at 5%	NS	3.78	2.21	0.03	2.22	NS	-

7. UCHANI

This experiment was conducted during spring season on mid maturing variety CoH 167. Sugarcane was planted on March 15, 2017 as per treatments. Pan evaporation rate readings were recorded from pan evaporimeter installed at the farm. Average pan evaporation rate values were 2.9, 5.7, 6.5 and 6.7 mm/day for the month of March, April, May and June 2017 (Pre-monsoon period), respectively. Highest values of pan evaporation rate were recorded in the month of May and June 2017. Soil moisture per cent (on volume basis) before each irrigation in 1.0, 0.8 and 0.6 IW/CPE treatments recorded during pre-monsoon period was 13.4-14.2 %, 11.2-11.8% and 8.2-8.6 %, respectively. The crop was harvested on March 25, 2018.Significant differences were observed among different method of planting in terms of germination, tillers, NMC and cane yield. Significantly higher germination, tillers, NMC, cane weight and cane yield were recorded in paired row trench planting (30:120 cm) as compared to conventional planting at 75 cm row spacing (**Table AS 70.7.1**). Trash mulching resulted in significantly higher cane yield as compared to without mulching treatments. CCS percent was not affected due to different planting methods.

Germination was not affected due to irrigation schedule as the irrigation schedule was followed after complete germination. Significant differences were observed among irrigation schedules in all the parameters except germination. Irrigation schedule of 1.0 produced significantly higher number of tillers, NMC, cane weight and cane yield as compared to irrigation schedule of 0.8 and 0.6 IW/ CPE (**Table** 5). Lowest value of all the sugarcane parameters was recorded in irrigation schedule of 0.6 IW/CPE. Interaction between method of planting and irrigation levels was found non-significant.Highest yield of cane produced/1000 litres of irrigation water applied was recorded in trench planting at 0.8 IW/CPE irrigation schedule with trash mulching.

Summary: Significantly higher germination, tillers, NMC, cane weight and cane yield were recorded in paired row trench planting (30:120 cm) as compared to conventional planting at 75 cm row spacing. Trash mulching resulted in significantly higher cane yield as compared to

without mulching treatments. Interaction between method of planting and irrigation levels was found non-significant. Total (Irrigation+ rainfall) water was calculated as 175.7, 190.7 and 205.7 cm in conventional and 153.7, 162.7 and 171.7 cm in paired row trench planting at 0.6, 0.8 and 1.0 IW/CPE irrigation schedule, respectively. Highest yield of cane produced/1000 litres of irrigation (12.18 kg) water was recorded in trench planting at 0.8 IW/CPE irrigation schedule

Table AS 70.7.1: Effect of planting methods and irrigation regimes on sugarcane at Uchani

Treatments	Germination (%)	Tillers (000/ha)		NMC (000/ha)	Cane wt. (g)	Cane yield (t/ha)
		90 DAP	120 DAP			
Planting methods						
Conventional planting with trash mulching	46.5	102.5	120.3	110.1	826	87.3
Conventional planting without trash mulching	46.4	97.0	115.2	106.5	796	81.4
Paired row trench with trash mulching	53.6	114.6	134.5	123.1	861	100.6
Paired row trench without trash mulching	54.2	108.2	129.4	118.6	849	96.4
CD at 5%	3.3	5.0	6.4	4.3	33	4.0
Irrigation schedule (IW/CPE)						
0.6	50.4	94.9	112.5	104.3	778	77.2
0.8	50.2	107.0	126.7	115.9	855	94.8
1.0	49.9	114.8	135.4	123.5	866	102.2
CD at 5%	NS	6.8	7.8	6.4	45	5.8

Table AS 70.7.2: Irrigation water applied and rainfall received during the crop season at Uchani

Planting method	IW/ CPE	Total Pre-monsoon irrigation including 1st irrigation (cm)	Post monsoon irrigation (cm)	Total irrigation (cm)	Cane yield (t/ha)	Cane produced per 1000 litres of irrigation water (kg)
Conventional planting with trash mulching	0.6	37.5	60	97.5	72.9	7.48
Conventional planting with trash mulching	0.8	52.5	60	112.5	90.7	8.06
Conventional planting with trash mulching	1.0	67.5	60	127.5	98.4	7.72
Conventional planting without trash mulching	0.6	37.5	60	97.5	66.6	6.83
Conventional planting without trash mulching	0.8	52.5	60	112.5	85	7.56
Conventional planting without trash mulching	1.0	67.5	60	127.5	92.5	7.25

Paired row trench with trash mulching	0.6	25.5	50	75.5	88.1	11.67
Paired row trench with trash mulching	0.8	34.5	50	84.5	102.9	12.18
Paired row trench with trash mulching	1.0	43.5	50	93.5	110.6	11.83
Paired row trench without trash mulching	0.6	25.5	50	75.5	81.2	10.75
Paired row trench without trash mulching	0.8	34.5	50	84.5	100.7	11.92
Paired row trench without trash mulching	1.0	43.5	50	93.5	107.3	11.48

PENINSULAR ZONE

8. PADEGAON

The furrow planting (120 cm row spacing) with green manure (sunnhemp) sown at 30 DAP, mulched at 75 DAP followed by earthing-up at 110 DAP (P2) recorded the highest cane yield (130.89 t/ha) and CSS yield (15.85 t/ha) which was significantly superior over other planting methods except P4 and P3 which were at par. The irrigation schedules did not express its significant effect on cane and CCS yield. However, numerically higher cane yield (128.24 t/ha) and CSS yield (15.56 t/ha) was recorded with (I3) Irrigation schedule. The interaction between planting method (P4) and irrigation schedule (I3) recorded significantly the highest cane yield (139.25 t/ha) however, it was found at par with interaction between I3 X P3, I1X P2 and I2 X P2.

The data revealed that furrow planting (120 cm row spacing) with green manure sowing at 30 DAP, mulching at 75 DAP and earthing-up at 110 DAP (P2) recorded significantly the highest plant height (242.56 cm) at 180DAP which was significantly superior over other planting methods except P3. The average cane weight was significantly influenced by planting methods and P2 planting methods recorded significantly higher average cane weight (1.78 kg) over that of other planting methods. Germination, tillering ratio, number of millable canes and cane girth (cm) were found to be non-significant. The highest tillering ratio at 90 and 120 DAP (3.65 and 2.89) was recorded with IW/CPE ratio of 1.0 (I_3) found at par with (I2). The average cane weight was significantly influenced by irrigation scheduling and irrigation scheduled at 1.00 IW/CPE ratio recorded significantly higher average cane weight (1.91 kg) which was significantly higher than other irrigation schedules.

Summary: Furrow planting (120 cm row spacing) with green manure (sunnhemp) sown at 30 DAP, mulched at 75 DAP followed by earthing-up at 110 DAP (P2) was found significantly superior for cane and CCS yields. While irrigation schedules not affects the Cane and CCS yields. The higher water use efficiency was recorded in Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing –up with green manure/brown mulching (P4) and irrigation schedule with 0.60 IW/CPE. (I1).All quality parameters were found to be non-significant.

Table AS 70.8.1: Effect of planting method and irrigation scheduling on sugarcane at Padegaon

Treatment	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})
Planting Method		
P_1: Furrow planting (120 cm row spacing) without mulching	111.05	13.45
P_2: Furrow planting (120 cm row spacing) with green manure (dhaincha/sunnhemp/cowpea) sowing at 30 DAP, mulching at 75 DAP and earthing-up at 110 DAP	130.89	15.85
P_3: Furrow planting (120 cm row spacing) with alternate skip furrow irrigation * after earthing –up without mulching	123.73	15.02
P_4: Furrow planting (120 cm row spacing) with alternate skip furrow irrigation* after earthing –up + green manure/brown mulching	126.77	15.37
SE±	2.47	0.46
C.D. at 5%	8.56	1.58
Irrigation schedule (IW/CPE)		
I_1 : 0.60	118.31	14.22
I_2 : 0.80	122.79	14.97
I_3 : 1.00	128.24	15.56
SE±	2.31	0.36
C.D. at 5%	NS	NS
Interactions		
SE±	**4.50**	**0.75**
C.D. at 5%	**12.02**	**NS**
General Mean	**123.11**	**14.92**

Table AS 70.8.2: Effect of interaction between planting method and irrigation regimes on cane yield at Padegaon

Planting Method / Irrigation schedule	P_1	P_2	P_3	P_4
I_1	111.89	134.00	110.67	116.67
I_2	111.48	134.67	120.60	124.40
I_3	109.79	124.00	139.93	139.25
SE±	4.50			
C.D. at 5%	12.02			

9. MANDYA

Among the planting methods, 120 cm row spaced furrow planting with *dhaincha* green manure sowing at 30 DAP and mulching at 75 DAP recorded significantly higher cane yield (158.5 t/ha) as compared to others(**Table AS 70.9.1**). However, it was at par with 120 cm row spaced furrow planting with alternate skip furrow irrigation after earthing up + *dhaincha* green manure mulching (152.3 t/ha). While, the lower cane yield was noticed in 120 cm row spaced furrow planting with alternate skip furrow irrigation without mulching (143.1 t/ha) and 120 cm row spaced furrow planting without mulching (148.8 t/ha). Among the irrigation schedules, IW/CPE ratio of 1.0 recorded significantly higher yield (168.1 t/ha) as compared to IW/CPE ratio of 0.60 (129.7 t/ha). While, it was at par with IW/CPE ratio of 0.80 (157.2 t/ha). Among the interactions, significantly higher cane yield was observed in 120 cm row spaced furrow planting with *dhaincha* green manure sowing at 30 DAP and mulching at 75 DAP with irrigation scheduling at IW/CPE ratio of 1.0 (177.4 t/ha) as compared to other interactions. However, it was on par with furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing up +green manure with irrigation scheduling at IW/CPE ratio of 1.0 (167.8 t/ha).

The irrigation water used was significantly lower in 120 cm spaced furrow planting with alternate skip furrow irrigation after earthing up + green manure mulching (1773 mm) and it saved 17.4% of irrigation water as compared to all furrow irrigation without mulching. However, it was at par with 120 cm spaced furrow planting with alternate skip furrow irrigation after earthing up without mulching (1801 mm). While, higher irrigation water used was observed with 120 cm spaced furrow planting without mulching (2146 mm). Scheduling of irrigation at IW/CPE ratio of 0.6 consumed lowest amount of irrigation water and saved 20% of irrigation water. While, the highest amount of irrigation water was consumed by IW/CPE ratio of 1.0 (2189 mm).

Summary:120 cm row spaced furrow planting with alternate skip furrow irrigation after earthing up + *dhaincha* green manure mulching found to enhance the water use efficiency and gave at par yield as that of 120 cm row spaced furrow planting with *dhaincha* green manure with full pledge irrigation.

Table AS 70.9.1: Effect of treatments on sugarcane at Mandya

Treatment	Single cane weight (kg)	Cane length (m)	Millable cane ('000/ha)	Cane yield (t/ha)	Sucrose %	CCS %	CCS (t/ha)	Water used (mm)
Planting methods								
P1	1.92	2.25	82.23	148.8	18.95	13.43	19.99	2146
P2	2.05	2.36	84.99	158.5	19.21	13.68	21.64	2059
P3	1.63	1.96	79.56	143.1	19.41	13.76	19.68	1801
P4	1.76	2.11	80.84	152.3	19.53	13.91	21.16	1773
S.Em.±	0.04	0.03	0.52	2.89	0.08	0.07	0.40	10.1
CD @ 5%	0.12	0.12	1.80	9.99	NS	NS	1.38	35.0
Scheduling of irrigation								
I1	1.65	2.00	78.17	129.7	19.52	13.84	17.96	1751
I2	1.84	2.18	82.96	157.2	19.27	13.69	21.12	1955
I3	2.03	2.33	84.59	168.1	19.03	13.55	22.77	2189
S.Em.±	0.03	0.04	1.12	3.40	0.08	0.06	0.48	15.6

CD @ 5%	0.10	0.16	4.40	13.35	NS	NS	1.89	61.3
Planting methods X Irrigation Scheduling								
P1I1	1.73	2.09	78.57	128.4	19.02	13.44	17.25	1881
P1I2	1.93	2.27	83.29	151.6	19.03	13.50	20.48	2171
P1I3	2.09	2.40	84.84	166.3	18.81	13.36	22.22	2386
P2I1	1.90	2.16	80.48	135.5	19.62	13.96	18.91	1845
P2I2	2.06	2.39	86.03	162.4	19.11	13.63	22.15	2057
P2I3	2.18	2.54	88.48	177.4	18.89	13.45	23.85	2277
P3I1	1.42	1.82	75.37	121.4	19.67	13.91	16.89	1683
P3I2	1.60	1.95	80.76	147.1	19.23	13.61	20.02	1877
P3I3	1.88	2.12	82.55	160.9	19.33	13.75	22.12	2083
P4I1	1.56	1.95	78.26	133.5	19.77	14.06	18.77	1593
P4I2	1.75	2.10	81.77	155.5	19.71	14.04	21.84	1717
P4I3	1.97	2.28	82.50	167.8	19.11	13.63	22.87	2010
S.Em.±	0.05	0.07	2.85	4.00	0.12	0.09	0.41	29.4
CD @ 5%	0.15	0.21	8.78	12.28	NS	NS	1.26	90.7

10. NAVSARI

Germination (%) was recorded significantly highest with planting method P3 (furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing up without mulching) over other planting method and remained at par with treatment P4 (furrow planting (120 cm row spacing) with alternate skip furrow irrigationafter earthing up + green manure/brown mulching). Tiller population was not significantly influenced due to different planting methods at 90 DAP however at 120 and 180 DAP, significantly highest numbers of tillers were recorded with planting methods P4 and P2 and remained at par with each other over other methods. Irrigation levels I3 (1.00 IW/CPE ratio) recorded significantly highest tillers population and remained at par with I2 over I1 at 180 DAP only.

Significantly highest plant height was noticed with planting method P4 and P2 and found equally effective over other methods at all the growth stages. Irrigation level I3 recorded significantly highest plant height (150.25, 165.72, 186.14 cm) at 90, 120 and 180 DAP respectively over I1 and remained at par with I2.

NMC (105840/ha) was recorded significantly higher with planting method P4 (furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing up + green manure/brown mulching) and remained at par with P2 and P1. Significantly highest and lowest NMC (107270 and 91180/ha) were recorded with irrigation levels I3 and I1 respectively. Cane length and cane diameter did not show any significant effect due to planting method and irrigation levels. Planting methods did not show significant effect on single cane weight while irrigation level I3 recorded significantly highest single cane weight (1.34 kg) over I1 and I2.

Significantly highest cane (114.19 t/ha) and CCS (15.24 t/ha) yield was noticed with planting method P4 but cane yield remained at par with P2 over other methods and CCS yield at par with P1 and P2. Significantly highest cane (118.62 t/ha) and CCS (15.82 t/ha) yield was observed with irrigation level I3 over I1 and I2.Among various quality parameters only brix was significantly influenced due to planting methods. Significantly highest brix was observed with planting method P1 and remained at par with P3 and P4 over P2 further it was

not significantly influenced due to irrigation levels.Field water use efficiency was recorded highest (124.15 kg/ha-mm) with irrigation level I1 followed by I3 (112.97 kg/ha-mm) and I3 (103.35 kg/ha-mm).Interaction effect between planting methods and irrigation levels was found non-significant for above all the growth, yield, quality and soil parameters (**Table AS 70.10.1**).

Table AS 70.10.1: Effect of different treatments on sugarcane at Navsari

Treatment	NMC ('000/ha)	Cane length (cm)	Cane diameter (cm)	Single cane weight (kg)	Cane yield (t/ha)	CCS yield (t/ha)
Planting method						
P_1	97.98	273.09	2.38	1.10	102.10	13.50
P_2	102.49	281.18	2.49	1.13	107.72	13.92
P_3	91.33	261.91	2.43	1.10	92.65	12.29
P_4	105.84	289.88	2.59	1.14	114.19	15.24
S.EM.±	2.71	8.11	0.05	0.03	3.00	0.53
C.D. at 5%	9.38	NS	NS	NS	10.38	1.83
C.V.%	8.18	8.80	6.04	8.93	8.64	11.57
Irrigation level						
I_1	94.18	269.37	2.37	0.99	93.11	12.15
I_2	96.78	276.49	2.50	1.02	100.77	13.25
I_3	107.27	283.69	2.54	1.34	118.62	15.82
S. EM.±	2.59	6.66	0.06	0.03	2.86	0.26
C.D. at 5%	10.18	NS	NS	0.10	11.25	1.03
C.V.%	9.03	8.34	8.27	7.93	9.53	6.63
Interaction						
S.EM.±	5.47	13.42	0.09	0.06	4.93	0.95
C.D. at 5%	NS	NS	NS	NS	NS	NS
C.V.%	9.53	8.41	6.22	8.61	8.20	11.93

11. THIRUVALLA

The experiment with the objective of enhancing crop and water productivity in sugarcane was planted on 20.01.2017and harvested on 15.01.2018. There were no effect on germination % and tiller count due to various planting methods and irrigation schedule.The treatment variation due to planting methods, green manure and mulch practices as well as irrigation schedule were significant for growth and yield parameters.

The growth and yield attributes recorded in P4(furrow planting at 120 cm spacing with alternate skip furrow irrigation after earthing up+ green manure/brown mulching was significantly superior to other planting methods and mulch practices tried. The maximum cane length (262.56 cm), cane diameter (3.18 cm), single cane weight (1.56kg), MCC (82000/ha), cane yield (101.00 t/ha) and sugar yield (9.47t/ha) were recorded by P4(**Table AS 70.12.1**). With regard to irrigation schedule, the highest value for cane length(259.92 cm), cane diameter (3.10 cm), MCC (77020/ha), cane yield (81.55t/ha)and sugar yield(7.99t/ha) were recorded by I3 (IW/CPE ratio 1.00). The interaction effect was significant for cane length, MCC, cane yield and sugar yield and the maximum values were recorded by the treatment combination P4 X I3 (260.94 cm, 88250, 111.27t/ha and 10.90 t/ha, respectively).

There was slight variation in the fertility status of the soil before and after the conduct of the trial. Among the treatment combinations, the highest BC ratio of 1.41 was recorded by the treatment combination P4 X I3.

Table AS 70.11.1: Effect of different treatments on sugarcane at Thiruvalla

Treatment	Cane length (cm)	Cane diameter (cm)	MCC ('000/ha)	Cane yield (t/ha)	Sugar yield (t/ha)	BC ratio
P_1	260..44	3.08	71.83	83.57	8.15	-
P_2	259.56	3.07	72.47	93.61	8.93	-
P_3	260.67	3.12	78.24	97.55	9.24	-
P_4	262.56	3.18	82.00	101.00	9.47	-
CD	**2.35**	**0.10**	**3.00**	**4.12**	**0.40**	**-**
I_1	250.42	3.18	70.71	78.23	7.49	-
I_2	255.58	3.06	72.00	80.95	7.92	-
I_3	259.92	3.10	77.02	81.55	7.99	-
CD	**1.30**	**0.05**	**2.50**	**4.03**	**0.30**	**-**
P_1I_1	256.00	2.92	73.64	84.68	8.35	1.22
P_1I_2	259.33	2.95	74.80	87.14	8.84	1.24
P_1I_3	260.67	3.06	76.15	91.29	8.47	1.25
P_2I_1	264.67	3.09	77.50	92.21	8.68	1.18
P_2I_2	265.67	3.10	78.10	95.47	9.53	1.18
P_2I_3	266.30	3.11	73.50	96.57	9.15	1.20
$P3I_1$	262.25	3.12	76.90	96.66	9.40	1.26
P_3I_2	257.00	3.14	78.94	98.80	9.43	1.28
P_3I_3	266.10	3.15	80.75	102.02	9.36	1.30
P_4I_1	268.07	3.20	82.56	106.75	9.97	1.33
P_4I_2	268.33	3.21	85.40	107.38	10.33	1.35
P_4I_3	270.94	3.22	88.25	111.27	10..90	1.41
PxI(CD)	**3.74**	**NS**	**3.72**	**3.13**	**0.72**	**NS**

EAST COAST ZONE

12. ANAKAPALLE

At 180 days, significant variations were observed in shoot population among different irrigation treatments. Interaction effect was non-significant. Scheduling irrigations at 1.0 IW/CPE (I3) recorded significantly more number of shoots (81742/ha) which was on par with scheduling irrigations at 0.8 IW/CPE (76,389/ha) and significantly superior over scheduling irrigation at 0.6 IW/CPE (73640/ha). Significant variations were not observed in shoot population at 180 DAP due to different mulching treatments. However furrow irrigation with sunnhemp mulch recorded more number of shoots (78665/ha) at 180 DAP.Significantly longer canes of 249.3 cm were recorded in scheduling irrigations at 1.0 IW/CPE (I3) as compared to I2 (224.0cm) and I1 (214.9 cm) treatments. Length of millable cane did not

vary significantly due to different mulching treatments.Significant differences were observed in number of millable canes at harvest due to irrigation and mulching treatments. Scheduling irrigations at frequent intervals (1.0 IW/CPE) recorded significantly more number of millable canes (78212/ha) as compared to less number of irrigations at longer intervals i.e. I2 (73264 /ha) and I1 (69821/ha) treatments. Furrow irrigation with sunnhemp mulch recorded significantly more number of millable canes (78626/ha) as compared to alternate furrow irrigation without mulch (69907/ha). The interaction effect was not significant.

Significantly higher cane yield (85.0 t/ha) was recorded in scheduling irrigations at frequent intervals at 1.0 IW/CPE (I3) as compared to scheduling irrigations at longer intervals at 0.6 IW/CPE (74.0 t/ha) but on par with scheduling irrigation at IW/CPE of 0.8 (79.5 t/ha). Furrow irrigation with mulching recorded significantly higher cane yield of 83.7 t/ha over all the other treatments. Interaction effect was found non-significant.Sugar yield was computed treatment wise. Highest sugar yield (12.33 t/ha) was recorded with scheduling irrigation at IW/CPE ratio of 1.0. Among different mulching treatments furrow irrigation with mulching recorded highest sugar yield of 12.29 t/ha(**Table AS 70.12.1**).

Summary: Studies on scheduling irrigation with mulch in sugarcane indicated that significantly higher cane yield (85.0 t/ha) was recorded in scheduling irrigations at frequent intervals at 1.0 IW/CPE (I3) as compared to scheduling irrigations at longer intervals at 0.6 IW/CPE (74.0 t/ha) and on par with scheduling irrigation at IW/CPE of 0.8 (79.5 t/ha) treatments. Furrow irrigation with mulching recorded significantly higher cane yield of 83.7 t/ha over all the other treatments. Interaction effect was found non-significant.

Table AS 70.12.1: Effect of treatments on sugarcane at Anakapalle

Treatment	Shoot population at 180 DAP	LMC (cm)	NMC/ha	Juice Sucrose (%)	Cane yield (t/ha)	Sugar yield (t/ha)
Irrigation Level						
I_1- 0.6	73640	214.9	69821	20.65	74.0	11.33
I_2-0.8	76389	224.0	73264	19.66	79.5	11.57
I_3-1.0	81742	249.3	78212	19.59	85.0	12.33
SEm ±	1428	5.7	1320	0.37	1.6	-
C.D (0.05)	5760	23.0	5325	NS	6.3	-
Mulching						
T1-Furrow irrigation without mulching	75,463	230.3	72184	19.73	79.1	11.52
T2-Furrow irrigation with mulching	78,665	231.9	78626	19.8	83.7	12.29
T3-Alternate Furrow irrigation without mulching	77,816	224.3	69907	19.76	76.9	11.18
T4-Alternate Furrow irrigation with mulching	77,083	229.8	74344	20.57	78.3	12.02
SEm ±	1983	7.3	2074	0.5	1.6	-
C.D (0.05)	NS	NS	6212	NS	4.8	-
Interaction	NS	NS	NS	NS	NS	-

13. CUDDALORE

The experiment was laid out on 27.02.2017 with the objective to enhance the crop and water productivity of sugarcane. No significant difference was observed among the treatments 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, mulched at 75 DAP and earthing up 120 DAP recorded maximum soil moisture content up to 40th day after planting (64.25 %) 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 up to 40th DAP (53.25 %). The same trend was also recorded up to 100th day after planting.

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 248530/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 236540/ha and adopting the IW/CPE ratio of 1.0 recorded significantly the maximum tillers of 238180/ha. Regarding plant height 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 plant height (147.23 cm)at 150 DAP. The furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing up without mulching recorded the highest millable cane population of 139250/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 135650/ha and adopting the IW/CPE ratio of 1.0 recorded significantly the maximum millable cane population of 131790/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 highest cane length (285.36 cm), cane diameter (2.85 cm) and cane weight (1.71 kg) 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 277.35cm, 2.75 cm and 1.72 kg of cane length, cane diameter and cane weight, respectively. Adopting the IW/CPE ratio of 1.0 recorded the maximum cane length of 267.25cm, cane diameter of 2.96 cm and cane weight of 1.76 kg respectively.

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 highest cane (142.56 t/ha) and sugar (18.13 t/ha) yield.Adopting the IW/CPE ratio of 1.0 recorded significantly the highest cane yield (136.14 t/ha), sugar yield (16.99 t/ha). The result on quality parameters revealed that, non-significant result among the treatment on quality parameters of cane (**Table AS 70.13.1**).

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 2084.33 kg/ha-cm and it was followed by the furrow planting (120cm row spacing) with alternate skip furrow irrigation after earthing up with green manure/brown mulching, which recorded WUE of 2029.30 kg/ha-cm. By adopting the IW/CPE ratio of 1.0 recorded the maximum WUE of 1841.61 kg/ha-cm (**Table AS 70.13.2**).

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 3.65, 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 3.56. Adopting the IW/CPE ratio of 1.0 recorded the maximum 3.64 of B:C ratio.

Summary: 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 (142.56 t/ha), sugar yield (18.13 t/ha) and B:C ratio of 3.65 and adopting the IW/CPE ratio of 1.0 recorded significantly the maximum cane yield (136.14 t/ha), sugar yield (16.99 t/ha) and B:C ratio 3.64.

Table AS 70.13.1: Effect of different treatments on sugarcane at Cuddalore

Treatment	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	1.95	1.29	19.89	12.23	88.56	12.38	128.56	15.92	3.49
P_2	2.85	1.71	19.98	12.87	87.69	12.72	142.56	18.13	3.56
P_3	2.21	1.34	20.12	12.78	89.68	12.46	124.65	15.53	3.44
P_4	2.75	1.72	20.12	12.99	88.79	12.57	136.58	17.17	3.65
CD P=0.05	0.16	0.28	0.96	NS	NS	NS	8.72	1.42	
Irrigation schedule (IW/CPE) with depth of irrigation 7.5 cm									
I_1	1.91	1.20	19.59	12.24	85.94	12.36	127.64	15.93	3.39
I_2	2.44	1.48	20.01	12.63	88.68	12.53	131.98	16.66	3.50
I_3	2.96	1.76	20.40	13.01	91.30	12.67	136.14	16.99	3.64
CD P=0.05	0.13	0.22	NS	NS	NS	NS	7.30	0.91	

Table AS 70.13.2: Effect on water use efficiency at Cuddalore

Treatment	Soil Moisture (%) DAP				Irrigation water applied (ha-cm)	WUE kg/ha-cm
	70	80	90	100		
Planting method and mulch practice						
P_1	52.32	49.32	46.32	43.25	89.00	1387.08
P_2	63.24	59.63	60.21	57.68	67.00	2084.33
P_3	37.42	37.25	39.25	37.24	61.50	1955.28
P_4	59.65	46.25	58.23	56.35	64.50	2029.30
CD (p=0.05)	4.05	2.02	3.86	1.891		
Irrigation schedule (IW/CPE) with depth of irrigation 7.5 cm						
I_1	49.23	47.86	46.92	45.23	68.18	1775.45
I_2	51.02	48.76	48.62	46.08	70.53	1809.63
I_3	52.73	49.58	50.24	46.87	72.79	1841.61
CD (p=0.05)	NS	NS	2.69	NS		

14. NAYAGARH

The experiment was laid out in strip plot on 25.01.2017 and harvested on 12.12.2010. Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing-up + brown mulching method produced higher NMC and cane yield of 91442/ha and 100.59t/ha respectively which was closely followed by furrow planting (120 cm row spacing) with brown mulching (NMC and cane yield 90699/ha and 100.06 t/ha). Irrigating the crop at IW/CPE ratio of 1.0 produced highest NMC and sugarcane yield of 92930/ha and 106.30 t/ha, respectively which is significantly different from irrigating the crop at IW/CPE ratio of 0.6 (NMC and cane yield 85.03'000/ha and 92.433 t/ha respectively). Planting method x irrigation schedule interaction was found not significant. However maximum water use efficiency was recorded with IW/CPE of 0.6 (817.85 kg/ha-cm) followed by IW/CPE ratio of 0.8 (775.68 kg/ha-cm). Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing-up + brown mulching treatment recorded higher water use efficiency (786.17 kg/ha-cm) than other planting methods (**Table AS 70.14.1 & 2**).

Table AS 70.14.1: Effect of different treatments on sugarcane at Nayagarh

Treatment	Germination (%) 45 DAP	No of tillers (000/ha) at 120 DAP	NMC (000/ha)	Cane yield (t/ha)	Juice Brix %	CCS %	CCS yield (t/ha)
Planting methods							
P_1	52.6	85.8	87.496	100.867	21.529	12.053	12.181
P_2	54.5	87.2	90.699	100.062	21.126	12.346	12.628
P_3	53.7	83.5	87.744	99.830	20.918	11.688	11.792
P_4	52.7	85.4	91.442	100.594	20.951	11.930	12.046
Sem $\pm$	1.0	1.3	1.122	1.73	0.576	0.238	0.342
CD at 5 %	NS	NS	3.29	NS	NS	NS	NS
Irrigation schedule							
I_1	52.9	82.4	85.030	92.433	20.527	11.726	10.872
I_2	53.0	86.1	90.076	102.277	21.465	12.067	12.557
I_3	54.	88.0	92.930	106.306	21.401	12.220	13.056
SEm $\pm$	0.90	1.1	0.972	1.498	0.499	0.206	0.296
CD at 5 %	NS	3.3	2.85	4.394	NS	NS	0.869

Table AS 70.14.2: Effect of different treatments on water use efficiency at Nayagarh

Treatment	Cane yield (t/ha)	Quantity of water applied (ha-cm)	Water use efficiency (kg/ha-cm)
Planting method			
P_1	100.867	146.5	762.1333
P_2	102.207	143.7	771.7467
P_3	100.931	140.5667	779.9433
P_4	100.594	139.1333	786.1667
Irrigation schedule (IW/CPE ratio)			
I_1	92.683	131.325	817.85
I_2	104.046	142.45	775.68
I_3	106.721	153.65	731.4625

NORTH CENTRLA ZONE

15. PUSA

The experimental findings revealed that growth, yield attributes and cane yield varied significantly with planting method (**Table AS 70.15.1**). Paired row trench planting (30: 120 cm row spacing) with trash mulching @ 6 t/ha (P3) being at par with paired row trench planting (30: 120 cm row spacing) without trash mulching (P4) produced significantly higher millable canes (143300/ha) and cane yield (99.5 t/ha) over other planting methods.

The number of irrigations were 3, 2 and 2 at IW: CPE ratios 1.00, 0.80 and 0.60, respectively. The total water applied on the basis of depth (7.5 cm) and number of irrigations was 22.5, 15.0 and 15.0 cm at IW: CPE ratios of 1.00, 0.80 and 0.60, respectively. Among the levels of irrigation, irrigation scheduled at IW: CPE ratio 1.00 recorded the significantly higher plant population (224500/ha), cane diameter (2.37 cm) and millable canes (125000/ha). However cane yield recorded at IW: CPE ratio 1.00 was statistically comparable to IW: CPE ratio 0.80.

Table AS 70.15.1: Effect of treatments on sugarcane at Pusa

Treatment	Germination (%) at 45 DAP	Plant population ($\times 10^3$/ha) at 120 DAP	Plant height (cm) at 240 DAP	Cane length (cm) at harvest	Cane diameter (cm)	Millable canes ($\times 10^3$/ha)	Single cane weight (g)	Cane yield (t/ha)
Planting method with and without mulch								
P_1- Conventional flat planting (75 cm row spacing) with trash mulching @ 6 t/ha	37.5	170.8	298	272	2.20	117.1	741	83.2

P_2 Conventional flat planting (75 cm row spacing) without mulching	34.1	154.2	292	268	2.15	109.5	737	78.0
P_3 Paired row trench planting (30: 120 cm row spacing) with trash mulching @ 6 t/ha	35.8	214.9	354	326	2.32	134.3	767	99.5
P_4 Paired row trench planting (30: 120 cm row spacing) without trash mulching	38.8	200.1	340	314	2.29	129.1	763	95.3
SEm (±)	0.36	3.82	4.19	2.71	0.02	2.19	7.05	1.4
CD (P=0.05)	1.2	13.2	14.5	9.4	0.1	7.6	24.4	5.0
CV (%)	6.0	6.2	6.9	6.0	6.3	5.37	6.8	4.8
Irrigation schedule (IW/CPE)								
I_1 0.60	35.3	143.1	300	276	2.10	102.2	748	76.3
I_2 0.80	36.8	187.4	327	298	2.25	125.0	753	91.6
I_3 1.00	37.4	224.5	336	311	2.37	140.3	755	99.1
SEm (±)	0.71	4.29	6.82	4.45	0.02	2.96	13.04	1.99
CD (P=0.05)	NS	16.9	26.8	17.5	0.1	11.6	NS	7.8
CV (%)	6.7	8.0	7.4	5.2	5.4	8.4	6.0	7.8

16. SEORAHI

Sugarcane crop was planted on 22 -02 -2017 and harvested on 15-03-2018. Paired row trench planting (120:30 cm row spacing) with organic mulch @ 6t/ha treatment gave significantly higher germination per cent (54.29), shoot population (183.39 thousand/ha), NMC (110.16 thousand/ha) and cane yield (95.61 t/ha) over remaining planting methods except paired row trench planting (120:30 cm row spacing) without mulch treatment. Lowest cane yield (66.24 t/ha) was obtained in conventional flat planting (75 cm row spacing) without mulch treatment. IW/CPE 0.6 ratio treatment gave significantly lower germination (42.95 per cent), Shoot population (163.84 thousand/ha) and cane yield (76.83 t/ha) over remaining treatments. Sucrose per cent was not affected significantly by different treatments of irrigation schedules and planting methods (Table AS70.16.1).

Summary: Among planting methods, Paired row trench planting (120:30 cm row spacing) with organic mulch @6t/ha (P3) treatment gave significantly higher germination per cent, shoot population, NMC and cane yield over Conventional flat planting (75 cm row spacing) with organic mulch @6t/ha (P1) and Conventional flat planting (75 cm row spacing) without

mulch (P2) treatments but among the irrigation scheduling IW/CPE 1.0 ratio was found the best. Cane yield was increased with increase in IW/CPE ratio. Sucrose per cent was not affected significantly with different treatments.

Table As 70.16.1: Effect of different treatments on sugarcane at Seorahi

Treatment	Germination %	Shoot (000/ha)	NMC (000/ha)	Cane Yield (t/ha)	Sucrose %
Planting methods					
P1	39.25	164.76	90.37	78.68	17.55
P2	38.82	165.61	85.19	66.24	17.48
P3	54.29	183.39	110.16	95.61	17.75
P4	52.14	178.94	104.60	90.37	17.61
SEm±	1.13	5.11	2.62	3.11	0.27
CD(P=0.05)	3.32	15.08	7.73	9.18	NS
Irrigation schedules					
I1	42.95	163.89	99.52	76.83	17.20
I2	46.22	172.74	97.54	79.72	17.59
I3	49.22	182.90	95.67	91.63	18.01
SEm±	0.97	4.43	2.27	2.70	0.23
CD(P=0.05)	2.87	13.07	NS	7.75	NS

Table AS 70.16.2: Effect of different treatments on sugarcane water productivity at Seorahi

Treatment	**Irrigation Water applied (mm)**	**Total rainfall (mm)**	**Total water applied (mm)**	**Cane yield (q/ha)**	**Total water applied (cm)**	**water productivity (q/ha-cm)**
Planting methods						
P1	300	1045	1345	786.8	134.5	5.85
P2	300	1045	1345	662.4	134.5	4.92
P3	300	1045	1345	952.4	134.5	7.08
P4	300	1045	1345	903.7	134.5	6.72
Irrigation schedules						
I1	225	1045	1270	768.3	127.0	6.05
I2	300	1045	1345	797.2	134.5	5.93
I3	375	1045	1420	916.3	142.0	6.45

NORTH EASTERN ZONE

17. BURALIKSON

The crop was planted on 6th March, 2017 and harvested on 10th March, 2018. The experimental soil was clay loam in texture, medium in organic carbon (0.68 %) and low in available P (19.4 kg P2O5/ ha) and medium in available K (251 Kg K2O/ ha) with pH 5.14. The data on Effect on irrigation on combination of planting methods and mulch practice" is presented on table **AS 70.17.1**. Data revealed that no significant difference was observed among the irrigation schedule on yield and quality of sugarcane. However, the highest cane yield was recorded by paired row trench planting (30:120 cm row spacing) with organic

mulching @ 6 t/ha (88.92t/ha) which is statistically at par with paired row trench planting (30:120 cm row spacing without mulch (86.70t/ha) but superior over other two planting methods. Moreover, no significant differences were recorded in case of quality of sugarcane.

Table AS 70.17.1: Effect of treatments on sugarcane at Buraliksaon

Treatment	Germination (%)	Tillers 120DAP	Cane length (m)	Cane girth (cm)	NMC ('000/ha)	Yield (t/ha)
Planting method						
P1	64.83	105.47	2.45	2.52	86.82	84.83
P2	62.79	101.05	2.41	2.45	83.21	81.37
P3	65.94	109.50	2.50	2.57	92.42	88.92
P4	67.83	106.46	2.48	2.50	88.49	86.70
CD(0.05)	2.96	3.94	0.04	0.07	3.20	2.45
Irrigation Schedule (IW/CPE ratio)						
I1	65.05	105.97	2.45	2.50	87.48	85.00
I2	65.62	106.07	2.44	2.51	87.45	84.83
I3	67.37	108.4	2.47	2.52	88.28	85.70
CD(0.05)	NS	NS	NS	NS	NS	NS

PROJECT NO.: AS 71

PROJECT TITLE: Carbon sequestration assessment in sugarcane based cropping system

Objective : To improve the total soil organic carbon build-up and sustain crop yields

Year of start : 2016 – 2017

Locations : All centers

Duration : One cycle of 3 years crop rotation

Treatments (Cropping system) : **North West and North Central Zones**

T_1 : Rice - Wheat – Rice – Wheat (residue retention without *Trichoderma*)

T_2 : Rice - Wheat – Rice – Wheat (residue retention with *Trichoderma*)

T_3 : Sugarcane – Ratoon (trash mulching without *Trichoderma*) - Wheat

T_4 : Sugarcane – Ratoon (trash removal without *Trichoderma*) - Wheat

T_5 : Sugarcane – Ratoon (trash mulching with *Trichoderma*) - Wheat

T_6 : Sugarcane – Ratoon - Wheat (trash incorporation through rotavator and *Trichoderma* incorporation before sowing of wheat)

T_7 : Sugarcane – Ratoon- Wheat (Zero tilled) without *Trichoderma*

T_8 : Sugarcane – Ratoon-Wheat (Zero tilled) with *Trichoderma*

Peninsular and East Coast Zones

T_1 : Soybean-wheat/maize/*toria*

T_2 : Sugarcane-Ratoon-cowpea/urd bean/moong bean

T_3-T_8 : Will be same as in North West and North Central Zones except wheat to be substituted by maize/*toria*/cowpea

Treatments : 8

Design : RBD

Replication : 3

Plot size : 6 rows of 6 meter length

Observations to be recorded :

Soil parameters

1. Initial and final soil fertility status (0-30, 30-60 and 60-90 cm soil depths) as well as physical parameters (bulk density, infiltration rate, WHC)
2. Total soil organic carbon before start of the experiment and after harvest of every crop

Rice – Wheat/ Maize/*Toria*:

1. Germination count

2. No. of tillers at 30, 60 & 90 DAS

3. Days to maturity
4. Straw and grain yield

Sugarcane:

1. Germination at 35 & 45 DAP
2. Periodic tiller population 90, 120, 180 DAP/DAR
3. Plant height at 90, 120, 180 DAP/DAR
4. Growth parameters i.e., NMC, cane length, diameter and cane wt.
5. Juice quality (Brix, pol % and purity %)
6. Cane and sugar yields (t/ha)

Note:

All other trash management treatments will be same for both the regions.

Trichodermaviride solid based culture (10^7 cfu/g)

The experiment will be conducted in permanent field layout.

Planting season: February – March

SUMMARY OF RESULTS OBTAINED DURING LAST YEAR (2016-17)

The trial was initiated during 2016-17 with allocation to all the centres. In all 15 centres conducted the trial in accordance with the approved technical programme. Being the initial year sugarcane plant crop was raised for adoption of treatment in the subsequent ratoon crop and effect of different treatments on cane productivity and soil health would be available during the next crop season. However, effect of residue incorporation in the rice-wheat crop rotation in north western and north central zones and soybean-maize rotation in other zones have been found to be positive on productivity of succeeding crops and soil health.

CURRENT YEAR (2017-18) REPORT

NORTH WEST ZONE

1. FARIDKOT

The experiment was started with planting of sugarcane during 2016 and the effect of various treatments has been applied and their effect studied in ratoon crops. The yield of rice and wheat was at par in both the treatments. Sugarcane yield from plant crop was also at par in all treatments.Sugarcane (variety CoJ 88) was planted on 22.03.2016 and harvested on 16.03.2017. The initial soil status stood as pH: 8.6, EC: 0.30 dsm-1, OC= 0.30%, P =13.0 kg/ha, K= 750 kg/ha. Sugarcane plant crop yilded 94.6 t/ha whereas rice and wheat yield was recorded to be 7.8 and 5.6 & 7.9 and 5.7 t/ha in treatments T1 and T2, Respectively.

During 2017-18 Wheat yield was significantly higher when sown after rice. The wheat following sugarcane was significantly better in T7 and T8 than T3 and T4. Sugarcane yield was better in T3, and T7 where trash was incorporated and was significantly higher than T4, T6 and T8 where trash was removed. Cane equivalent yield was also higher in T3, T5 and T7 than other treatments.

Table AS 71.1.1: Sowing and planitng dated of various crops in the systemat Faridkot

Year	Crop	Variety	Date of Planting, Ratooning	Date of Harvesting
2016-17	Sugarcane	CoJ 88	22.03.2016	16.03.2017
	Rice	PR 124	24.06.2016	19.10.2016
	Wheat	PBW 725	11.11.2016	22.04.2017
2017-18	Sugarcane (Ratoon)	CoJ 88	17.03.2017	20.12.2017
	Rice	PR 124	27.06.2017	18.10.2017
	Wheat	Unnat PBW 343	24.11.2017	27.04.2018
	Wheat after sugarcane	PBW 658	24.12.2017	27.04.2018

Table AS 71.1.2: Yield performance of variosu crops in the system at Faridkot

Treatment	Yield (t/ha)			
	Rice	Wheat	Sugarcane	Cane Eq. Yield
T1	7.7	5.9	-	70.4
T2	7.9	6.6	-	75.1
T3	-	3.4	91.8	109.6
T4	-	3.4	77.4	95.2

T5	-	3.8	88.8	108.7
T6	-	4.0	74.1	95.1
T7	-	4.2	93.7	115.7
T8	-	4.4	74.8	97.9
CD (5%)	-	0.7	13.5	

Crop price used for calculating cane eqyuivalent yield: Rice (Rs/q) 1590; Wheat(Rs/q) 1625; Sugarcane(Rs/q) 310.

2. KOTA

A field experiment was planted on 8th March, 2016 to improve the total soil organic carbon build-up and sustain crop yields. Sugarcane variety CoPb 09181 was planted at 75 cm row distance. The highest sugarcane – equivalent yield (62.40 t/ha) was recorded with the Soybean-wheat -moongbean (residue retention with Trichoderma) treatment than T1. The soybean – equivalent yield (52.89 q/ha), mean crop grain yield in kharif, rabi and summer season were also recorded in the same cropping system. Higher germination percent in kharif and rabi and tillers/plant in rabi were observed in Soybean-wheat -moongbean (residue retention without Trichoderma), while number of branches /plant in kharif and summer was recorded in soybean-wheat -moongbean (residue retention with Trichoderma) treatment.

During the year 2017-18 ratoon was initiated on 10th March, 2017. Among the cropping systems, highest sugarcane ratoon shoot count at 35 and 45 DARI, tiller population at 90 DAR and 180 DAR (90930 and171130), plant height at 120, 180 and at harvest (140.8,179.8 and 251.8 cm), cane diameter (3.47 cm), NMC (145100), cane weight (836.87 g), cane yield (93.80 t/ha) was recorded with the Sugarcane – Ratoon - Moong bean (trash incorporation through rotavator and Trichoderma incorporation before sowing of Moong bean) treatment . Quality parameters were also recorded highest in the same cropping system (Table AS 72.2.2).

Significant increase in soil organic carbon (0.527 %) was recorded under Soybean-Wheat -Moongbean (residue retention with Trichoderma) treatment over T3 and T4 treatment and at par with rest. The highest infiltration rate (4.64 mm/hr) was recorded under Soybean-Wheat -Moongbean (residue retention with Trichoderma) treatment over all the treatment except T1. Soil pH did not influenced by different cropping system, whereas WHC (47.27 %) of soil influenced significantly by Soybean-Wheat -Moongbean (residue retention with Trichoderma) treatment over T3 and T4 and on par with rest of treatments of cropping system during the second (Ratoon) year. Bulk density (1.44 mg/m2) of soil reduced significantly with application of T2 treatment over T1, T3 , T4 and T6 treatments and at par with rest. Significantly higher available N (339.00 kg/ha) in soil was obtained with T2 treatment over T3 and T4 treatments and at par with rest of treatments. Whereas higher available P (25.20kg/ha) was noted with T2 which was significantly superior over all the treatments except T1 treatments. Available K (328.77 kg/ha) in soil also increased significantly with T2 over T3 and T4 treatments and at par with rest of treatments.

Summary: Based on the two year study of soil properties, it can be concluded that soybean-wheat -moongbean (residue retention with Trichoderma) treatment was found better with respect to significantly enhancement in OC, infiltration rate, bulk density, WHC and Nutrient status of soil over T3 and T4 treatments. Whereas in case of ratoon T6 recorded significantly higher germination, tillers, plant height, cane diameter, cane weight, cane yield as well as juice quality parameters over rest of treatments.

Table AS 71.2.1: Performance of crops in rotation at Kota

Cropping system	Mean crop grain yield (q/ha)			Mean crop straw yield (q/ha)			Soybean-equivalent (q/ha)
	Kharif	Rabi	Summer	Kharif	Rabi	Summer	
T_1 **:** Soybean - Wheat – Mungbean (Residue retention without Trichoderma)	17.2	40.1	8.8	29.5	63.0	19.8	51.7
T_2**:**Soybean-Wheat – Mungbean (Residue retention with Trichoderma)	17.4	40.8	9.2	30.4	62.2	20.5	52.8

Table AS 71.2.2: Yield performance of different crops under various systems at Kota

Treatment	**Cane yield (t/ha)**	**Sucrose (%)**	**CCS (%)**	**CCS yield (t/ha)**
T_1**:** Soybean-Wheat - Soybean –Wheat (residue retention without *Trichoderma*)/ sugarcane equivalent yield in system	62.50*	**-**	**-**	**-**
T_2 **:** Soybean-Wheat - Soybean -Wheat (residue retention with *Trichoderma*) /sugarcane equivalent yield in system	62.70*	**-**	**-**	**-**
T_3**:**Sugarcane – Ratoon (trash mulching without *Trichoderma*) – Moong bean	91.67	17.98	12.39	11.36
T_4 **:** Sugarcane – Ratoon (trash removal without *Trichoderma*) - Moong bean	90.83	16.97	11.64	10.58
T_5 **:** Sugarcane – Ratoon (trash mulching with *Trichoderma*) - Moong bean	93.00	18.28	12.61	11.73
T_6 **:** Sugarcane – Ratoon - Moong bean (trash incorporation through rotavator and *Trichoderma* incorporation before sowing of Moong bean)	93.80	18.35	12.66	11.87
T_7 **:** Sugarcane – Ratoon- Moong bean (Zero tilled) without *Trichoderma*	92.07	18.10	12.48	11.49
T_8 **:**Sugarcane – Ratoon- Moong bean (Zero tilled) with *Trichoderma*	93.03	18.08	12.46	11.58
SEm ±	1.51	0.30	0.22	0.25
CD (P=0.05)	4.57	0.92	0.68	0.76

3. KAPURTHALA

The experiment was started with planting of sugarcane during 2016 and the effect of various treatments has been applied and their effect studied in ratoon crops. Initial soil status was recorded as pH 8.2, EC 0.27 dSm^{-1}, OC 0.25%, P 13.5 kg/ha, K 135 kg/ha. The yield of

rice and wheat was at par in both the treatments. Sugarcane yield from plant crop was also at par in all treatments.

The data presented in (**Table AS 71.3.1**) depicted that yield and quality parameters like cane length, cane diameter, cane length, POL%, CCS% and CCS were not significantly influenced by different treatments. However, parameters like number of shoots, number of millable cane, cane yield and cane equivalent yield showed significant response towards different treatments. Highest number of shoots were recorded in treatment T5 (sugarcane-Ratoon (trash mulching with Trichoderma)– Wheat) those were at par with number of shoots in treatment T8 (Sugarcane – Ratoon-Wheat (Zero tilled) with Trichoderma) and in treatment T3 (Sugarcane–Ratoon (trash mulching without Trichoderma) – Wheat) but were significantly higher over the shoots produced in rest of the treatments. Number of shoots produced in treatments T4 [Sugarcane–Ratoon (trash removal without Trichoderma) – Wheat], T6 [Sugarcane – Ratoon - Wheat (trash incorporation through rotavator and Trichoderma incorporation before sowing of wheat)] and T7 [Sugarcane – Ratoon-Wheat (Zero tilled) without Trichoderma] were statistically similar among themselves. Whereas highest number of millable canes were recorded in T3 those were at par with number of shoots produced in T5, T6 and T8 but significantly higher than shoots produced in all other treatments. Cane equivalent yield was significantly higher in T3 that was at par with cane yield in treatments T5, T6 and T7 but it was significantly higher than the yield under remaining treatments.

Table AS 71.3.1: Performance of different crops under various systems at Kapurthala

Treatment	No. of Shoots 000/ha	NMC 000/ha	Cane length (cm)	Cane diameter (cm)	Single cane wt. (g)	Cane yield (t/ha)	Cane equivalent yield t/ha (R-W system)	Wheat yield (t/ha)
T1	Rice: 7.2 t/ha Wheat: 6.0 t/ha						70.1	4.0
T2	Rice: 6.4 t/ha Wheat: 6.6 t/ha						69.8	3.7
T3	121.2	116.8	271.0	2.34	785.6	91.7	91.7	2.7
T4	110.5	104.3	251.5	2.25	773.0	80.7	80.7	2.8
T5	129.2	116.5	265.5	2.34	742.7	89.8	89.8	2.9
T6	115.6	113.3	260.0	2.28	697.0	91.1	91.1	2.9
T7	114.2	108.2	265.1	2.31	885.3	90.5	90.5	2.9
T8	125.3	109.6	250.3	2.32	690.3	81.5	81.5	2.7
CD (5%)	9.2	7.4	NS	NS	NS	7.5	6.8	0.4

4. LUCKNOW

Sugarcane genotype CoPk 05191 was planted in the experiment by 18th Feb 2016. The experimental soil was silt loam with pH 7.42 and organic carbon 0.42%, low in

available nitrogen (270 kg/ha), medium in available phosphorus (36 kg/ha) and medium in available potassium (310 kg/ha). The water holding capacity (%) ,bulk density , infiltration rate, SOC (%), EC and available nutrients of N P K , were recorded at various soil depths (0-30, 30-60 and 60-90 cm). During the first year (2016-17) rice-wheat cropping system recorded grain yield of rice 4.22 t and wheat 4.57 t/ha. However sugarcane plant crop yielded to the tune of 107 to 119 t/ha in different sugarcane based cropping system (T3-T8). Residue retention with Trichoderma in wheat improved the wheat yield by 7%.

During 2017-18 soil analysis of experimental field revealed that rice-wheat cropping system recorded mean organic carbon 0.36% as compared to sugarcane based cropping system (0.43%) in 0-30 cm depth of soil. It subsequently decreased in 30-60 cm depth and recorded 0.24 and 0.29 % SOC, respectively. Mean available nutrient status in soil decreased as compared to initial status of soil. During second year of experimentation, rice-wheat cropping system recorded grain yield of rice and wheat in tune of 41.6 and 35.9 q/ha respectively (Table AS 71.4.1). Ratoon crop yielded 109.8 t/ha in sugarcane based cropping system.Higher wheat yield (46.9 q/ha) was recorded in sugarcane based cropping system just after harvest of ratoon crop as compared to 35.9 q/ha in rice-wheat system. Residue retention with Trichoderma in wheat improved the wheat yield by 11.2% in rice-wheat based cropping system. However, trash mulching with Trichoderma in ratoon crop improved the cane yield by 9.5% as compared to mulching without Trichoderma. .

Table AS 71.4.1: performance of different crops under various systems at Lucknow

Cropping System	2016-17		2017-18	
	Rice (q/ha)	Wheat (q/ha)	Rice (q/ha)	Wheat (q/ha)
T1: Rice – Wheat – Rice – Wheat (residue retention without *Trichoderma*)	41.7	44.2	42.4	34.01
T2: Rice – Wheat – Rice – Wheat (residue retention with *Trichoderma*)	42.8	47.3	40.8	37.8
Mean	42.3	45.8	41.6	35.9
Sugarcane-Wheat				
	Plant yield (t/ha)		Ratoon yield (t/ha)	Wheat yield (q/ha)
T3: Sugarcane – Ratoon (Trash mulching without *Trichoderma*) – Wheat	110		110	48.7
T4: Sugarcane – Ratoon (Trash removal without *Trichoderma*) – Wheat	116		107.5	45.8
T5: Sugarcane – Ratoon (Trash mulching with *Trichoderma*) – Wheat	107		120.5	49.8
T6 : Sugarcane – Ratoon – Wheat (Trash incorporation through rotavator and *Trichoderma* incorporation before sowing of wheat)	119		103.3	46.7
T7:Sugarcane – Ratoon – Wheat (Zero tilled) without *Trichoderma*	107		109.1	43.8
T8: Sugarcane – Ratoon – Wheat (Zero tilled) with t*richoderma*	113		108.7	46.5
Mean	112		109.8	46.9

5. PANTNAGAR

Sugarcane (Co Pant 5224) was planted on 22.2.2016 by flatbed method at 75 cm apart row to row. Soil of the experimental plot was silty clay loam, neutral in pH (7.2), rich in organic carbon (1.05%), low in available N, and medium in Potassium and high in available Phosphorus. Sugarcane crop produced almost similar shoot population, NMC and cane yield in different treatments which were found non-significant to each other. Sucrose% and CCS yield were also found non-significant.Rice crop variety HKR-47 was raised matured in 104 days after planting and produced 47.0 q/ha straw and 54.8 q/ha grain yield.Wheat variety HD 2967 produced 48.6 q/ha grain yield and 46.2 q/ha straw, matured in 145 days.

After harvestof sugarcane planted crop, ratoon was initiated on 16.03.2017 and was harvested on 17.11.2017.Wheat variety HD 2967 was sown on 15.11.2017 in rice harvested field and on 01.12.2017 after ratoon harvesting. Rice variety HKR – 47 was transplanted on 05.07.2017 and was harvested on 23.10.2017.Cane yield in ratoon was recorded highest in the treatment T5 – trash mulching with Trichoderma which was significantly higher over rest of the treatments except the treatments T3 – trash mulch without Trichoderma. Higher ratoon cane yield in these treatments was the results of higher individual cane weight, highest/length, girth of the cane of higher NMC. Sucrose % was also recorded higher in T5, T6 and T8 which were significantly higher over rest of the treatments. However, sucrose % was not much influenced by either trash incorporation or removal with and without Trichoderma. CCS yield was higher in T5 – ratoon + trash + Trichoderma significantly over no trash and no Trichoderma. There was no significant difference in between treatment T7 andT8. Rice yield was higher in residue incorporation with Trichoderma over no Trichoderma. Highest grain yield of wheat variety HD 2967 was recorded in the treatment T5 – sugarcane – ratoon (trash mulch + Trichoderma) – wheat which was significantly higher over rest of the treatments.

There was no significant difference in carbon % accumulation after wheat harvest. However, some increase in organic carbon was recorded in the treatment T5 and T6 in which trash mulch was retain with Trichoderma in ratoon (T5) and trash was added with incorporation by rotavator(T6).

Summary: Highest cane yield and wheat yield in ratoon recorded in T5 – Trash mulching with *Trichoderma*. Sucrose % in ratoon at harvest was not influenced by trash mulching or removal. There was no significant difference in organic carbon build up in any of the treatment however highest organic carbon % was recorded in T5 – sugarcane-ratoon (trash mulching with *Trichoderma*) – wheat.

Table AS 71.5.1: Performance of different crops under various systems at Pantnagar

Treatments	Grain yield (q/ha)	
	Rice	**Wheat**
T_1- Rice-wheat-rice-wheat (residue retention without *Trichoderma*)	50.3	46.8
T_2-Rice-wheat-rice-wheat (residue retention with *Trichoderma*)	53.4	47.0
T_3-Sugarcane-ratoon (trash mulching without *Trichoderma*)-wheat	0	47.7
T_4-Sugarcane-ratoon (trash removal without *Trichoderma*)-wheat	0	46.0
T_5-Sugarcane-ratoon (trash mulching with *Trichoderma*)-wheat	0	49.2
T_6-Sugarcane-ratoon-wheat (trash incorporation through rotavator and *Trichoderma* incorporation before sowing of wheat)	0	47.6
T_7-Sugarcane-ratoon-wheat (zero tilled) without *Trichoderma*	0	45.4
T_8-Sugarcane-ratoon-wheat (zero tilled) with *Trichoderma*	0	47.5
SEm±	-	0.40
CD at 5 %	-	1.22

Table AS 71.5.2: Performance of sugarcane under different systems at Pantnagar

Treatment	Clumps (000/ ha)	NMC (000/ ha)	Cane yield (t/ha)	Per cane wt. (g)	Cane ht. (cm.)	Girth	Pol (%)	CCS (t/ ha)
T_1- Rice-wheat-rice-wheat (residue retention without *Trichoderma*)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
T_2-Rice-wheat-rice-wheat (residue retention with *Trichoderma*)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
T_3-Sugarcane-ratoon (trash mulching without *Trichoderma*) -wheat	22.9	74.8	60.0	813	370	8.6	16.9	6.4
T_4-Sugarcane-ratoon (trash removal without *Trichoderma*)-wheat	25.2	75.0	53.6	683	373	8.3	16.8	6.0
T_5-Sugarcane-ratoon (trash mulching with *Trichoderma*)-wheat	24.1	78.3	60.5	816	380	9.6	18.2	7.5
T_6-Sugarcane-ratoon-wheat (trash incorporation through rotavator and *Trichoderma* incorporation before sowing of wheat)	23.7	80.4	53.0	816	351	9.3	17.8	6.5
T_7-Sugarcane-ratoon-wheat (zero tilled) without *Trichoderma*	24.8	71.5	50.0	666	331	8.0	16.9	6.0
T_8-Sugarcane-ratoon-wheat (zero tilled) with *Trichoderma*	25.2	76.1	51.3	766	332	8.3	17.0	6.1
SEm±	0.7	1.3	0.9	34.2	11.1	0.4	0.1	0.1
CD at 5 %	2.3	4.1	2.7	104	33.8	1.4	0.4	0.4

6. UCHANI

During 2016-17grain yield of rice and sugarcane yield of plant crop was not affected due to different treatments, as no treatment was applied in rice and sugarcane plant crop. Numerically higher grain yield of wheat was recorded in T2 treatment (Rice-wheat rotation) where residue was retained with Trichoderma inoculation as compared to T1 treatment where residue was retained without Trichoderma. Physical properties of soil were adversely affected in treatment T1 and T2 after harvest of puddled transplanted rice. The bulk density increased from 1.64 (initial) to 1.72 g/cc after harvest of rice crop. The bulk density and WHC improved after rice residue retention in wheat crop through happy seeder machine in treatment T1 and T2.

Sugarcane variety CoH 167 (Mid maturing) was planted during spring seasons on March15, 2016 and was harvested on March 10, 2017 to take ratoon crop. Soil sampling was undertaken just after harvesting of plant crop of sugarcane. The treatments have been applied in ratoon crop as per technical programme. In rice –wheat cropping system treatments (T1 and T2), non-scented rice variety HKR 47 was transplanted on July 5, 2016 and fertilized with 150-60-60 NPK kg/ha. Rests of the inputs were applied in rice crop as per state recommendation. The rice crop was harvested on October 20, 2016. After harvesting of rice crop, the soil sampling was undertaken for measuring the required parameters in this experiment. Wheat variety HD 2967 was sown on November 5, 2016 by Happy Seeder in full residue load after harvesting of rice crop. The wheat was fertilized with 150-60-60 NPK kg/ha. Wheat crop was harvested on April 15, 2017 in first year of experimentation. Soil sampling was again done after harvesting of wheat crop in treatment T1 and T2. The ratoon crop was harvested on December 15, 2017. Second crop of wheat was harvested on April 20, 2018.

Paddy and wheat grain yield in T2 (Rice-Wheat- Rice-Wheat (residue retention with Trichoderma) treatment was comparatively higher as compared to T1 (Rice-Wheat-Rice-Wheat (residue retention without Trichoderma) treatment (Table 7). Highest wheat grain yield was recorded in rice-wheat cropping system (T1 and T2) treatments due to timely sowing of wheat in these treatments. Wheat yield levels were comparatively lower in wheat sown after ratoon harvest. Higher cane yield were recorded in the treatment ((T3, T5, T7) where trash mulching/Trichoderma was applied. Higher cane equivalent yield was recorded in Sugarcane plant- ratoon-wheat cropping system as compared to Rice- wheat cropping system. Highest cane equivalent yield of 115.4, 115.0 and 110.0 t/ha was recorded in treatment T7 (sugarcane (Spring)– Ratoon- Wheat (ZT) without Trichoderma, T5(S.cane (Spring) – Ratoon (trash mulch with Trichoderma) – Wheat) and T3 (sugarcane (Spring) – Ratoon (trash mulch without Trichoderma) – Wheat).

Summary: Higher cane equivalent yield was recorded in Sugarcane plant- ratoon-wheat cropping system as compared to Rice- wheat cropping system. Highest cane equivalent yield of 115.4, 115.0 and 110.0 t/ha was recorded in treatment T7 (sugarcane – Ratoon- Wheat (ZT) without Trichoderma, T5 (sugarcane – Ratoon (trash mulch with Trichoderma) – Wheat) and T3 (sugarcane – Ratoon (trash mulch without Trichoderma) – Wheat). Physical properties of soil were adversely affected in treatment T1 and T2 after harvest of puddled transplanted rice. The bulk density increased from 1.63 (initial) to 1.72 g/cc after harvest of rice crop. The bulk density and WHC improved after rice residue retention in wheat crop through happy seeder machine in treatment T1 and T2. Sugarcane proved superior in

maintaining soil physical properties in comparison to puddled transplanted rice- wheat rotation.

Table AS 71.6.1: Performance of different crops under various systems at Uchani

	Cropping system	Paddy grain yield (t/ha)	Wheat Grain yield (t/ha)	Cane yield (t/ha)	Cane equivalent yield (t/ha)
T1	Rice-Wheat-Rice-Wheat (residue retention without *Trichoderma*)	6.65	5.84	-	64.3
T2	Rice-Wheat- Rice-Wheat (residue retention with *Trichoderma*)	6.83	6.08	-	66.5
T3	S.cane (Spring) – Ratoon (trash mulch without *Trichoderma*) - Wheat	-	4.62	85.5	110.0
T4	S.cane (Spring) – Ratoon (trash removal without *Trichoderma*) - Wheat	-	4.65	79.5	104.2
T5	Sugarcane (Spring) – Ratoon (trash mulch with *Trichoderma*) - Wheat	-	4.81	89.4	115.0
T6	Sugarcane (Spring) – Ratoon - Wheat (trash incorporation through rotavator &*Tricho* incorporation before sowing of wheat)	-	5.10	77.8	104.9
T7	Sugarcane (Spring)– Ratoon-Wheat (ZT) without *Trichoderma*	-	5.32	87.1	115.4
T8	Sugarcane (Spring)– Ratoon-Wheat (ZT) with *Trichoderma*	-	5.41	77.5	106.2
	CD at 5%		0.63	5.6	

PENINSULAR ZONE

7. PADEGAON

During 2016-17 mean sugarcane yield was observed to the tune of 106.8 t/ha to 108.5 t/ha. The soybean yield recorded in treatment T1 was 15.6 q/ha and T2 14.80 q/ha while wheat yield recorded in T1 was 26.85 q/ha and T2 31.71 q/ha.

During 2017-18 soybean grain yield recorded in treatment T1 was 10.6 q/ha and T2 11.6 q/ha while wheat grain yield was recorded in T1 was 29.39 q/ha and T2 was 31.01 q/ha. Mean sugarcane ratoon yield was observed to be 72.9 t/ha to 100.8 t/ha.

Table AS 71.7.1: Performance of different crops under various systems at Padegaon

Treatment	I st (Planting) Year		II nd (Ratoon) year	
	Cane yield (t ha^{-1})	**CCS yield (t ha^{-1})**	**Cane yield (t ha^{-1})**	**CCS yield (t ha^{-1})**
T_1 : Soybean-Wheat- Soybean-Wheat (Residue retention without *Trichoderma*	**--**	--	-	-
T_2 : Soybean-Wheat- Soybean-Wheat (Residue retention with *Trichoderma*)	**--**	--	-	-
T_3 : Sugarcane-Ratoon (trash mulching without *Trichoderma*)-Green gram	107.1	13.4	91.3	12.7
T_4 : Sugarcane-Ratoon (trash removal without *Trichoderma*)-Green gram	106.8	12.3	72.9	9.9
T_5 : Sugarcane-Ratoon (trash mulching with *Trichoderma*)-Green gram	108.5	12.3	100.8	12.1
T_6 : Sugarcane-Ratoon- Green gram (trash incorporation through rotavator and*Trichoderma* incorporation before sowing of Green gram)	107.3	11.9	68.9	9.5
T_7 : Sugarcane-Ratoon-Green gram (Zero tilled) trash mulching without*Trichoderma*	107.2	12.6	78.0	9.9
T_8 : Sugarcane-Ratoon-Green gram (Zero tilled) trash mulching with*Trichoderma*	108.0	13.2	83.9	10.4

8. NAVSARI

For the first year (2016-17) plant cane yield (124.61 t/ha) was recorded. Rice grain and straw (85.89 and 148.18 q/ha) and maize grain and straw (54.37 and 388.62 q/ha) yield were recorded with treatment T1.

During 2017-18 ratoon was initiated on 6.11.2017. Tiller population were not significantly influenced due to different treatment at 90 DAP; while at 120 and 180 DAP significantly highest number of tillers were observed with the treatment T5 that remained at par with T3.Plant height at 90 DAP was significantly influenced due to different treatments. Significantly highest plant height was recorded with T5 over T2 and remained at par with T3 while at 120 and 180 DAP, significantly highest plant height was recorded with T5 over T2 and remained at par with T3, T4 and T6.

NMC (111430/ha) was recorded significantly higher with treatment T5 over T7 and remained at par with T3. Cane length and cane diameter at harvest was failed to show any significant effect due to different treatments. Single Cane weight was recorded significantly highest with treatment T5 and remained at par with T3, T6 and T7.Significantly highest Cane yield (121.17 t/ha) was noticed with treatment T5 over T7 and remained at par T3. CCS yield was not significantly influenced due to different treatments.

Rice grain and straw (15.3 and 28.0 t/ha) was counted in rice planted plot in kharif season and maize grain and straw (4.02 and 16.86 t/ha) yield were recorded with treatment T5 while green gram grain and straw yield (1050.60 and 2120.65 kg ha-1) recorded under that plot.

Table AS 71.8.1: Performance of sugarcane in various in cropping system at Navsari

Treatment	NMC at harvest (000 ha^{-1})	Cane length (cm) at harvest	Cane diameter (cm) at harvest	Single cane wt. at harvest (kg)	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})
T_1	-	-	-	-	-	-
T_2	92.65	273.76	2.54	1.55	100.72	14.58
T_3	98.41	279.68	2.65	1.63	113.11	16.03
T_4	95.64	261.30	2.39	1.56	104.51	14.83
T_5	111.43	281.49	2.69	1.84	121.17	17.55
T_6	95.81	259.37	2.37	1.61	104.91	15.62
T_7	83.42	263.25	2.46	1.65	94.33	13.19
T_8	96.27	274.10	2.48	1.50	103.72	14.40
SEM.±	4.73	13.12	0.10	0.08	4.99	0.86
C.D. at 5%	14.57	NS	NS	0.24	15.39	NS
C.V.%	8.51	8.40	7.07	8.23	8.16	9.81

9. MANDYA

In first year, sugarcane was raised in T2 to T7 treatment and soybean-maize was grown in T1 treatment. All the sugarcane treatments recorded on par yield and yield attributing parameters; and in soybean-maize treatment, soybean yield was 18.23 q/ha and maize yield was 88.0 q/ha.

In the second year sugarcane was ratooned in T2 to T7 treatment and soybean-maize was grown in T1 treatment. All the sugarcane treatments recorded on par yield and yield attributing parameters and in soybean-maize treatment soybean yield was 16.5 q/ha and maize yield was 85.0 q/ha (**Table AS 71.9.1**). Soil chemical parameters viz., soil pH, EC, OC, BD and soil available N, P2O5 and K2O content after the harvest of ratoon crop were not influenced significantly due to different cropping systems.

Table AS 71.9.1: Performance of sugarcane ratoon under various systems at Mandya

Treatment	Single cane weight (kg)	Cane length (m)	Cane girth (cm)	No. of internodes	Millable cane ('000/ha)	Cane yield (t/ha)	CCS (t/ha)
T_1	-	-	-	-	-	-	-
T_2	2.06	2.27	3.30	22.65	75.39	162.63	21.43
T_3	2.15	2.42	3.63	24.14	79.46	170.20	23.05
T_4	2.04	2.24	3.30	22.76	74.96	161.13	22.73
T_5	2.18	2.53	3.80	24.50	80.47	172.33	23.53
T_6	2.05	2.30	3.37	22.95	74.83	161.83	22.92
T_7	2.01	2.20	3.33	22.77	74.44	159.53	22.46
T_8	2.06	2.22	3.37	22.70	75.95	163.07	21.73
S.Em.±	**0.05**	**0.06**	**0.07**	**0.30**	**3.44**	**6.12**	**0.88**
CD@5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

10. THIRUVALLA

The plant crop has been taken up during 2016-17 and subsequently treatment schedule for the ratoon crop as specified in the technical programme has been undertaken during 2017-18.

There were no effect on sprouting and tiller count due to various treatments .The variation due to different treatments were significant for growth and yield parameters. Among them, T5 - Sugarcane-Ratoon (trash mulching with Trichoderma)-cowpea recorded the maximum cane length (260.68 cm), cane diameter (2.47 cm), single cane weight (1.70 kg) etc. and resulted in significantly higher cane and sugar yield(77.17 and 8.23 t/ha respectively) followed by T6 - Sugarcane-ratoon-cowpea(trash incorporation through rotavator and Trichoderma incorporation before sowing of cowpea) which recorded the values of 254.33 cm, 2.41 cm, 1.65 kg and 69.65 and 6.81 t/ha respectively for the said parameters.

There was considerable variation in the fertility status of the soil before and after the conduct of the trial where the nutrient status was improved after imposing the various treatments.

Table AS 71.10.1: Performance of sugarcane under various systems at Thiruvalla

Treatment	Tiller count (000/ha)		Cane length (cm)	Cane diameter (cm)	MCC ('000/ha)	Cane yield (t/ha)	Sugar yield (t/ha)	BC ratio
	120 DAP	150 DAP						
T_1Soybean wheat/maize/toria	-	-	-	-	-	-	-	-
T_2Sugarcane-ratoon-cowpea/urd bean/moong bean .	68.3	63.8	230.6	2.10	54.25	64.50	5.92	1.27
T_3Sugarcane-Ratoon(trash mulching without Trichoderma)-cowpea	77.2	72.2	236.1	2.25	56.34	65.84	6.22	1.28
T_4Sugarcane – Ratoon (trash removal without Trichoderma)-cowpea	73.0	68.7	236.5	2.20	53.57	60.49	6.48	1.26
T_5Sugarcane-Ratoon (trash mulching with Trichoderma)-cowpea	87.2	77.7	260.6	2.47	67.64	77.17	8.23	1.32
T_6 Sugarcane-Ratoon-Cowpea (trash incorporation through rotavator and Trichoderma incorporation before sowing of cowpea)	80.4	77.0	254.3	2.41	62.50	69.65	6.81	1.29

T_7Sugarcane-Ratoon-cowpea (zero tilled) without Trichoderma	70.2	65.2	228.1	2.35	59.05	60.28	5.40	1.25
T_8Sugarcane-Ratoon-cowpea (zero tilled) with Trichoderma	60.2	55.9	232.3	2.20	93.18	54.11	5.37	1.12
CD (0.05)	3.30	2.65	6.83	0.11	9.25	5.04	0.25	NS

EAST COAST ZONE

11. ANAKAPALLE

First year experimentation results indicated that there was no significant variations in yield and quality of sugarcane plant crop in T2 to T8 treatments. Soybean crop was sown during first week of June, 2016 and harvested during second week of September, 2016. After harvesting the soybean crop soil samples were collected depth wise. Due to the continuous rainfall sowing of maize crop after harvesting of soybean was delayed and maize crop was sown during third week of October, 2016. Soybean crop establishment was poor due to continuous rainfall (186.4 mm) in the month of June, 2016 and recorded grain yield of 520 kg/ha. Maize sown after soybean performed better and gave green cob yield of 20500/ha.

In sugarcane ratoon crop raised from first year plant crops significant differences were not observed in number of millable canes at harvest.Per cent juice sucrose values did not vary significantly among different sugarcane plots. Commercial cane sugar was calculated treatment wise and CCS% did not vary significantly.More or less similar Cane yield and Sugar Yield were recorded in all sugarcane plots (**Table AS 71.11.1**).

Summary: Studies on carbon sequestration assessment in sugarcane based cropping system indicated that there is no significant variation in yield and quality of sugarcane ratoon crop in T2 to T8 treatments.

Table AS 71.11.1: Performance of sugarcane ratoon under various systems at Anakapalle

Treatment	**NMC/ha**	**Cane yield (t/ha)**	**Juice sucrose (%)**	**CCS (%)**	**Sugar yield (t/ha)**
T2:Sugarcane-Ratoon-Greengram	65,365	78.73	18.02	13.42	10.57
T3: Sugarcane-Ratoon-(trash mulching without *Trichoderma)*-Maize	69,097	79.95	17.48	12.96	10.36
T4:Sugarcane-Ratoon-(trash removal without *Trichoderma)*-Maize	68,056	77.52	17.52	13.10	10.16
T5:Sugarcane-Ratoon-(trash mulching with *Trichoderma)*-Maize	69,010	80.47	17.88	13.29	10.69
T6:Sugarcane-Ratoon-Maize*(* trash incorporation through rotavator*&Trichoderma* incorporation before sowing of Maize)	67,448	77.34	18.10	13.61	10.53

T7:Sugarcane-Ratoon-Maize(Zero tilled) without *Trichoderma*	67,101	76.56	16.94	12.64	9.68
T8:Sugarcane-Ratoon-Maize (Zero tilled) with *Trichoderma*	66,927	77.34	17.95	13.58	10.50
C.D (0.05)	NS	NS	NS	NS	-
C.V	4.7	3.4	2.2	2.8	-

12. CUDDALORE

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, organic carbon content of 0.35 per cent, CEC of 29.84 c mol p (+)/kg, available nitrogen content of 240.33 kg/ha, available phosphorus content of 39.67 kg/ha and available potassium content of 123.7 kg/ha were found to be in the surface soil. This experiment was laid out on 24.02.2016. In cropping sequence the soybean crop grain yield (16.23 q/ha). The maize crop recorded the 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). Among the treatments non-significant difference was recorded with respect to cane yield and sugar yield. Even though, the highest cane yield (137.6 t/ha) and sugar yield (16.66 t/ha) was recorded.

During 2017-18 among the treatments on sugarcane ratoon non-significant result was recorded with respect to cane length. The treatment (T5) Sugarcane – Ratoon (trash mulching with Trichoderma) – Maize has significantly recorded higher number of millable cane (145600/ha), cane length (286.5 cm) cane diameter (2.14 cm) and individual cane weight (1.71 kg) of sugarcane(**Table AS 71.12.1**). The treatment (T5) Sugarcane – Ratoon (trash mulching with Trichoderma) – Maize has significantly recorded the highest cane yield (145.2 t/ha) and sugar yield (17.89 t/ha) and it was on par with Sugarcane – Ratoon – Maize (trash incorporation through rotovator and Trichoderma incorporation before planting of Maize) cropping sequence (142.2 t/ha and 17.16 t/ha respectively).

Table AS 71.12.1: Performance of sugarcane under various systems at Cuddalore

Treatment	**NMC ('000/ha)**	**Cane length (cm)**	**Cane diameter (cm)**	**Single cane weight (kg)**	**CCS (%)**	**Cane yield t/ha**	**Sugar yield t/ha**	**B:C ratio**
T_1	-	-	-	-	-	-	-	-
T_2	125.3	274.3	2.14	1.48	12.3	130.2	16.07	2.57
T_3	141.2	278.6	1.91	1.52	11.5	132.2	15.24	2.76
T_4	138.3	285.7	1.99	1.54	12.7	135.3	17.18	3.05
T_5	145.6	286.5	2.14	1.71	12.3	145.2	17.89	4.02
T_6	142.2	281.2	1.99	1.55	12.1	142.2	17.16	3.73
T_7	137.6	280.2	2.15	1.52	12.2	128.6	15.71	2.41
T_8	139.6	281.3	1.99	1.49	12.2	129.6	15.75	2.50
CD (p=0.05)	6.43	NS	0.09	0.07	0.57	6.25	0.76	-

13. NAYAGARH

Sugarcane (CoOr 10346) was planted during 2016-17. Initial soil organic carbon was calculated by taking observations of Organic carbon % and bulk density of different depths. In the first treatment cowpea (1.7 q/ha) and sesame (5.42 q/ha) were grown to compare with sugarcane based cropping system. The observations on growth parameters and yield and yield attributes were analyzed but there were no significant differences among the treatments.In the second year cowpea and sesame crop was grown along with ratoon crop to compare with sugarcane based cropping system. The observations on growth parameters and yield and yield attributes were analysed. The ratoon crop with trash mulching with Trichoderma produced highest number of net millable canes (90700/ha), cane (94.14 t/ha) and CCS yield (11.34 t/ha).

Table AS 71.13.1: Performance of sugarcane under various systems at Nayagarh

Treatment	Germination % at 45 DAR	No of tillers (000/ha) 180 DAR	NMC (000/ha)	Cane yield (t/ha)	Juice Brix %	CCS %	CCS yield (t/ha)
T_2	52.05	82.01	82.793	85.29	19.367	11.617	9.904
T_3	54.33	84.80	85.180	88.52	20.050	11.773	10.416
T_4	51.42	81.72	82.960	86.52	19.450	11.540	9.982
T_5	58.71	89.57	90.700	94.14	20.220	12.047	11.346
T_6	53.37	83.80	84.217	87.05	18.820	11.243	9.776
T_7	53.86	82.65	82.947	85.90	19.657	11.413	9.811
T_8	54.96	80.47	81.783	84.87	19.440	11.577	9.826
Sem±	1.11	1.61	1.528	1.723	0.430	0.259	0.283
CD at 5 %	3.41	4.96	4.707	5.30	NS	NS	0.871

NORTH CENTRAL ZONE

14. PUSA

During 2016-17 data on growth, yield attributes, yield and organic carbon content on post-harvest soil and quality of sugarcane as affected by different treatments have been recorded. Data revealed that comparatively higher grain (3.98 and 4.22 t/ha) and straw (5.17 and 5.74 t/ha) of rice and wheat, respectively was obtained with rice- wheat-rice- wheat (residue retention with Trichoderma) cropping system (T2). However, sugarcane (88.5 t/ha) and sugar (10.73 t/ha) yield was obtained in other treatments.

During 2017-18 data on growth, yield attributes, ratoon yield and quality of sugarcane and yield of rice, wheat system and organic carbon content on post-harvest soil indicated that none of treatments except straws yield of wheat could establish significant effect in improving the growth, yield, quality and organic carbon content. However, comparatively higher ratoon cane yield (82.0 t/ha) was obtained with sugarcane-ratoon-wheat (trash

incorporation through rotavator and Trichoderma incorporation before sowing of wheat) (T6). Comparatively higher grain (3.73 and 3.91 t/ha) and straw yield (4.80 and 5.40 t/ha) of rice and wheat, respectively was obtained with rice-wheat-rice-wheat (residue retention with Trichoderma cropping system (T2).

Table AS 71.14.1: Performance of different crops under various systems at Pusa

Treatment	Tiller count ($\times 10^3$/ ha) at 120 DAP	Plant height (cm) at 240 DAP	Cane length (cm) at harvest	Cane dia. (cm)	NMC ($\times 10^3$ /ha)	Single cane weight (g)	Cane yield (t/ha)	Rice		Wheat	
								Grain yield (t/ha)	Straw yield (t/ha)	Grain yield (t/ha)	Straw yield (t/ha)
Cropping system											
T_1Rice-Wheat- Rice-Wheat (residue retention without *Trichoderma*)	-	-	-	-	-	-	-	3.62	4.70	3.71	5.23
T_2Rice-Wheat- Rice-Wheat (residue retention with *Trichoderma*)	-	-	-	-	-	-	-	3.73	4.80	3.91	5.40
T_3Sugarcane-Ratoon- (trash mulching without *Trichoderma*) -Wheat	231.4	275	252	2.05	144.6	524	75.3	-	-	3.17	4.02
T_4Sugarcane-Ratoon- (trash removal without *Trichoderma*) -Wheat	243.7	273	248	2.03	147.7	509	75.2	-	-	3.23	4.10
T_5Sugarcane-Ratoon- (trash mulching with *Trichoderma*) -Wheat	228.3	271	246	2.06	142.7	521	74.0	-	-	3.09	3.98
T_6Sugarcane-Ratoon- Wheat (trash incorporation through rotavator and *Trichoderma incorporation before sowing of wheat*)	260.4	279	256	1.95	157.8	531	82.0	-	-	3.00	3.88
T_7Sugarcane – Ratoon- Wheat (Zero tilled) without	256.4	278	254	2.02	155.4	524	79.3	-	-	2.96	3.82

Trichoderma											
T_8Sugarcane – Ratoon- Wheat (Zero tilled) with *Trichoderma*	247.8	276	253	2.00	150.2	522	76.5	-	-	3.46	4.39
SEm (±)	18.79	21.12	21.29	0.144	9.73	35.30	4.92	-	-	0.177	0.219
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	-	-	NS	0.66
CV (%)	13.3	13.3	14.7	12..4	11.3	11.7	11.1	-	-	9.2	8.8

PROJECT NO.: AS 72

PROJECT TITLE: Agronomic performance of elite sugarcane genotypes

Objective : To assess the performance of promising sugarcane genotypes of Advanced Varietal Trial (AVT)

Year of start : 2016-2017

Duration : One year

Locations : All centres where post of Agronomist has been provided as well as any voluntary center.

Planting time : North West, North Central & North East Zones: February-March
Peninsular & East Coast Zones: Ist fortnight of January

Treatments :

1. **Genotypes** : Please see varieties and checks of the Centre's zone (listed below)

2. **Agronomy** : **Spacing :** Wider spacing for all the entries
   1. 90 cm and120 cm for North West, North Central, North East and East Coast Zones.
   2. 120 cm and 150 cm for the Peninsular Zone.

   Fertilizer levels:
   125% of the recommended dose of NPK for the zone

Design : RBD

Replication : 2 or 3

Plot size : North West, North Central, North East and East Coast Zones: 5 rows of 6 m length.
Peninsular Zone: 4 rows of 6 m length.

Note: 1. Seed material of the test varieties may please be obtained from concerned breeder of the center.

2. Separate trials to be laid out for early and mid-late maturity groups along with zonal checks.

Observations to be recorded :

i) Initial soil fertility status for available NPK, soil texture, physico-chemical properties of the soil.

ii) Data on germination, no. of millable canes, cane yield, Pol (%), CCS (t/ha).

List of varieties (zone-wise) for the Experiment AS 72 during 2017-18

I. North West Zone (AVT II Plant)

Early maturing varieties (4):	Co 12026, Co 12027, CoLk 12203 and CoPant 12221
Zonal Check (2):	CoJ 64 and Co 0238
Midlate maturing varieties (6):	Co 12029, CoH 12263, CoLk 12205, CoPant 12226, CoPb 12211 and CoS 12232
Zonal Check (3):	CoS 767, CoS 8436 and CoPant 97222

II. North Central & North East Zones (AVT II Plant)

Early maturing varieties (3):	CoLk 12207, CoP 12436 and CoSe 12451
Zonal Check (2):	BO 130 and CoSe 95422
Midlate maturing varieties (4):	CoLk 09204, CoLk 12209, CoP 12438 and CoSe 12453
Zonal Check (2):	BO 91, CoP 9301

III. Peninsular Zone (AVT II Plant)

Early maturing varieties (5):	Co 11001, Co 11004, CoM 11081, CoM 11082 and CoM 11084
Zonal Check (3):	Co 85004, Co 94008 and CoC 671
Midlate maturing varieties (6):	Co 11005, Co 11007, Co 11012, Co 11019, CoM 11085 and CoM 11086
Zonal Check (2):	Co 86032 and Co 99004

IV. East Coast Zone (AVT II Plant)

Early maturing varieties (5):	CoA 13322, CoA 13323, CoC 13336, CoC 13337 and CoV 13356
Zonal Check (2):	CoC 01061 and CoA 92081
Midlate maturing varieties (4) :	CoA 11326, CoA 12324, CoC 13339 and CoOr 13346
Zonal Check (2):	CoV 92102 and Co 86249

Note: Varieties other than listed above should not be included or substituted.

SUMMARY OF RESULTS OBTAINED DURING LAST YEAR (2016-17)

The trial was initiated during 2016-17 with allocation to all the centres. In all 21 centres conducted the trial in accordance with the approved technical programme. Centre wise high lights of the findings are enumerated below.

NORTH WEST ZONE

1. FARIDKOT

The highest cane yield in early group was obtained for CoH 11262 (83.6 t/ha) which was at par with other genotypes except CoLk 11201 and CoLk 11202. Same was the case in sugar yield. CoH 11262 was found promising in cane and sugar yield. Among mid-late test entries the highest cane yield was of CoPb 11214 (98.3 t/ha) which was at par with CoLk 11206 (91.7 t/ha). Sugar yield was higher in CoLk 11206 but was at par with CoPb 11214.

2. KOTA

Among early genotypes, CoH 11262 recorded significantly higher germination (48.20 %), tiller count (139000/ha), number of millable cane (86800 thousand/ha) and cane yield (85.63 t/ha) over CoJ 64 and Co 0238 and at par with CoLK 11201, CoL11202 and CoLK 11203. Similarly CoH 11262 recorded significantly higher CCS yield (11.13 t/ha) over CoLK 11201, CoLK 11202 and CoJ 64 and on par with rest of the genotypes. Among mid-late entries cane yield (88.15 t/ha) was recorded significantly higher in genotype CoLK 11206 over CoPb 11214, CoS 11232 and CoS 767 and at par with rest of genotypes. Similarly CoLK 11206 recorded significantly the highest CCS yield (11.41 t/ha) over CoLK 11204, CoS 11232 and CoS 767 and at par with rest of genotypes.

3. KAPURTHALA

The highest cane yield among early entries was of CoLk 11203 (82.9t/ha) & CoLk 11202 (81.9 t/ha) that was significantly higher over other genotypes. CoLk 11202 & CoLk 11203 were found promising in cane and sugar yield. Among mid late genotypes the highest cane yield was of CoS 11232 (85.2 t/ha) which was at par with CoPb 11214 & CoLk 11206 and significantly superior to all other genotypes. Sugar yield was highest in CoPb 11214 which was at par with CoS 11232 & CoLk 11206.

4. LUCKNOW

In the early genotypes CoLk 11203 was superior over CoLk 11201 and CoLk 11202 in respect to all the parameters. The performance of genotype CoH 11262 was significantly inferior over rest of the genotypes and gave lowest cane yield (18.84 t/ha). Highest brix, sucrose and purity % measured at 10-month stage was recorded with Co 0238, which was at par with CoLk 11203. While genotype CoLk 11201 showed the lowest value of all these parameters at the same growth stage. Among mid-late entries with the yield level of 80.76 t/ ha, the genotype CoLK 11206 proved to be the highest yielder but was at par with genotypes CoPb 11214 and CoLk 11204. The genotype CoLk 11206 gave highest sugar yield at both the stages (viz. 10 and 12 months stage) but was at par with genotypes Co Pb 11214 and CoLk11204.

5. PANTNAGAR

Among early entries CoH 11262 performed better with regard to cane yield, NMC, germination %, individual cane weight, sucrose % and commercial cane yield. Sucrose % was on par to Co Pant 3220. Mid-late entries were not evaluated.

6. SHAHJAHANPUR

In early genotypes CoLk 11202 and mid–late genotype CoLk 11206 produced significantly higher cane yield than standards and other entries with cane yield of 105.50 t/ha and 97.60 t/ha, respectively. Row spacing of 90 cm was found superior to 120 cm spacing in cane yield under both early and mid – late genotypes with cane yield of 99.30/ha and 91.52 t/ha, respectively. CCS percent was not affected significantly due to various genotypes and spacing treatments.

7. UCHANI

In early group, genotypes CoH 11262, CoLk 11202 and Co 0238 being at par recorded significantly highest cane weight (986, 952, 978 g), cane yield (101.2, 103.1, 107.5 t/ha) and sugar yield (12.63, 12.85, 13.59 t/ha) as compared to CoLk 11201, CoLk 11203 and CoJ 64. In mid late group, entries CoH 11263 (102.9 t/ha), CoLk 11206 (100.3 t/ha) and CoPb 11214 (97.1 t/ha) being at par produced significantly higher cane yield as compared to checks and rest of the varieties. Varieties did not differ significantly for CCS % at harvest. Varieties CoH 11263 (12.99 t/ha) and CoLk 11206 (12.35 t/ha) being at par produced significantly highest sugar yield among all the varieties.

PENINSULAR ZONE

8. PADEGAON

The genotype Co 10006 was found significantly superior for cane and CCS yields than the other genotypes. Genotype Co 10027 recorded significantly highest sucrose %, CCS and purity as compared to the other early maturing genotypes. For mid-late group genotypes CoT 10369 was found significantly superior for cane and CCS yields than the other genotypes. Genotype PI 10132 recorded significantly the highest brix (c), sucrose % and CCS% as compared to the other genotypes.

9. POWARKHEDA

Results revealed that among early genotypes Co 10004 recorded significantly higher cane yield (99.17 t/ha) than Co 85004 (93.43 t/ha), Co 94008 (93.15 t/ha) and Co C 671 (93.15 t/ha) but the cane yield obtained at par in between Co 85004 (93.43 t/ha) Co 94008 (93.15 t/ha), Co C 671 (93.15 t/ha) and CoT 10367 (93.06 t/ha). Among mid-late genotypes Co10031 recorded significantly higher cane yield (106.48 t/ha) than Co 86032 (100.00 t/ha) and Co 99004 (97.87 t/ha).

10. PUNE

The results indicated that, the early genotype Co 10004 found better with maximum germination (70.20 %), tillering (0.74 lac/ha), single cane weight (2.22 kg), cane girth (11.08 cm), cane yield (119.81 t/ha), CCS yield (16.47 t/ha) and B:C ratio (1:2.22), but inferior in juice quality than check variety CoC 671.The mid-late genotype Co 10033 was found better with tillering (1.14 lac/ha), NMC (0.86 lac/ha), cane yield (134.41 t/ha), CCS yield (20.18t/ha), B:C ratio (2.68) and juice quality than the check variety Co 86032.

11. MANDYA

Among early genotypes, Co 10005 recorded significantly higher cane yield (104.3 t/ha). For mid-late genotypes, Co 10033 was found superior with respect to cane yield (113.7 t/ha). But, was on par with PI 10131 (106.3 t/ha), PI 10132 (110.0 t/ha), CoVC 10061 (113.4 t/ha), CoT 10369 (103.4 t/ha) and Co 09009 (103.8 t/ha).

12. NAVSARI

In early group significantly highest cane yield (120.18 t/ha) was recorded with variety C0 10024 over checks and remained at par with all the varieties except V3. Co10024 recorded significantly highest CCS yield (16.49 t/ha) over checks and at par with V1, V2, V5 and V8. Whereas, for mid-late genotypes significantly highest cane yield (127.78 t/ha) was recorded with variety V2 (C0 10015) over checks and remained at par with the varieties V5, V6 and V8. CCS yield was not significantly influenced due to different varieties.

13. KOLHAPUR

In early group Co10027 recorded significantly highest cane and CCS yield (95.34 and 14.05 t/ha) over standard checks, however, it was found at par with the genotype Co 10004 (92.97 and 13.03 t/ha) followed by Co10026 (89.36 and 12.66 t/ha). For mid-late group CoT10369 recorded significantly highest cane and CCS yield (t/ha) (88.07 and 12.75) over check varieties and was at par with genotypes CoM 10083 (85.35 and 11.95) and PI 10131 (84.08 and 11.46).

14. SANKESHWAR

Among the early genotypes tested significantly higher cane yield was recorded in Co 94008 (68.20 t/ha) and was on par with Co 85004 (64.96 t/ha). The lowest cane yield was recorded in CoC 671 (49.95 t/ha). In mid-late group PI 10132 and Co 86032 performed better among the varieties tested for agronomic performance for most of the growth, yield and quality parameters.

15. THIRUVALLA

The treatment variation due to various early genotypes were significant for cane length, cane girth, single cane weight, NMC, cane yield and sugar yield and COC 671 recorded the highest value for the said parameters (255.52 cm, 9.33cm, 1.62kg, 74750/ha, 85.21 t/ha, 11.40 t/ha, respectively) followed by Co 10005 (244.70cm, 9.14 cm, 1.53 Kg, 60750/ha, 72.0 t/ha, respectively). The highest BC ratio of 1.33 was also recorded by CoC 671. With regard to mid-late varieties, the highest values for cane length, cane girth, single cane weight, NMC, cane yield and sugar yield were recorded by Co10015 (250.90 cm, 9.75 cm, 1.59 Kg, 70120/ha, 87.64 t/ha and11.74 t/ha) followed by Co 99004 (248.61cm, 9.50 cm, 1.57 kg, 69350/ha, 62.25 t/ha and 9.97t/ha, respectively). The highest BC ratio of 1.35 was also recorded by Co10015.

EAST COAST ZONE

16. ANAKAPALLE

Among the five new early genotypes under test CoA12322 proved superior (89.8 t/ha) as compared to other genotypes but found on par with Co V 12356 (87.1 t/ha) and Co A 12323 (86.9 t/ha).

17. CUDDALORE

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.

18. NAYAGARH

The genotype CoOr 12346 produced the highest average cane yield of 102.34 t/ha with application of 125 % RD of fertilizer and was closely followed by CoA 12322 (100.45 t/ha) and CoA 12323 (98.64 t/ha).

NORTH CENTRAL ZONE

19. PUSA

Among early genotypes higher cane yield of 88.2 t/ha was recorded with CoP 11436 followed by CoSe 11451 (87.0 t/ha), BO 130 (81.1 t/ha), CoSe 95422 (78.0 t/ha), CoP 11437 (76.5 t/ha), BO 153 (74.1 t/ha) and lowest cane yield of 62.6 t/ha was recorded by CoP 11438. The maximum sucrose content (18.39%) was obtained with CoP 11438 which was significantly superior to CoSe 95422 and statistically comparable to rest of the genotypes. Among mid-late genotype BO 155 recorded higher germination percentage (46.2%) plant population (152100/ha) and millable canes (107800/ha) followed by CoSe 95423. Genotype CoSe 11455 (103.4 t/ha), being on a par with BO 155 (91.4 t/ha) produced the highest cane yield and BO 91 (55.4 t/ha), the lowest. The higher sucrose content (18.71%) juice was noticed by the genotype CoP 9301 which was significantly superior to BO 155 (16.53%) and statistically comparable to rest of genotypes.

20. SEORAHI

Among test genotype, maximum sucrose per cent value produced in CoSe 11453 in mid-late and CoSe 11451 in early group genotype. CoSe 11455 in mid-late and CoP 11438 in early genotype recorded significantly higher cane yield over check varieties and remaining test genotypes. Cane yield increased up to 125 per cent recommended dose of fertilizer. 90 cm spacing treatment produced significantly higher yield as compared to 120 cm row spacing treatment. Sucrose per cent was not affected significantly with different treatments of fertility levels and spacing in mid-late and early genotype experiments.

NORTH EASTERN ZONE

21. BURALIKSON

None of genotypes was found superior than the check. However, significant difference was observed in case of quality of sugarcane. The low yield recorded by genotypes might be due to high rainfall received throughout the growth period.

Important Observations:

Best performing genotypes across the centres located in different zones are listed herewith:

Sl. No.	Zone	Early genotypes	Mid-late genotypes
1	**North Western**	CoH 11262, CoLk 11202, CoLk 11203, CoLk 11201	CoLk 11206, CoPb 11214, CoH 11263, CoS 11232, CoLk 11204
2	**Peninsular**	Co 10006, Co 10004, Co 10005, Co 10024, Co 10027, CoT 10367, Co 10026	CoT 10369, Co 10031, Co 10033, PI 10131, Co 10015, CoM 10083, PI 10132, Co 09009
3	**East Coast**	CoA 12322, CoV 12356, CoA 12321, CoOr 12346	---
4	**North Central**	CoP 11436, CoSe 11451, CoP 11438	CoSe 11455, BO 155
5	**North Eastern**	All genotypes performed similar and below the performance of check varieties.	All genotypes performed similar and below the performance of check varieties.

CURRENT YEAR (2017-18) REPORT

NORTH WESTERN ZONE

1. FARIDKOT

Early

The experiment was conducted by planting six genotypes at 90 am 120 cm spacing and by applying 125% of recommended N. Initial soil status was pH 7.9, EC 0.41 dS m^{-1}, OC 0.47%, P14.5 kg/ha and K 470 kg/ha. The yield was significantly better at 90 cm spacing than 120 cm spacing (**Table AS 72.1.1a**). The number of shoots and millable canes were better at 90 cm spacing but single cane weight was better at 120 cm spacing ((Table 6 b). The mean highest cane yield was of CoPant 12221 (126.6 t/ha) followed by CoLk 12203 (107.6 t/ha).

Mid-late

The experiment was conducted by planting nine genotypes at 90 am 120 cm spacing and by applying 125% of recommended N. The yield was significantly better at 90 cm spacing than 120 cm spacing (**Table AS 72.1.2**). The number of shoots and millable canes were better at 90 cm spacing but single cane weight was better at 120 cm spacing ((Table 7 b). The highest cane yield was of CoS 12232 (120 t/ha) followed by CoPant 12226 (119.4 t/ha), CoPb 12211 (115 t/ha) and Co 12029 (113.7 t/ha).

Table AS 72.1.1a: Performance of early maturing genotypes at different row spacing at Faridkot

Spacing/ Genotype	**90 cm**	**120 cm**	**Mean**
Co 12026	109.5	73.8	91.7
Co 12027	108.9	76.3	92.6
CoLk 12203	131.7	83.4	107.6
CoPant 12221	141.1	112.1	126.6
CoJ 64	87.8	64.6	76.2
Co 0238	113.4	76.3	94.9
Mean	115.4	81.1	
CD (5%)	Row spacing	Genotypes	Interaction
	8.2	14.2	NS

Table AS 72.1.1 b: Growthperformance of early maturing genotypes at Faridkot

Spacings/ Genotypes	Germination %	No. of Shoots 000/ha	NMC 000/ha	Cane length (cm)	Cane diameter (cm)	Single cane wt. (g)	Sucrose (%)
Spacing							
90 cm	42.7	140.8	116.2	277	2.43	1260	16.4
120 cm	42.0	111.4	82.9	241	2.54	1409	16.3
CD (5%)	NS	12.3	5.0	22	0.10	NS	NS
Genotypes							
Co 12026	43.9	122.9	90.9	247	2.38	1318	16.7
Co 12027	34.3	127.7	101.9	257	2.38	1310	18.3
CoLk 12203	40.0	131.4	111.1	268	2.33	1302	13.8
CoPant 12221	54.1	160.3	127.7	312	2.28	1350	15.1
CoJ 64	35.4	114.1	90.1	221	2.60	1105	17.1
Co 0238	46.6	100.3	75.6	249	3.00	1622	17.2
CD (5%)	2.7	21.3	8.7	37	0.18	NS	0.5

Table AS 72.1.2: Cane yield of mid-late maturing genotypes at Faridkot

Spacing/ Genotype	90 cm	120 cm	Mean
Co 12029	115.6	111.7	113.7
CoH 12263	80.6	78.3	79.5
CoLk 12205	86.7	85.8	86.3
CoPant 12226	124.5	114.2	119.4
CoPb 12211	120.0	110.0	115.0
CoS 12232	125.0	115.0	120.0
CoS 767	88.4	79.2	83.8
CoS 8436	83.4	82.5	83.0
CoPant 97222	102.2	89.6	95.9
Mean	102.9	96.3	
CD (5%)	Row spacing	Genotypes	Interaction
	5.3	11.1	NS

2. KOTA

Early

The experiment was planted in spring on 15.3.2017 and harvested in 18.03.2018.The experiment consisted of 6 genotypes viz., Co 12026, Co12027, CoLK 12203 and CoPant 12221 CoJ 64 and Co 0238 (zonal checks)were planted at 120 cm row spacing with 125% of the recommended dose of NPK (250:75:50 kg/ha)).

Among genotypes Co 12027 recorded significantly higher germination (46.47 %) over rest of the genotypes. Significantly superior of single cane length (258.57 cm), single cane weight (1030.53 gm), number of millable cane (89.93 thousand/ ha) were recorded with Co 0238(ZC) and significantly higher cane yield was recorded with Co 12027 (87.10 t/ha) at par with CoLK 12203 and CoPant 12221. Similarly Co 12027 recorded maximum and

significantly higher CCS yield (10.70 t/ha) however it was at par with Co 0238.Whereas brix (20.37 %), sucrose (17.83 %), CCS (12.28 %) was recorded higher with Co 12027(**Table AS 72.2.1**).

Summary: Among genotypes, Co 12027 recorded significantly higher germination (46.47 %), tillers count (140.13 '000/ha), cane yield (87.10 t/ha), brix (20.37 %), Sucrose (17.83 %), CCS (12.28 %) and CCS yield (10.70 t/ha) over CoJ 64 (zc) and Co 0238 (zc). However, CoLK 12203 also maintained its superiority over other genotypes in terms of cane quality during 2017-18.

Mid-late

The experiment on sugarcane mid-late maturing varieties was planted in spring on 15.3.2017 and harvested in 18.03.2018.The experiment consisted of 9 genotypes viz., Co 12029, CoH 12263, CoLK 12205, CoPant 12226, CoPb 12211, CoS 12232along with CoS 767, CoS 8436 and CoPant 97222 aszonal checkswere planted at 120 cm row spacing with 125% of the recommended dose of NPK (250:75:50 kg/ha)).

CoPant 12226 recorded significantly higher germination (48.55 %), tiller count (141200/ha), number of millable canes (93.95 thousand/ ha), cane yield (93.50 t/ha) over CoH 12263 and CoPb 12211 and at par with CoLK 12205. Cane length (cm) and single cane weight (g) did not show significant difference in different genotypes. Further CoPant 12226 recorded significantly higher Brix (21.20 %), sucrose (18.69 %) and CCS (12.91 %) however it was at par with Co 12029, CoH 12263, CoS 12232, CoS 767 (zc) and CoS 8436 (zc). Similarly CoPant 12226 recorded significantly higher CCS yield (12.08 t/ha) being at par with Co 12029 and CoH 12263(**Table AS 72.2.2**).

Summary: Among genotypes CoPant 12226 recorded significantly higher germination (48.55 %), tiller (141200/ha) number of millable cane (93.95 thousand/ha) and cane yield (93.50 t/ha) over CoS 12232, CoPant 97222 (zc), CoPb 12211 and was at par with CoH 12263 and CoLK 12205. However, CoH 12263 also maintained its superiority over other genotypes in terms of cane quality during 2017-18.

Table AS 72.2.1: Performance of early genotypes of sugarcane at Kota

Treatment	Germination 45 DAP (%)	Cane length (cm)	Millable cane (000/ ha)	Single cane weight (g)	Cane yield (t/ha)	Sucrose (%)	CCS (%)	CCS yield (t/ha)
Co 12026	41.37	236.50	86.63	939.40	77.03	16.15	11.03	8.51
Co 12027	46.47	255.33	88.00	895.50	87.10	17.83	12.28	10.70
CoLK 12203	40.60	239.27	83.90	1028.87	82.23	13.95	9.41	7.73
CoPant 12221	45.87	235.47	81.13	794.37	81.53	15.22	10.35	8.41
CoJ 64 (zc)	43.17	234.57	95.57	915.07	75.93	15.49	10.55	8.00
Co 0238 (zc)	45.17	258.57	89.93	1030.53	85.90	16.66	11.41	9.84
SEm ±	1.11	4.32	3.12	50.60	2.94	0.91	0.67	0.61
CD (P=0.05)	3.50	13.61	9.85	159.55	9.27	2.87	2.12	1.91
CV	4.39	3.07	6.18	9.38	6.24	9.94	10.76	11.84

Table AS 72.2.2: Performance of mid-late genotypes at Kota

Treatment	Germination 45 DAP (%)	Millable cane (000/ ha)	Single cane weight (g)	Cane yield (t/ha)	Sucrose (%)	CCS (%)	CCS yield (t/ha)
Varieties							
Co 12029	47.05	87.90	905.80	91.50	17.30	11.88	10.84
CoH 12263	**40.70**	**91.05**	**1210.00**	**90.90**	**18.07**	**12.45**	**11.33**
CoLK 12205	**45.70**	**87.55**	**880.00**	**87.85**	**16.27**	**11.12**	**9.75**
CoPant 12226	**48.55**	**93.95**	**1170.00**	**93.50**	**18.69**	**12.91**	**12.08**
CoPb 12211	40.70	89.25	975.00	85.35	16.37	11.20	9.57
CoS 12232	42.60	79.15	885.00	78.55	17.40	11.96	9.40
CoS 767 (zc)	45.15	92.00	1000.00	80.15	17.51	12.04	9.66
CoS 8436 (zc)	46.45	88.95	950.00	78.30	17.35	11.92	9.35
CoPant 97222(zc)	42.60	79.75	855.00	79.95	16.22	11.08	8.88
SEm ±	1.47	2.68	165.91	4.00	0.58	0.43	0.64
CD (P=0.05)	4.79	8.74	NS	13.03	1.89	1.40	2.08
CV	4.68	4.32	23.91	6.64	4.77	5.13	8.93

3. KAPURTHALA

Early

Row spacing did not significantly affect the germination %, number of shoots and plant height at 180 DAS. Whereas the genotypes differed significantly in all said growth parameters. Genotypes, CoLk 12203, Co Pant 12221 and Co 0238 were having statistically similar germination % but genotypes CoLk 12203 recorded highest germination among genotypes. Whereas total number of shoots at 180 DAS were highest in Co Pant 12221 which were similar to CoJ 64 but significantly higher over remaining genotypes. Genotypes Co 12026, Co 12027 and CoLk 12203 also produced statistically similar number of shoots at 180 DAS of crop.Significantly higher cane length and number of canes were observed in planting at 90 cm row spacing compared to 120 cm planting but reverse trend was observed in single cane weight where it was significantly higher at 120 cm row planting. Cane yield showed non-significant response with respect to planting methods where it was statistically similar in both row spacing (**Table AS 72.3.1).** Genotypes Co Pant 12221, Co 12026, CoJ 64 were statistically similar in production of cane yield.

Genotype CoJ 64 recorded significantly higher brix and POL % values among all genotypes at 12 months after sowing followed by Co12027. Genotype CoLk 12203 had least value of brix and POL % among genotypes. Genotype Co 12027 produced highest CCS that was statistically similar to genotypes CoJ 64 and Co 238 but significantly higher over other genotypes

Mid-late

All growth and yield parameters were significantly influenced by planting methods except cane girth and cane yield which showed non-significant response to row spacing (90&120 cm). However, their numerical values were higher at row spacing of 120 cm compared to 90 cm row spacing (Table 72.5) Total number of shoots and number of millable canes were significantly higher at narrow row spacing (90cm) compared to wider row

spacing. However, reverse trend was obtained in case of single cane weight and cane length which was significantly higher at wider row spacing compared to narrow row spacing.

Genotypes Co Pant 97222 produced significantly higher cane yield. Cane yield of genotypes CoH 12263, CoLk 12205 and Co 12029 were also statistically similar but significantly higher over CoS 767, CoS 8436, Co Pant 97222, Co Pb 12211 and CoS 12232.

Table AS 72.3.1: Performance of early maturing genotypes at Kapurthala

Genotype	Row spacing (cm)		Mean
	90	120 cm	
CoJ 64	73.0	76.2	**74.6**
Co 0238	84.4	81.2	**82.8**
Co 12026	79.4	76.6	**78.1**
Co 12027	87.2	85.5	**86.7**
CoLk 12203	70.5	75.2	**72.8**
Co Pant 12221	76.7	78.4	**77.6**
Mean	**79.5**	**79.1**	
CD (P=0.05)	Spacing: NS Genotypes: 4.4 Spacing x Genotypes: 6.2		

Table AS 72.3.2: Performance of mid-late maturing genotypes at Kapurthala

Genotype	No. of Shoots 000/ha	NMC 000/ha	Cane length (cm)	Cane diameter (cm)	Single cane wt.(g)	Cane yield (t/ha)
Row spacing (cm)						
90 cm	107.3	97.8	252.5	2.37	1108.6	76.7
120cm	81.9	86.2	267.2	2.40	1185.2	77.6
CD (P=0.05)	4.6	3.5	6.4	NS	24.4	NS
Genotypes						
CoS 767	87.0	84.3	257.5	2.31	1033.2	72.0
CoS 8436	99.9	99.2	229.0	2.25	1005.7	71.1
Co Pant 97222	89.6	92.9	252.7	2.10	1182.7	86.7
Co 12029	98.0	96.0	280.2	2.45	1149.2	79.0
CoLk 12205	102.6	99.4	256.2	2.29	1237.2	77.5
Co Pb 12211	87.7	85.5	261.5	2.44	1278.2	72.3
Co Pant 12226	97.2	88.0	261.2	2.56	1079.0	70.7
COS12232	92.6	93.8	259.7	2.39	1221.0	71.0
CoH 12263	93.8	92.5	271.0	2.45	1217.2	79.2
CD (5%)	10.3	7.9	14.2	0.10	54.6	5.0

4. LUCKNOW

Early

A field experiment was conducted to evaluate the agronomic performance of elite genotypes (early) of sugarcane (Co 12027, CoLk 12203 and CoPant 12221) along with CoJ 64 and Co 0238 as zonal check at 2 row spacings viz. 90 and 120 cm as well as at higher fertilizer level (25 % higher over recommended doses of NPK/ha).

The data illustrated that growth, yield and its attributes and juice quality were affected significantly with different genotypes of sugarcane and row to row spacing. The performance of all early genotypes of sugarcane in respect to plant growth, yield attributing parameters and cane and sugar yield were poor at wider spacing (120 cm row to row) compared to 90 cm row to row spacing. The result also showed that highest tillers at 120 and 150 DAP, and NMC was registered with genotype CoLk12203 and CoPant 12221, respectively over rest of the genotypes including zonal check varieties. While, lowest tillers at 150 DAP and NMC was recorded with Co 0238- a promising zonal variety. However, highest stalk length (232 and 220 cm), single cane weight (0.91 and 0.92 kg), cane yield (102 and 84.3 t/ha) and sugar yield (11.8 and 9.7 t/ha at 10-month stage) was recorded with CoLk 12203 at 90 and 120 cm row to row spacing, respectively. The lowest cane (60 and 52 t/ha) and sugar (7.2 and 6.8 t/ha) at both the spacings, respectively was recorded with CoJ 64 a zonal check variety followed by new Co 12027 genotype of sugarcane. So far juice quality parameters are concerned, higher brix, sucrose and CCS per-cent was registered with Co 0238 and CoJ 64 a zonal check only. Among new sets of genotypes (early), Co 12027 andCoPant 12221 were superior over CoLk 12203 in respect to the juice quality parameters(**Table AS 72.4.1**).

Summary: Among all early maturing promising sugarcane genotypes including zonal check under test, the genotype CoLk 12203 gave highest cane and sugar yield /ha due to higher tillering, NMC, girth and weight of single cane. But it could not perform well particularly in respect to juice quality parameters viz, brix and sucrose content compared to the performance level of zonal check variety Co 0238 and CoJ 64.

Mid-late

Genotype Co Lk 12205 sown at 90 cm row spacing gave higher NMC over CoS 767; CoS 8436 sown at both the spacing and Co Pant 97222 sown at 90 cm spacing. The cane yield (t/ ha) was highest in genotype Co Pant 97222 sown at 90 cm spacing. The CCS (t/ ha) at 10 month stage was significantly higher in CoS 12232 planted at 120 cm spacing over all the genotypes. At 12 month stage the CCS (t/ ha) yield in genotype Co Pant 97222; CoLk 12205; CoS 12232 Co Pant 1226 and Co H 12263 being at par differ significantly over rest of the genotypes (**Table AS 72.4.2**).

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Table AS 72.4.1: Performance of early genotypes at Lucknow

Treatment	Germination % at 45DAP	Tillers (‘000/ha) 150 DAP	Stalk length (m)	Stalk girth (cm)	NMC (000/ha)	CCS yield (t/ha) at 8 months	CCS yield (t/ha) at 10 months	Cane yield (t/ha)
Co 12027-90cm	47.4	165.3	191.7	2.22	81.7	5.30	7.80	62.00
Co 12027-120cm	43.6	130.4	180.7	2.37	73.9	4.77	6.77	56.00
CoLk 12203-90cm	34.9	176.6	232.0	2.21	116.3	8.71	11.75	102.0
CoLk 12203-120cm	30.3	158.8	220.0	2.24	99.3	6.70	9.73	84.27
CoPant 12221-90cm	31.1	160.0	214.7	2.10	99.7	6.84	9.45	78.00
CoPant 12221-120cm	32.4	135.9	209.3	2.20	83.8	5.97	7.17	61.70
CoJ 64-90cm	37.3	141.1	178.0	2.24	91.7	6.34	7.76	60.47
CoJ 64-120cm	35.5	127.3	174.3	2.41	80.1	5.19	6.75	52.70
Co 0238-90cm	38.7	134.9	202.7	2.60	79.3	7.99	10.57	79.00
Co 0238-120cm	34.3	126.7	204.0	2.71	69.2	7.02	8.77	66.03
C.D.	9.9	20.1	27.4	0.31	19.3	1.72	2.23	18.04
SE(d)	4.7	9.5	12.9	0.15	9.1	0.81	1.05	8.5

Table AS 72.4.2: Performance of mid-late genotypes at Lucknow

Treatment	Germination	Tillers 120 DAP	Shoot	NMC	yield	Per cane wt
	%	(000)/ha	(000)/ha	(000)/ha	t/ ha	kg
CoS767 - 90cm	30.8	203.13	132.29	102.52	70.2	0.68
CoS767 - 120cm	32.19	159.72	118.25	95.92	72.5	0.76
Co 120 -90cm	38.20	205.77	143.58	101.05	77.6	0.76
Co 120 -120cm	38.64	134.31	126.39	93.83	73.5	0.77
CoLk12205-90 cm	36.01	188.17	155.61	114.84	104.3	0.92
CoLk12205-120 cm	35.86	157.19	117.59	91.19	80.5	0.86
CoS 12232 - 90cm	25.52	170.42	135.22	100.90	91.3	0.92
CoS12232 -120 cm	23.54	119.79	112.64	89.32	74.6	0.82
CoPant 97222- 90 cm	26.76	176.58	134.49	108.68	115	1.04
CoPant 97222-120 cm	20.68	98.01	106.26	82.39	63.8	0.75
CoPb 12211- 90 cm	34.46	188.46	153.56	101.78	71.5	0.69
CoPb 12211-120 cm	36.66	151.58	119.35	88.44	71.6	0.80
CoS 8436 - 90 cm	19.14	104.72	122.17	85.94	58.7	0.66
CoS 8436 -120 cm	18.04	63.25	102.63	69.96	52.0	0.73

Co Pant 12226 - 90 cm	28.16	205.92	129.94	97.09	75.3	0.78
Co Pant 12226- 120 cm	24.12	139.92	112.97	81.62	71.2	0.86
CoH 12263-90 Cm	29.18	149.6	120.12	88.88	70.9	0.78
CoH 12263-120 Cm	26.25	115.06	97.90	76.78	61.4	0.78
C.D.	7.66	36.93	14.18	10.82	7.29	0.11
SE(m)	2.65	12.79	4.91	3.75	2.52	0.03
SE(d)	3.75	18.09	6.95	5.30	3.57	0.05
C.V.	15.79	14.60	6.83	6.99	5.80	8.40

5. PANTNAGAR

Early

Four genotypes (Co 12026, Co 12027, CoLk 12203, Co Pant 12221) were tested for their productivity and quality of juice alongwith two checks i.e. Co J 64 and Co 0238 during spring season of 2017-18. Genotypes were planted at 90 and 120 cm distance with 125 % NPK of the recommended dose. Crop was raised with recommended package and practices. Soil of the experimental field was neutral in pH, silty clay loam. Sugarcane genotypes (6) were planted on 06.04.2017 and were harvested on 21.03.2018.

Planting at 90 cm spacing

Highest germination % was recorded in Co 0238 at 30 DAP which were significantly higher over Co 12026, Co 12027 and Co J 64. At 45 days stage germination in Co 0238 was significantly higher than Co 12026 and Co J 64. Shoot population was also higher in Co 0238 at 90, 120 and 150 DAP over rest of the genotypes. Cane yield, individual cane weight and CCs yield (t/ha) were also recorded significantly higher over rest of the genotypes.

Planting at 120 cm spacing

Significantly higher germination was recorded in Co 0238 at 45 DAP which was significantly higher over Co J 64, Co 12027 and Co 12026. Higher shoot population was also recorded in Co 0238 at all the stages 90, 120 and 150 DAP. None of the genotypes could perform better than Co 0238 in cane yield because the individual cane weight was also significantly higher in Co 0238 over rest of the genotypes. However sucrose % was significantly higher in Co 0238 over rest of the genotypes except Co 12026, 12027 and Co Pant 12224. CCS yield was significantly highest in Co 0238 over rest of the genotypes.

Summary: At both the spacing (90 and 120 cm) Co 0238performed better in respect of germination %, cane yield, and CCS yield. None of the proposed genotypes were at par or higher than Co 0238 in cane yield, individual cane weight and CCS yield. No significant improvement in cane yield was recorded in wider row spacing (120 cm) over 90 cm.

Mid-late

Sugarcane genotypes were planted in rows having row to row spacing 90 and 120 cm on 06.04.2017. Crop was harvested on 27.03.2018. Soil of the experimental field was silty clay loam with neutral pH, and high in K.Highest cane yield at 90 cm spacing was recorded for the genotype Co Pant 12226 which was significantly higher over rest of the genotypes except Co 12029. Germination % at 30 DAP and 45 DAP was also significantly higher in these two genotypes (both were at par) over rest of the genotypes. Shoot population at 120 DAP and cane yield was also recorded higher in these two genotypes among others.Sucrose

% and CCS yield were also significantly higher in genotypes Co Pant 12226 and in Co 12029 over rest of the genotypes. The similar results were obtained in 120 cm spacing. Highest cane yield was recorded in genotypes Co Pant 12226 and in Co 12029 which were significantly higher over rest of the genotypes. CCS yield was significantly higher in Co Pant 12226 over rest of the genotypes.

Summary: Among all the 9 genotypes (mid late), genotype Co pant 12226 performed better than others except Co 12029. Highest cane yield was recorded from Co Pant 12226 which produced significantly higher over rest of the genotypes except Co 12029. Higher cane yield in these genotype was due to higher initial germination, shoot population, NMC, individual cane weight. CCS yield and sucrose % were also higher in these genotypes (Co Pant 12226 and Co 12029). The similar results were obtained in 90 and 120 cm spacing.

Table AS 72.5.1: Performance of early maturing genotypes at Pantnagar

Treatment kru	Germination (%) DAP		Shoot population DAP			NMC (000/ ha)	Yield (t/ha)	Single cane wt. (g)	Sucrose (%)	CCS (t/ ha)
	30	45	90	120	150					
Co Pant 12026	22.1	27.0	48.2	55.3	62.4	120.3	71.0	633.3	15.2	6.5
CO 12027	27.0	35.4	63.7	76.4	77.1	118.0	86.7	750.0	15.5	8.1
CoLK 12203	32.3	38.2	67.5	82.3	83.5	108.7	95.4	850.0	16.0	9.3
CO Pant 12221	31.2	37.7	65.0	82.0	81.4	116.0	91.1	816.7	15.7	9.1
CoJ 64	25.3	31.0	57.0	69.2	71.1	121.7	72.5	616.7	15.0	6.4
Co 0238	33.1	39.0	72.7	83.9	87.3	107.7	105. 9	1053. 3	16.6	10.8
SEm ±	1.2	1.8	0.9	0.9	0.8	0.4	0.4	33.2	0.3	0.15
C.D. at 5 %	4.0	5.8	2.9	2.8	2.4	1.2	1.2	104.7	0.9	0.49

Table AS 72.5.2: Performance of mid-late maturing genotypes at Pantnagar

Treatment	Germination (%) DAP		Shoot population DAP		Millable canes (000/ha)	Yield (t/ha)	Individu al cane wt. (g)	Sucros e (%)	CCS (t/ha)
	30	**45**	**90**	**120**					
Co Pant 12226	45.2	47.1	91.1	93.0	81.0	107.7	1333.0	16.1	10.8
COH 12263	35.9	31.1	75.4	91.0	71.7	97.7	1083.0	15.9	9.7
CoPb 12211	31.1	32.5	71.2	83.0	89.0	90.0	883.3	15.6	8.5
CoS 12232	26.5	38.1	69.5	81.1	73.7	82.3	666.7	16.2	8.2
CoLK 12205	33.0	36.1	74.1	89.8	97.3	96.0	1000.0	16.2	9.0
Co 12029	42.0	46.2	89.5	92.5	128.7	105.7	1066.7	15.8	9.7
CoS 767	28.3	31.9	70.0	82.2	140.7	85.3	600.0	15.6	8.0
CoS 8436	32.3	34.3	73.3	86.0	101.3	91.7	900.0	15.7	8.2
Co Pant 97222	25.3	30.4	68.7	77.3	74.7	81.0	700.0	15.8	7.8
SEm ±	1.5	1.4	3.0	3.8	0.7	1.0	56.5	0.2	0.3
C.D. at 5 %	4.5	4.2	9.2	11.5	2.1	3.2	169.3	0.6	1.0

6. SHAHJAHANPUR

The soil of experimental field was low in organic carbon (0.41%), phosphorus (7.6 kg/ha) and medium in potassium 171 kg/ha with pH 7.7. Experimental plant crop of early genotype was planted on 4.03.2017 and mid – late genotype on 05.03.2017. Crop of early genotypes was harvested on 28.03.2018 and mid –late genotypes on 28.03.2018.

Early

Experimental results of early genotypes (**Table AS 72.6.1**) revealed that genotype CoLK 11202 produced significantly higher cane yield (107t/ha) than those of standards Co 0238 (100.50 t/ha) and CoJ 64 (80.40t/ha). Regarding spacing, significantly higher cane yield (99.90t/ha) was recorded with 90 cm row spacing than that of 120 cm (85.50 t/ha). CCS% in cane at harvest was found significantly higher in Co 0238 (12.49) followed by CoLk 11203 (12.48)and CoLk 11202 (12.18).

Mid-late

Experimental results of mid –late genotypes (**Table AS 72.6.2**) showed that genotype CoLK 11206 produced significantly higher number of millable canes (121800/ha) and cane yield (101.40 t/ha) than those of all three standards and other entries. Regarding spacing, significantly higher number of shoots (156000/ha), millable canes (117300/ha) and cane yield (93.89 t/ha) were recorded with 90 cm row spacing than those of 120 cm row spacing. CCS% in cane at harvest was observed significantly higher in genotype CoH 11263 (12.43) followed by CoS 8436 (12.30).

Summary: In early genotypes CoLK 11202 and in mid–late genotypes CoLK 11206 produced significantly higher cane yield than standards and other entries viz. 107.00 t/ha and 101.40 t/ha, respectively. Row spacing of 90cm was found superior to 120 cm spacing in cane yield under both early and mid – late genotypes with cane yield of 99.90/ha and 93.89 t/ha, respectively.

Table AS 72.6.1: Performance of early maturing genotypes at Shahjahanpur

Treatment	Germination (%)	Shoots (000/ha)	NMC (000/ha)	Cane yield t/ha	CCS%
A- **Genotypes**					
V_1 CoLk 11201	38.06	146.7	101.9	87.10	11.89
V_2 CoLk 11202	36.67	162.3	114.9	107.00	12.18
V_3 CoLk 11203	44.49	169.5	119.9	91.00	12.48
V_4CoH 11262	39.73	158.4	107.6	90.50	11.86
V_5Co 0238	40.42	151.9	94.00	100.50	12.49
V_6 CoJ 64	37.09	160.9	113.60	80.40	12.16
SE±	3.05	6.28	1.43	3.81	0.21
CD at 5%	NS	13.03	3.55	7.90	0.44
B – Spacing					
$S_1$90 cm	39.35	187.1	126.00	99.90	12.22
$S_2$120 cm	39.46	129.5	91.30	85.50	12.13
SE±	1.76	3.63	1.21	2.20	0.12
CD at 5%	NS	7.52	3.05	4.56	NS

Table AS 72.6.2: Performance of mid-late genotypes at Shahjahanpur

Treatment	Germination (%)	Shoots (000/ha)	NMC (000/ha)	Cane yield t/ha	CCS%
A- Genotypes					
V_1 Co11027	22.23	104.80	79.30	72.50	11.86
V_2 CoH 11263	31.46	112.30	81.60	88.10	12.43
V_3 CoLk 11204	38.06	150.60	106.30	96.60	12.14
V_4 CoLk 11206	48.68	139.90	121.80	101.40	12.02
V_5 CoPb 11214	36.53	161.90	103.30	93.30	12.06
V_6 CoS 11232	20.21	112.50	83.20	70.30	12.13
V_7 CoS 767	33.40	145.70	110.30	80.40	12.01
V_8 CoS 8436	41.74	149.40	106.40	83.30	12.30
V_9 Co Pant 97222	32.43	137.40	104.30	84.20	11.96
SE±	2.11	4.16	1.48	0.87	0.16
CD at 5%	4.30	8.46	3.00	1.77	0.32
B – Spacing					
$S_1$90 cm	32.88	156.00	117	93.89	11.91
$S_2$120 cm	31.84	113.90	81.90	76.74	12.07
SE±	0.99	1.96	0.70	0.84	0.07
CD at 5%	NS	3.98	1.42	1.72	NS

7. UCHANI

All the genotypes were planted at 90 cm and 120 cm with 125 % of recommended dose of NPK i.e. 187.5+ 62.5+62.5 NPK kg/ha during spring season on March 6, 2017. The soil of the experimental field was sandy loam in texture with pH 7.8, EC 0.4 dSm^{-1}, organic carbon 0.38%, available P 11.6 kg/ha and available K 186 kg/ha. The crop was irrigated at 8-10 days interval during re-monsoon seasons and 15-20 days interval during post monsoon seasons. The crop was harvested on February 26, 2018.

Early

Germination per cent recorded at 40 days after planting was not affected significantly due to different spacing. Tillers, NMC cane yield and sugar yield were affected significantly due to different spacing. Significantly higher number of tillers, NMC, cane yield and sugar yield were recorded at 90 cm spacing as compared to 120 cm spacing whereas, cane weight was significantly higher at 120 cm spacing as compared to 90 cm spacing. CCS per cent was not affected significantly due to different spacing. Varieties Co 12026, CoLk 12203 and CoPant 12221 being at par recorded significantly higher germination as compared to rest of the varieties. Lowest germination was recorded in variety CoJ 64. Varieties CoLk 12203 and CoPant 12221 being at par produced significantly higher number of tillers in comparison to rest of the varieties. Lowest number of millable canes and highest cane weight was recorded in variety Co 0238. CCS per cent was not affected significantly due to different varieties. Among different varieties, CoLk 12203, CoPant 12221 and Co 0238 being at par produced significantly higher cane yield and sugar yield as compared to rest of the varieties. Lowest cane yield and sugar yield was recorded in variety Co 12027. Though interaction was not found significant but there was no reduction in cane yield of varieties Co 0238 and Co 12026 at 120 cm spacing (**Table AS 72.7.1**).

Mid-late

Germination was not affected significantly due to different level of spacing. Tillers, NMC, Cane yield and sugar yield were affected significantly due to different spacing. Significantly higher number of tillers, NMC, cane yield and sugar yield was recorded at 90 cm spacing as compared to 120 cm spacing whereas, cane weight was significantly higher at 120 cm. CCS percent was not affected significantly due to different spacing. Among varieties, CoS 12232 and Co 12029 being at par recorded significantly higher germination at 40 days after planting. Varieties CoS 767 and CoS 8436 recorded lowest germination among all the varieties. Varieties CoS 12232, CoPant 97222, CoPant 12226 and Co 12029 being at par recorded significantly higher cane yield and sugar yield as compared to rest of the varieties. Though interaction was not found significant but reduction in cane yield of the varieties CoPant 97222, CoS 8436 and CoPant 12226 was minimum at 120 cm spacing as compared to 90 cm spacing (**Table AS 72.7.2**).

Summary: Significantly higher number of tillers, number of millable canes, cane yield and sugar yield were recorded at 90 cm spacing as compared to 120 cm spacing irrespective of the maturity group. Among early maturing varieties, CoLk 12203 (89.9 t/ha), CoPant 12221(90.1 t/ha) and Co 0238 (91.2 t/ha) being at par produced significantly higher cane yield and sugar yield as compared to rest of the varieties. Among mid late varieties, CoS 12232 (100.2 t/ha), CoPant 97222 (99.2 t/ha), CoPant 12226 (96.7 t/ha) and Co 12029 (93.5 t/ha) being at par recorded significantly higher cane yield and sugar yield as compared to rest of the varieties.

Table AS 72.7.1: Performance of early maturing genotypes at Uchani

Spacing	Genotype						
	Co 12026	**Co 12027**	**CoLk 12203**	**CoPant 12221**	**CoJ 64**	**Co 0238**	**Mean**
	NMC (000/ha)						
90 cm	98.6	101.8	122.8	118.2	104.4	100.6	107.7
120 cm	86.8	75.9	98.4	94.1	89.7	92.8	89.6
Mean	92.7	88.9	110.6	106.2	97.1	96.7	
CD at 5%	Spacing	4.3	Varieties	7.5		Interaction	NS
	Cane weight (g)						
90 cm	862	670	790	821	684	945	795
120 cm	995	780	903	968	787	1028	910
Mean	929	725	846	894	735	986	
CD at 5%	Spacing	34	Varieties	58		Interaction	NS
	Cane yield (t/ha)						
90 cm	81.3	65.7	92.7	93.0	68.3	91.1	82.0
120 cm	82.7	56.6	85.0	87.2	67.5	91.3	78.4
Mean	82.0	61.2	88.9	90.1	67.9	91.2	
CD at 5%	Spacing	3.5	Varieties	4.0		Interaction	NS
	CCS (%)						
90 cm	11.83	11.88	11.92	11.89	12.18	12.15	11.98
120 cm	1180	11.90	11.89	11.88	12.15	12.15	11.97
Mean	11.82	11.89	11.91	11.89	12.17	12.15	

CD at 5%	Spacing	NS	Varieties	NS		Interaction	NS
	Sugar yield (t/ha)						
90 cm	9.61	7.80	11.04	11.05	8.32	11.06	9.82
120 cm	9.75	6.73	10.12	10.38	8.19	11.09	9.37
Mean	9.68	7.27	10.58	10.71	8.26	11.08	
CD at 5%	Spacing	0.39	Varieties	0.68		Interaction	NS

Table AS 72.7.2: Performance of mid-late maturing genotypes at Uchani

	Genotype									
Spacing	Co 12029	CoH 12263	CoLk 12205	CoPant 12226	CoPb 12211	CoS 12232	CoS 767	CoS 8436	CoPant 97222	Mean
	NMC(000/ha)									
90 cm	125.5	117.5	105.8	118.2	110.4	135.5	117.3	105.8	125.2	117.9
120 cm	105.8	96.7	95.3	105.1	89.4	110.1	87.1	90.9	103.3	98.2
Mean	115.7	107.1	100.6	111.7	99.9	122.8	102.2	98.4	114.3	
CD at 5%	Spa.	4.2	Var.	8.9					Int.	NS
	Cane weight (g)									
90 cm	804	821	823	870	875	810	715	878	840	826
120 cm	875	883	876	925	929	885	770	975	972	899
Mean	840	852	850	898	902	848	743	926	906	
CD at 5%	Spa.		Var.						Int.	NS
	Cane yield (t/ha)									
90 cm	97.6	93.2	84.1	99.5	93.4	106.0	81.0	89.6	101.4	94.0
120 cm	89.4	84.9	80.4	93.9	80.2	94.3	65.0	85.6	97.0	85.6
Mean	93.5	89.1	82.3	96.7	86.8	100.2	73.0	87.6	99.2	
CD at 5%	Spa.	3.6	Var.	7.6					Int.	NS

PENINSULAR ZONE

8. PADEGAON

Early

Genotype Co 11001 recorded the highest cane yield (95.67 t/ha) and it was at par with CoM 11081, CoM 11082, Co85004and Co94008 in respect of cane yield. Significantly higher CCS yield (12.90 t/ha) was recorded in the genotypeo94008and it was at par with Co11001, CoM11081and CoM11082 genotypes.Co 85004 recorded significantly the highest number of millable cane (82222/ha). However, it was found at par with Co 11001, CoM 11081. Significantly higher girth (9.92cm) was observed in genotype Co94008, however it was found at par with CoM 11081 and CoM 11082 genotypes. CoC 671 recorded significantly highest sucrose (21.59%), CCS (15.31%), Brix (22.52) and purity (94.21%) and it was found at par with CoM 11082 in respect of brix.CoM11081,CoM11082 and Co 94008,

in respect of sucrose , CCS per cent and purity. The genotype Co 11001 was at par in respect of sucrose percent(**Table AS 72.8.1**).

Mid-late

Co 11005 recorded the highest cane yield (102.33 t/ha) which was found at par with Co 86032, CoM 11085 and CoM 11019. Significantly highest CCS yield (13.32 t/ha) was recorded by Co86032 genotype, which was found at par with Co 11005,CoM 11085, Co 11019 and Co 99004 genotypes. The genotype CoM 11086 recorded significantly the highest number of millable cane (80463/ha) than other genotypes.Co 11012 recorded significantly the highest sucrose (20.63 %), CCS (14.96%) and Purity (92.84%) than all other genotypes (**Table AS 72.8.2**).

Summary: Among early genotypes, Co 11001 was found superior for cane yield and genotype Co 94008 for CCS yield than the other genotypes. For the mid-late genotypes, Co 11005 was found significantly superior for Cane yield and Co 86032 for CCS yield than the other genotypes. Genotype Co 11012 recorded significantly the highest Sucrose %, Purity % and CCS% as compared to the other genotypes.

Table AS 72.8.1: Performance of early maturity genotypes at Padegaon

Treatment	Cane Yield (t/ha)	CCS Yield (t/ha)	NMC ('000/ha)	Girth (cm)	Brix (c)	Sucrose (%)	CCS (%)
T_1: Co 11001	95.67	12.83	79167	8.19	21.15	19.74	13.43
T_2 : CoM 11084	57.00	7.15	66111	8.17	19.72	18.41	12.54
T_3 : CoM 11081	87.67	11.61	80463	8.92	20.51	19.31	13.27
T_4 : CoM 11082	87.00	12.67	74167	9.78	22.33	21.02	14.61
T_5 : Co 11004	75.33	9.85	66944	8.38	20.61	19.19	13.09
T_6 : Co 85004	81.33	6.77	82222	8.37	21.78	16.87	8.35
T_7 : Co 94008	91.33	12.90	59537	9.92	21.78	20.53	14.15
T_8 : CoC 671	61.00	9.30	43241	8.78	22.52	21.59	15.31
CD at 5 %	**15.88**	**2.20**	**5543**	**1.07**	**0.64**	**2.21**	**0.30**

Table AS 72.8.2: Performance of mid-late maturity genotypes at Padegaon

Treatment	Cane Yield (t ha^{-1})	CCS Yield (t ha^{-1})	Germination (%)		NMC ('000/ha)	Cane girth (cm)	Cane length (cm)	Sucrose (%)
			30 DAP	60 DAP				
Co 11007	74.67	10.06	23.31	68.25	62315	10.62	222	19.13
Co 11005	102.33	12.25	43.05	79.22	73519	9.47	225	19.17
Co 11012	71.00	9.39	14.07	47.25	54907	9.43	214	20.63

Co 11019	82.00	11.95	11.13	49.98	65092	11.43	225	18.67
CoM 11085	95.00	12.21	27.93	75.60	68519	9.82	219	18.38
CoM 11086	75.00	6.24	40.53	81.90	80463	9.32	198	19.03
Co 86032	97.00	13.32	39.90	76.65	73148	10.13	213	18.34
Co 99004	72.67	11.08	19.11	55.65	67408	10.48	212	19.62
CD at 5 %	22.30	3.06	9.13	8.78	6621	NS	12.22	0.92

9. PUNE

The highest cane yield in early group of genotypes (125.33 t/ha) was obtained in genotype Co 10026 and mid-late genotype Co 10033 with177.00 t/ha which was more than the check varieties, CoC 671 and Co 86032, respectively. Sugar yield (t/ha) was also significantly higher (17.74 t/ha) obtained in early genotype Co 10026 which was less than the check variety CoC 671 (21.01 t/ha). Whereas, Co 10033,mid-late genotype yielded the highest sugar yield of 22.72 t/ha (**Table AS 72.9.1**). Which was more than the check variety Co 86032 (22.17 t/ha). Benefit cost ratio was affected due to various genotypes. It was maximum (3.45) in Co 10033 (mid-late genotype) and 2.63 in early genotype Co 10026.The juice quality parameters measured in terms of Brix %, Sucrose % and CCS % differed significantly due to different genotypes. In early group, maximum Brix % (20.43), CCS % (14.39) and Sucrose % (19.99) was noticed in genotype Co 10026, which was more than the check variety CoC 671 and Co 86032. Whereas, mid-late genotype Co 10033 recorded maximum Brix % (21.12), CCS % (15.05) and Sucrose % (20.53).

Summary: The results of the plant crop indicated that, the early genotype Co 10026 found better with maximum germination (67.78 %), tillering (0.90 lakh/ha), single cane weight (2.13 kg), cane girth (10.66 cm), Cane yield (125.33 t/ha), CCS yield (17.74 t/ha) and B:C ratio (1:2.63), which was found superior in juice quality than check variety CoC 671 and Co 86032.The mid-late genotype Co 10015 performed better in case of NMC (0.96 lakh/ha) while Co 10033 found better with tillering (0.96 lakh/ha), Cane yield (177.00 t/ha), CCS yield (22.72 t/ha), B:C ratio (1:3.45) and also superior in juice quality than both the check variety.

Table AS 72.9.1: Performance of genotypes at Pune

Treatment Details	Ger % 45 DAP	Tillering (lac/ha) 120 DAP	NMC (lac/ha)	Cane Yield (t/ha)	B:C Ratio	CCS T/ha	cane weight (kg/cane)
Co 10004	58.14	0.86	0.68	118.00	2.47	16.60	1.56
Co 10005	65.27	0.87	0.88	122.00	2.58	15.29	1.22
Co 10026	67.78	0.90	1.07	125.33	2.63	17.74	2.13
Co 10015	69.58	0.85	0.96	155.00	3.07	21.90	1.87
Co 10033	76.27	0.96	0.89	177.00	3.45	22.72	2.42
PI 10132	53.89	0.85	0.70	146.33	2.98	20.98	2.34
CoC 671.	73.74	0.88	0.77	150.33	3.07	21.01	2.18
Co 86032	62.08	0.98	0.99	162.67	3.15	22.17	1.98
S.E.	2.36	0.02	0.03	10.71		1.13	0.08
C.D.at 5 %	7.16	0.07	0.12	32.51		3.44	0.27
CV	7.00	5.22	8.96	14.44		11.16	8.91

10. MANDYA

Early

Performance of promising early sugarcane genotypes of advanced Varietal Trial under optimum agronomic management practices and wide row spacing of 150 cm were evaluated. Among the genotypes, CoM 11082 recorded significantly higher cane yield (127.97 t/ha) as compared to others. But, it was on par with CoM 11084 (123.00 t/ha) and Co 11001 (120.09 t/ha). This increased cane yield was mainly attributed to increased yield parameters viz., single cane weight, cane length, cane girth, number of internodes and number of millable cane/ha. While, the quality parameters viz., sucrose and CCS (%) were not influenced significantly among the genotypes. The above genotypes recorded 4-16% higher cane yield over check varieties Co 671, Co 94008 and Co 85004 (**Table AS 72.10.1**).

Mid-late

Among the genotypes, Co 11012 found superior with respect to cane yield (160.9 t/ha) as compared to others. But, was on par with Co 11019 (155.3 t/ha) and CoM 11086 (154.6 t/ha). This increased cane yield was due to enhanced single cane weight, cane length, cane girth, inter-nodal length, number of internodes and number of millable cane/ha. While, quality parameters viz., sucrose % and CCS% did not vary significantly among the genotypes. The above genotypes recorded 8-14% higher cane yield over check varieties (**Table AS 72.10.2**)

Summary: Among the elite early genotypes, CoM 11082 recorded significantly higher cane yield (127.97 t/ha) as compared to others. But, it was on par with CoM 11084 (123.00 t/ha) and Co 11001 (120.09 t/ha).Among elite mid-late genotypes, Co 11012 found superior with respect to cane yield (160.9 t/ha) as compared to others. But, was on par with Co 11019 (155.3 t/ha) and CoM 11086 (154.6 t/ha).

Table AS 72.10.1: Performance of early genotypes at Mandya

Treatment	Single cane weight (kg)	Cane length (m)	Cane girth (cm)	Millable cane (‘000/ha)	Cane yield (t/ha)	Sucrose %	CCS (t/ha)
Co 11001	1.30	1.91	3.27	97.32	120.09	18.79	15.99
Co 11004	1.01	1.55	2.45	86.08	94.59	19.30	12.89
CoM 11081	0.95	1.48	2.40	85.02	88.81	18.70	11.69
CoM 11082	1.39	2.07	3.49	103.15	127.97	19.91	18.05
CoM 11084	1.33	1.97	3.35	98.46	123.00	19.69	17.17
Co 85004	1.20	1.81	3.11	96.07	114.63	18.28	14.83
Co 94008	1.14	1.81	2.95	93.18	109.66	18.04	13.91
CoC 671	1.16	1.69	3.04	94.65	112.24	18.55	14.65
S.Em.±	0.07	0.10	0.15	3.13	4.14	0.40	0.60
CD@5%	0.22	0.30	0.45	9.51	12.55	1.22	1.83

Table AS 72.10.2: Performance of mid-late genotypes at Mandya

Treatment	Single cane weight (kg)	Cane length (m)	Cane girth (cm)	Millable cane ('000/ha)	Cane yield (t/ha)	CCS %	CCS (t/ha)
C0 11005	1.15	1.56	3.36	93.83	114.1	12.24	13.95
Co 11007	1.16	1.62	3.75	95.19	113.8	12.83	14.63
Co 11012	1.68	2.20	3.67	110.00	160.9	14.46	23.26
Co 11019	1.62	2.11	3.30	104.57	155.3	13.69	21.25
CoM 11085	1.18	1.46	3.25	93.02	114.9	12.64	14.61
CoM 11086	1.61	2.11	3.41	105.03	154.6	13.95	21.58
C0 86032	1.46	1.93	3.28	98.39	143.8	13.66	19.64
Co 99004	1.39	1.83	3.50	93.30	135.8	13.01	17.67
S.Em.±	0.07	0.07	0.08	3.73	5.5	0.42	1.01
CD@5%	0.20	0.23	0.24	11.33	16.6	1.28	3.06

11. NAVSARI

Early

Variety V2 (Co 11004) recorded significantly highest NMC (116410/ha) over checks and remained at par with variety V2, V3, V4 and V5. Different varieties did not show any significant effect on cane length and diameter. Variety V4 (Co 11082) recorded significantly highest single cane weight (1.35 kg) and remained at par with the varieties V1, V2 and V8. Significantly highest cane yield (137.20 t/ha) was recorded with variety V4 (C0 11082) over checks and remained at par with varieties V1, V2 and V3. Variety V4 (Co11082) recorded significantly highest CCS yield (19.26 t/ha) over checks and at par with V1, V2, V3 and V5.

Among various quality parameters, brix, fibre % and CCS % were significantly influenced under different varieties. Significantly highest brix was recorded with variety V3 and remained at par with V5, V7 and V8. Fibre % was recorded significantly lowest with variety V1 and remained at par with almost all the varieties except V2 and V3. CCS % was recorded significantly highest with V8 (CoC 671) and remained at par with V3, V4, V5 and Check V7 (**Table AS 72.11.1**).

Mid-late

Variety V6 (CoM 11086) recorded significantly highest NMC (121970/ha) over other varieties and remained at par with variety V5. Cane length and cane diameter was not significantly influenced due to various varieties. V2 (CoM 11086) recorded significantly highest single cane weight (1.31 kg) over checks and remained at par with V1, V4 and V5.Significantly highest cane yield (129.97 t/ha) was recorded with variety V6 (CoM 11086) over checks and remained at par with the varieties V3, V4 and V5. CCS yield was not significantly influenced due to different varieties.

Among various quality parameters, pol % juice, pol % cane and CCS % were significantly influenced with different varieties. Almost all this parameters was significantly highest with variety V7 (Co 86032) and remained at par with V3, V4, V5 and V8 (**Table AS 72.11.2**).

Summary: In early group significantly highest cane yield (137.20 t/ha) was recorded with variety V4 (C0 11082) over checks and remained at par with varieties V1, V2 and V3. Variety V4 (Co11082) recorded significantly highest CCS yield (19.26 t/ha) over checks and

at par with V1, V2, V3 and V5.Significantly highest cane yield (129.97 t/ha) was recorded with variety V6 (CoM 11086) over checks and remained at par with the varieties V3, V4 and V5.

Table AS 72.11.1: Performance of early maturing genotypes at Navsari

Variety	No. of tillers at 120 DAP (000 ha^{-1})	NMC (000 ha^{-1}) at harvest	Cane length at harvest (cm)	Single cane weight (kg)	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})
V_1- Co 11001	150.98	109.72	240.51	1.24	129.76	17.56
V_2-Co 11004	147.05	116.41	272.68	1.26	123.27	16.65
V_3-Co 11081	139.73	107.83	231.53	1.16	119.78	17.27
V_4- Co 11082	144.74	113.05	279.99	1.35	137.20	19.26
V_5-Co 11084	137.14	106.83	253.35	1.10	113.19	16.58
V_6-Co 85004	128.60	98.97	263.19	1.18	104.73	14.17
V_7-Co 94008	126.31	94.19	262.45	1.16	102.55	15.00
V_8- CoC 671	131.80	96.55	265.41	1.29	107.84	16.09
S. Em. ±	5.38	4.82	13.56	0.05	6.64	0.91
C.D. at 5%	16.32	14.62	NS	0.15	20.15	2.75
C.V. %	6.74	7.92	9.08	7.09	9.81	9.46

Table AS 72.11.2: Performance of mid-late maturing genotypes at Navsari

Variety	**No. of tillers at 120 DAP (000 ha^{-1})**	**NMC (000 ha^{-1}) at harvest**	**Cane diameter (cm)**	**Single cane weight (kg)**	**Cane yield (t ha^{-1})**	**CCS yield (t ha^{-1})**
V_1-Co 11005	129.22	110.56	2.50	1.18	112.29	14.28
V_2-Co 11007	137.32	107.52	2.55	1.14	108.16	12.87
V_3-Co 11012	136.95	105.91	2.56	1.17	113.74	15.41
V_4-Co 11019	148.74	105.52	2.62	1.27	115.16	14.22
V_5-Co 11085	150.79	117.99	2.70	1.25	125.31	17.15
V_6-CoM 11086	156.38	121.97	2.72	1.31	129.97	14.56
V_7-Co 86032	152.03	107.46	2.53	1.04	108.19	15.32
V_8- Co 99004	148.20	98.10	2.52	1.14	101.68	13.11
S. Em. ±	5.60	4.51	0.09	0.05	5.57	0.91
C.D. at 5%	16.99	13.69	NS	0.16	16.90	NS
C.V. %	6.69	7.15	6.24	7.48	8.44	10.84

12. KOLHAPUR

Early

No single genotype recorded higher number of millable canes, cane diameter and cane height over respective best standards. However, genotypes CoM 11084 and Co 11001 were at

par with Co 94008 (zonal check) in respect of number of millable canes, genotypes CoM 11082, CoM 11081 and Co 11001 were at par with CoC 671 (zonal check) in respect of cane diameter and genotypes CoM 11082 and Co 11004 in respect of cane height with Co 94008 (zonal check).The genotype CoM 11082 recorded highest single cane weight (1.47 kg) among genotypes and it was found at par with best standard CoC 671 (1.45 kg), Co 94008 (1.36 kg) and genotype CoM 11081 (1.27 kg). The data revealed that though the elite genotypes and standards (zonal checks) showed significant differences in respect of cane and CCS yield, no genotype recorded higher cane yield or CCS yield over best standard. However, CoM 11082 recorded highest cane yield (98.00 t/ha) and CCS yield (15.55 t/ha) among new genotypes and remained at par with standard zonal check Co 94008 for cane yield and with CoC 671 for CCS yield t/ha (**Table AS 72.12.1**).

Mid-late

The growth parameters viz., germination, number of tillers and cane lengthdiffered non-significantly among the genotypes and checks. Co 11007 recorded significantly higher cane diameter (3.45 cm) and single cane weight (1.67 kg) over the best standard Co 86032. The genotype CoM 11086 recorded statistically similar number of millable canes (76110/ha) with best standard Co 86032 and genotypes Co 11019 and Co 11005.Co 11019 (94.67 and 14.87 t/ha), Co 11007 (89.67 cane yield) and CoM 11086 (89.33 t/ha and 12.68 t/ha) recorded significantly higher cane and CCS yield over best standard Co 86032 (91.33 t/ha and 13.31 t/ha) **Table AS 72.12.2**.

Summary: Genotype CoM 11082 recorded highest cane yield (98.0 t/ha) and CCS yield (15.55 t/ha) among the early genotypes. Among mid-late genotypes Co 11019 (94.67 t/ha and 14.87 t/ha), Co 11007 (89.67 t/ha and 10.53 t/ha) and CoM 11086 (89.33 t/ha and 12.68 t/ha) recorded higher but statistically at par cane and CCS yield, respectively over best standard Co 86032.

Table AS 72.12.1: Performance of early genotypes at Kolhapur

Treatment	Cane Yield (t ha^{-1})	CCS Yield (t ha^{-1})	Germination (%) 30 DAP	Tilllers/ ha (000')	No of Mill. Cane/ha (000')	Dia. (cm)	Height (cm)	SCW (kg)	Brix (c)	Sucrose (%)	CCS (%)	Purity (%)
Co 11001	80.00	10.81	42.78	83.67	68.24	2.93	189.66	1.16	20.78	19.17	13.52	92.24
Co 11004	67.17	10.70	38.75	75.16	59.26	2.77	221.34	1.11	22.95	22.15	15.94	96.53
CoM 11081	74.00	11.38	41.94	81.65	55.28	2.94	202.78	1.27	22.55	21.57	15.46	95.69
CoM 11082	98.00	15.55	36.18	79.37	67.50	3.16	230.11	1.47	22.31	21.89	15.86	98.10
CoM 11084	75.97	11.72	36.76	86.05	76.85	2.59	209.55	0.98	22.01	21.36	15.41	97.04
CoC 671	99.00	15.57	32.78	76.96	69.17	3.16	219.00	1.45	22.61	21.81	15.68	96.44
Co 94008	104.33	14.67	33.59	81.40	77.96	3.03	232.33	1.36	20.51	19.63	14.07	95.69
Co 85004	71.90	11.48	35.28	80.83	77.69	2.43	213.56	0.88	22.91	22.17	15.97	96.76
SE±	**7.03**	**1.13**	**3.18**	**3.49**	**3.24**	**0.11**	**4.72**	**0.10**	**0.18**	**0.24**	**0.22**	**0.97**
CD at 5 %	**21.32**	**3.44**	**NS**	**NS**	**9.83**	**0.35**	**14.32**	**0.31**	**0.55**	**0.74**	**0.68**	**2.93**

Table AS 72.12.2: Performance of mid-late genotypes at Kolhapur

Treatment	Cane Yield (t ha^{-1})	CCS Yield (t ha^{-1})	Germi-nation (%) 30 DAP	Tilllers /ha (000')	No of Mill. Cane/ha (000')	Cane Dia. (cm)	Cane Height (cm)	SCW (kg)	Brix (c)	Sucr ose (%)	CCS (%)	Purity (%)
Co 11005	63.73	9.67	36.70	50.73	63.70	2.50	212.78	0.98	22.01	21.17	15.21	96.20
Co 11007	89.67	10.53	50.10	42.44	55.83	3.45	222.78	1.67	18.21	16.71	11.76	91.73
Co 11012	66.43	10.69	38.56	42.88	46.85	2.88	213.33	1.33	22.91	22.25	16.05	97.14
Co 11019	94.67	14.87	54.77	47.81	69.54	2.78	227.78	1.35	23.11	21.96	15.70	95.05
CoM 11085	59.33	9.37	34.35	46.87	44.91	2.92	203.78	1.27	22.58	21.90	15.79	97.02
CoM 11086	89.33	12.68	51.01	50.55	76.11	2.79	222.78	1.16	19.85	19.55	14.18	98.52
Co 86032	91.33	13.31	52.32	46.98	75.65	2.93	224.89	1.20	21.08	20.27	14.56	96.12
Co 99004	61.33	9.50	35.42	48.77	52.04	2.67	236.67	1.18	23.01	21.73	15.49	94.44
SE±	**6.66**	**1.02**	**2.66**	**2.66**	**4.52**	**0.11**	**7.00**	**0.08**	**0.27**	**0.31**	**0.25**	**0.68**
CD at 5 %	**20.21**	**3.09**	**NS**	**NS**	**13.69**	**0.33**	**NS**	**0.24**	**0.82**	**0.93**	**0.74**	**2.06**

13. SANKESHWAR

Early

There was significant difference among the genotypes tested for yield and yield attributes. Significantly higher cane yield (90.58 t/ha), single cane weight (1.63 kg) and CCS yield (11.49 t/ha) was recorded in CoM 11082 and was on par with Co 11001 (86.86 t/ha) and Co 85004 (C) (79.36 t/ha). The lowest cane yield (56.91 t/ha), single cane weight (0.90 kg) and CCS yield (6.99 t/ha) was recorded in CoM 11084. The lowest NMC was recorded in CoC 671 (47,830/ha) and the highest was recorded in Co 85004 (c) (85,930/ha). The cane girth was highest in Co 11001 (2.98 cm) and was lowest in Co 85004 (c) (2.29 cm).

Juice purity did not differ significantly among the genotypes tested. However, rest of the quality parameters differed significantly. The higher POL (19.46%), CCS (13.19 %) and purity (84.91 %) was recorded in CoC 671. The brix % was highest in CoM 11082. The lowest was recorded in Co 94008 for all the quality parameters tested(**Table AS 72.13.1**).

Mid-late

Significantly higher cane yield (91.72 t/ha) and CCS yield (11.17 t/ha) was recorded in Co 86032 and was on par with CoM 11019 (71.47 t/ha) and CoM 11086 (85.57 t/ha). The lowest cane yield (49.56 t/ha) and CCS yield (6.49 t/ha) was recorded in Co 11005. The highest NMC (71970/ha) was recorded in CoM 11086 and lowest NMC (38,730 /ha) was recorded in Co 11007. Cane girth was highest in Co 11007(3.31 cm) and was lowest in Co 99004 (2.53 cm). Single cane weight was highest in Co 11007 (1.64 kg) and was lowest in Co 11005 (0.97 kg) (**Table AS 72.14.2**).

Juice purity did not differ significantly among the genotypes tested. However, significant differences were noticed for all the other quality parameters tested. The highest values were recorded in CoM 11019 for brix% (23.09), POL% (19.52) and CCS% (13.21). The lowest were recorded in Co 11007 for brix % (19.09), POL %(16.59) and CCS % (11.39).

Table AS 72.13.1: Performance of early genotypes at Sankeshwar

Treatment	Cane yield (t/ha)	NMC (000/ha)	Cane girth (cm)	Single cane weight (kg)	CCS yield (t/ha)
Co 11001	86.86	56.73	2.98	1.56	10.13
Co 11004	62.36	49.23	2.70	1.25	8.01
CoM 11081	66.59	56.03	2.66	1.21	8.34
CoM 11082	90.58	55.73	2.73	1.63	11.49
CoM 11084	56.91	62.67	2.30	0.90	6.99
Co 85004(C)	79.36	85.93	2.29	0.92	10.03
Co 94008 (C)	66.99	52.87	2.76	1.25	7.70
CoC 671 (C)	60.88	47.83	2.82	1.27	8.03
Sem ±	6.73	4.47	0.04	0.09	0.88
CD 5%	20.41	13.56	0.13	0.26	2.68

Table AS 72.13.2: Performance of mid-late genotypes at Sankeshwar

Treatment	Cane yield (t/ha)	NMC (000/ha)	Cane girth (cm)	Single cane weight (kg)	CCS yield (t/ha)
Co 11005	49.56	50.57	2.61	0.97	6.49
Co 11007	64.17	38.73	3.31	1.64	7.27
CoM 11012	53.36	41.60	3.05	1.29	6.70
CoM 11019	71.47	60.07	2.58	1.19	9.48
CoM 11085	66.27	54.60	2.98	1.22	8.68
CoM 11086	85.57	71.97	2.75	1.19	10.63
Co 86032 (C)	91.72	69.83	2.87	1.31	11.17
Co 99004 (C)	67.61	50.90	2.53	1.30	8.77
Sem ±	7.77	4.35	0.12	0.07	1.01
CD 5%	23.56	13.20	0.35	0.22	3.07

14. THIRUVALLA

The experiment to evaluate the performance of elite sugarcane genotypes was planted on 27.01.2017and was harvested on 20.01.2018. In the case of early varieties, the germination % and tiller count were influenced significantly by the various genotypes and the highest values for the said parameters were recorded by CoM 11082 followed by Co 94008 under both the spacing (120 and 150 cm). The variation due to genotypes (**Table AS 72.14.1**) were significant for cane length, cane diameter, single cane weight, MCC, cane yield and sugar yield and CoM 11082 recorded the highest value for the said parameters (232.65 and 240.28 cm, 2.99 and 3.07cm, 1.31 and 1.35 kg, 69360 and 74430/ha, 63.90 and 70.72 t/ha, 7.10 and 7.82 t/ha respectively) followed by Co 94008 (228.00 and 235.34 cm, 2.96 and 3.03 cm,1.29 and 1.32kg, 60210 and 65650/ha,55.70 and 62.41t/ha ,5.88 and 6.28 t/ha respectively).

With regard to mid-late varieties (**Table AS 72.14.2**), both the growth and yield parameters were influenced significantly by the genotypes and the highest values for cane length, cane diameter, single cane weight, MCC, cane yield and sugar yield were recorded by Co11007 (255.33 and 262.74 cm, 3.03 and 3.10 cm, 1.52 and 1.57 kg, 72120 and 77770 nos./ha, 69.30 and 75.17 t/ha, 7.60 and 8.25 t/ha) followed by Co 86032(252.33 and

257.14cm, 2.91 and 2.96 cm, 1.49 and1.53 kg, 60180 and 65250 nos./ha, 55.17 and 60.08 t/ha respectively).

Table AS 72.14.1: Performance of early genotypes at Thiruvalla

Treatment	Cane length (cm)	Cane diameter (cm)	Single cane weight (kg)	MCC (`000/ha)	CCS (%)	Cane yield (t/ha)	Sugar yield (t/ha)
120 cm spacing							
Co11001	215.09	2.66	1.08	50.71	10.70	48.80	5.22
Co 11004	214.00	2.53	1.07	48.25	11.11	47.77	5.30
Co M 11081	221.66	2.68	1.17	55.26	10.23	49.59	4.67
Co M 11082	232.05	2.99	1.31	69.36	11.09	63.90	7.10
Co M 11084	203.67	2.50	1.06	45.73	10.70	43.27	4.62
Co 85004	217.05	2.66	1.13	51.65	10.70	49.00	5.20
Co 94008	228.00	2.96	1.29	60.21	10.37	55.70	5.88
CoC 671	218.65	2.68	1.14	52.50	11.44	49.23	5.63
CD (0.05)	4.12*	NS	NS	5.20*	NS	4.65*	1.08
150 cm spacing							
Co11001	220.25	2.69	1.13	55.64	10.69	51.97	5.56
Co 11004	217.20	2.60	1.10	53.70	11.10	49.94	5.54
Co M 11081	230.57	2.80	1.25	60.50	10.21	57.18	5.83
Co M 11082	240.28	3.07	1.35	74.43	11.06	70.72	7.82
Co M 11084	211.59	2.52	1.08	50.38	10.70	46.75	5.01
Co 85004	222.61	2.70	1.17	56.70	10.69	53.10	5.67
Co 94008	235.34	3.03	1.32	65.65	10.37	62.41	6.47
CoC 671	225.45	2.74	1.20	57.19	11.44	54.90	6.28
CD (0.05)	4.27*	NS	NS	5.36*	NS	4.80*	1.12

Table AS 72.14.2: Performance of mid-late genotypes at Thiruvalla

Treatment	Cane length (cm)	Cane diameter (cm)	Single cane weight (kg)	MCC (`000/ha)	CCS (%)	Cane yield (t/ha)	Sugar yield (t/ha)
120 cm spacing							
Co 11005	210.24	2.67	1.18	46.74	10.48	44.33	4.83
Co 11007	255.33	3.03	1.52	72.12	10.97	69.30	7.60
Co 11012	190.32	2.65	1.13	45.08	11.18	42.87	4.97
Co 11019	224.15	2.68	1.35	48.27	11.61	45.50	5.28
Co M 11085	245.67	2.79	1.21	58.65	11.32	54.07	6.56
Co M 11086	240.67	2.88	1.38	54.21	11.31	52.23	5.87
Co 86032	252.33	2.91	1.49	60.18	11.13	55.17	5.25
Co 99004	230.00	2.74	1.29	51.64	11.03	47.37	5.22
CD (0.05)	5.74	NS	NS	6.06	NS	5.14	0.60

150 cm spacing							
Co 11005	216.18	2.72	1.24	51.50	10.50	50.12	5.26
Co 11007	262.74	3.10	1.57	77.77	10.97	75.17	8.25
Co 11012	198.52	2.70	1.16	50.10	11.20	48.34	5.41
Co 11019	230.70	2.75	1.40	53.19	11.63	51.17	5.95
Co M 11085	250.95	2.85	1.27	63.68	11.32	51.42	5.82
Co M 11086	246.25	2.94	1.44	59.75	11.33	56.60	6.41
Co 86032	257.14	2.96	1.53	65.25	11.13	60.08	6.68
Co 99004	236.22	2.80	1.35	56.75	11.05	52.76	5.83
CD (0.05)	7.05	NS	NS	7.84	NS	6.75	0.65

EAST COAST ZONE

15. ANAKAPALLE

The experimental soil was neutral in pH (7.45), normal in E.C (0.180 dS/m), low in organic carbon (0.48%), medium in available nitrogen (251 kg N/ha), high in available phosphorus (66.0 kg/ha) and high in available potassium (280 kg K2O/ha).Tiller population at 120 DAP of different new early sugarcane genotypes did not vary significantly. However, higher number of tillers was recorded with the check COC 01061 (169792/ha) followed by COA 13322 (155324/ha). Lowest tiller population was noticed with the variety COC 13337 (130324 /ha).

Length of millable cane differed significantly among varieties. Significantly highest cane length was recorded with the genotype COC 13336 (277 cm) which was on par with all the genotypes except COA 92081 (236 cm) and COC 13337 (193 cm). Number of millable canes at harvest varied significantly (**Table AS 72.15.1**). At harvest COV 13356 recorded significantly higher number of millable canes of 88773/ha which was on par with COA 92081 (82870/ha) and COC 13336 (81945/ha). Lowest number of millable canes was recorded with the genotype COC 13337 (71 643/ha). Among the five new early genotypes COV 13356 recorded significantly higher cane yield of 88.2 t/ha as compared to the genotype CO C 13337 (72.7 t/ha) and found on par with COC 13336 (87.8 t/ha) and COA 13322 (84.1 t/ha).

Significant differences in juice sucrose (%) were not observed with different new early genotypes. However, COA 92081recorded highest per cent juice sucrose of 17.3 %. COA 92081 recorded higher CCS % of 12.99 %. Sugar yield was calculated based on CCS% and cane yield. Highest sugar yield was recorded with the genotype COA 92081 (10.98 t/ha) followed by COV 13356 (9.39 t/ha).

Mid- late

Tiller population of different new mid late sugarcane genotypes at 120 DAP was recorded. Among mid late genotypes CoA 13339 recorded highest tiller population of 143750/ha followed by the check variety Co86249 (138888/ha). Lowest shoot population was recorded with the genotypes CoA12324 (96412) and CoA 11326 (102893). Number of millable canes at harvest was recorded and genotype CoOr 13346 recorded higher number of millable canes of 96296/ha followed by CoV 92102 (94907 /ha). Lowest number of millable canes was recorded with the genotype CoA12324 (89468 /ha). Among the mid late genotypes CoA 11326 recorded (**Table AS 72.15.2**) higher cane yield (86.8 t/ha) than that of the check genotypes CoV92102 (81.3 t/ha) and Co 86249 (82.0 t/ha).Highest juice sucrose

per cent was recorded with the check variety CoV 92102(21.1 %) followedby CoA12324 (20.1 %). Lowest sucrose per cent was recorded with the genotype CoOr 13346 (13.8 %). Lowest sugar yield was recorded with the genotype CoOr 13346 (8.1 t/ha). Highest commercial cane sugar per cent was recorded with the check variety CoV 92102(15.61%) followed by CoA12324 (14.74 %). Lowest sucrose per cent was recorded with the genotype CoOr 13346 (9.4 %).

Summary: Among the five new early genotypes COV 13356 recorded significantly higher cane yield of 88.2 t/ha as compared to the genotype CO C 13337 (72.7 t/ha) and found on par with COC 13336 (87.8 t/ha) and COA 13322 (84.1 t/ha). Among the four new mid late genotypes Co A 11326 recorded higher cane yield of 86.8 t/ha followed by COV 13356 (86.7 t/ha) than that of the check genotypes CoV92102 (81.3 t/ha) and Co 86249 (82.0 t/ha).

Table AS 72.15.1: Performance of early genotypes at Anakapalle

Genotype	Germination (%)	Shoot population at 120 DAP	LMC (cm)	NMC	Cane yield (t/ha)	Sugar yield (t/ha)
COA 13322	87.4	1,55,324	254	76,852	84.1	8.51
COA 13323	65.9	1,37,268	261	76,505	80.7	8.04
COC 13336	71.0	1,48,032	277	81,945	87.8	9.22
COC 13337	82.2	1,30,324	193	71,643	72.7	7.51
COV 13356	81.3	1,45,949	247	88,773	88.2	9.39
COC 01061	99.1	1,69,792	265	77,431	79.2	9.05
COA 92081	82.8	1,42,130	236	82,870	84.5	10.98
C.D (0.05)	14.1	NS	24	9743	9.1	-
C.V (%)	9.6	15.6	5.5	6.8	6.1	-

Table AS 72.15.2: Performance of mid-late genotypes at Anakapalle

Treatment	Germination (%)	Tiller population at 120 DAP	LMC (cm)	NMC	Cane yield (t/ha)	CCS (%)	Sugar yield (t/ha)
CoA 11326	66.7	1,02,893	200.8	90162	86.8	13.09	11.4
CoA12324	61.8	96,412	240.3	89468	84.9	14.74	12.5
Co A 13339	97.0	1,43,750	210.8	93519	86.3	13.63	11.8
Co Or 13346	97.9	1,29,861	215.4	96296	86.7	9.40	8.1
CoV 92102 (Check)	98.0	1,08,680	216.3	94907	81.3	15.61	12.7
Co 86249 (Check)	81.7	1,38,888	251.3	90625	82.0	11.62	9.5

16. CUDDALORE

Early

The results revealed that the genotype CoC 13337 has recorded the maximum germination of 67.35 per cent and it was comparable with the standard CoC 01061, which recorded 66.53 per cent of germination. Whereas, CoC 13336 has recorded the maximum

tiller population of 148980/ha and it was comparable with the standard CoC 01061and genotype CoA 13322, which recorded 144650/ha and 145360/ha of tillers respectively. The results revealed that the genotype CoC 13336 recorded the significantly highest economic shoot of 130250/ha, millable cane population of 122250/ha, cane weight (1.34 kg), cane length (295.7 cm) and cane diameter (2.97 cm).The genotype also recorded significantly the highest cane yield (143.3 t/ha) and sugar yield (17.83 t/ha) and it was on par with the new entry CoC 13337.

Table AS 72.16.1: Performance of early genotypes at Cuddalore

Treatment	Cane yield t/ha	Extraction (%)	Pol (%)	Purity (%)	CCS (%)	Sugar yield t/ha	B:C ratio
CoA 13322	128.6	52.25	13.63	88.88	12.63	15.74	2.86
CoA 13323	124.3	53.14	13.86	89.91	12.77	14.62	2.73
CoC 13336	143.3	53.91	13.95	90.17	12.96	17.83	3.30
CoC 13337	140.3	52.68	13.91	90.07	12.82	17.04	3.21
CoV 13356	124.6	52.37	13.74	90.16	12.75	14.63	2.74
CoC 01061	115.6	52.64	13.82	89.95	12.80	14.77	2.47
CoA 92081	119.6	51.78	13.51	88.14	12.47	13.90	2.59
CD (p=0.05)	6.27	NS	NS	NS	0.62	0.76	

17. NAYAGARH

Early

The experiment was laid out in randomized block design with five genotypes from AVT namely CoA 13322, CoA 13323, CoC 13336, CoC 13337 and CoV 13356 along with two standard check i.e. CoC 01061 and CoA 92081on red laterite soil. The soil was acidic (pH 5.33) in reaction with electrical conductivity of 0.206 dS/m. Available N content was in lower range (155 kg/ha), but the soil was medium in available P (19.6 kg/ha) and (K 164 kg/ha) content. Analysis of variance suggested that there is significant variations among the genotypes (**Table AS 72.17.1**) with respect to cane yield, sucrose %, CCS%, germination %, number of tillers at 180 days and number of millable canes (‘000/ha). The genotype CoA 13323 produced the highest average cane yield of 102.34 t/ha with application of 125 % RD of fertilizer and was closely followed by CoA 13322 (100.45 t/ha) and CoV 13356 (98.64 t/ha).

Mid-late

The experiment was laid out in randomized block design with four genotypes from AVT namely CoA 11326, CoA 12324, CoC 13339, CoOr 13346 along with two standard check i.e. CoV 92102, Co86249. Analysis of variance suggested that there was significant variations (**Table AS 72.17.2**) among the genotypes with respect to cane yield, germination %, number of tillers at 180 days and number of millable canes (‘000/ha). The genotype CoOr 13346 produced the highest average cane yield of 101.5t/ha with application of 125 % RD of fertiliser and was closely followed by CoA 13324 (99.7 t/ha) and CoA 11326 (98.64 t/ha).

Table AS 72.17.1: Performance of early maturity genotypes at Nayagarh

Treatment	Germination % 45 DAP	No of tillers (000/ha) 180 DAP	NMC (000/ha)	Cane yield (t/ha)	Juice Brix %	Juice Sucrose%	CCS %
CoA 13322	54.96	87.51	89.45	100.45	20.42	11.30	11.44
CoA 13323	56.92	89.68	94.92	102.34	20.69	12.14	12.42
CoC 13336	53.83	86.85	86.35	97.64	19.25	11.84	11.55
CoC 13337	54.66	87.51	88.83	96.42	20.15	11.90	12.03
CoV 13356	56.92	87.94	87.75	98.64	19.44	11.68	11.51
CoC 01061	50.48	84.37	85.73	95.11	18.42	11.24	10.69
CoA 92081	54.34	85.25	86.70	94.68	18.82	11.69	11.08
SEm±	1.76	0.98	1.71	1.60	0.597	0.35	0.29
CD at 5 %	5.43	3.03	5.28	4.94	NS	NS	0.90
CV%	5.6	1.96	3.35	2.84	5.28	5.31	4.42

Table AS 72.17.2: Performance of mid-late genotypes at Nayagarh

Treatment	Germination % 45 DAP	No of tillers (000/ha) 180 DAP	NMC (000/ha)	Cane yield (t/ha)	Juice Sucrose%	CCS %
CoA 11326	52.7	85.5	89.4	97.1	17.0	11.5
CoA 12324	51.6	85.3	88.9	99.7	17.3	11.8
CoC 13339	50.2	86.5	87.8	96.7	17.5	11.5
CoOr 13346	57.1	88.8	93.3	101.5	17.7	12.0
CoV 92102	49.1	83.9	86.1	95.4	16.8	11.5
Co86 249	50.2	81.8	85.9	93.5	17.2	11.3
SEm±	1.44	1.39	1.57	1.63	0.36	0.32
CD at 5 %	4.35	4.18	4.74	4.93	NS	NS
CV%	5.57	3.25	3.55	3.36	4.15	5.54

NORTH CENTRAL ZONE

18. PUSA

Early

As examination of the data indicates that 90 cm row spacing recorded significantly higher plant population (183600 /ha) millable canes (126200 /ha) and cane yield (96.2 t/ha). Though, sucrose content juice did not varied significantly.Genotypes had significant impact on growth (**Table AS 72.18.1**), yield and quality of sugarcane. Genotype CoSe 95422 noticed maximum cane yield (104.4 t/ha) which was followed by CoSe 12451 (94.04 t/ha) and CoLk 12207 (91.8 t/ha). Though higher sucrose content juice was obtained with the genotype CoLk 12207 (18.13 %) which was statistically similar to BO 130 (Std.).

Mid-late

Planting of sugarcane at 90 row spacing recorded significantly higher plant population (174100/ha) NMC (113500 /ha) and cane yield (94.1 t/ha). However, sucrose content juice was found to be non-significant.The maximum cane yield of 106.7 t/ha was obtained with the genotypes CoLk 09204 which was followed by BO 91 (Std.) and CoSe 12453. Though, maximum sucrose content juice (18.04 %) was noticed with the genotype CoP 9301 which was followed by CoLk 09204 (17.39 %) and BO 91 (17.29 %).

Table AS 72.18.1: Performance of early genotypes at Pusa

Treatment	Germination (%)	Plant population ($\times 10^3$/ha)	NMC ($\times 10^3$/ha)	Cane yield (t/ha)	Sucrose (%) in juice
Row spacing (cm)					
90 cm	35.5	183.6	126.2	96.2	17.39
120 cm	36.3	150.9	111.1	85.5	17.64
SEm±	1.01	4.78	3.15	2.10	0.095
CD (P=0.05)	NS	13.3	9.4	6.2	NS
Early promising genotypes					
CoLk 12207	34.8	169.8	117.0	91.8	18.13
CoP 12436	38.3	159.1	113.5	85.9	16.93
CoSe 12451	35.6	179.8	128.0	94.0	17.36
BO 130 (std.)	31.7	132.5	100.7	78.2	17.97
CoSe 95422	39.2	195.1	134.0	104.4	17.19
SEm±	1.59	7.08	4.98	3.31	0.151
CD (P=0.05)	4.7	29.7	14.8	9.8	0.45
CV (%)	10.9	10.4	10.3	8.9	2.1

Table AS 72.18.2: Performance of mid-late genotypes at Pusa

Treatment	Germination (%)	Plant population ($\times 10^3$/ha)	NMC ($\times 10^3$/ha)	Cane yield (t/ha)	Sucrose (%) in juice
Row spacing (cm)					
90 cm	35.7	174.1	113.5	94.1	17.13
120 cm	34.6	148.9	101.6	81.4	17.29
CD (P=0.05)	NS	13.3	7.8	6.4	NS
Mid-late promising genotypes					
CoLk 09204	34.5	142.1	102.8	106.7	17.39

CoLk 12209	33.3	140.4	97.5	88.6	17.10
CoP 12438	34.8	165.8	106.8	75.9	16.38
CoSe 12453	36.0	184.7	116.9	90.3	17.07
BO 91 (Std.)	37.3	202.6	124.6	93.3	17.29
CoP 9301 (Std.)	35.0	133.4	96.8	71.8	18.04
CD (P=0.05)	NS	23.0	13.5	11.1	0.84
CV (%)	10.8	11.9	10.5	10.6	4.08

19. SEORAHI

Early

In the tested genotypes of early group, CoP 11438 produced higher germination per cent (56.60), shoot population (160.47 '000/ha), NMC (91.59 '000/ha) and cane yield (94.32 t/ha) followed by the genotypes CoSe 11451, CoP 11437 and CoP 11436. Cane yield was obtained significantly higher i.e. 81.05, 82.96, 94.32 and 87.02 t/ha in CoP 11436, CoP 11437, CoP 11438 and CoSe 11451, respectively as compared to standard genotypes. Sucrose per cent was obtained significantly lower (16.03) in CoP 11436 genotype. Effect of row spacing on NMC and cane yield were recorded significantly higher in 90 cm row spacing treatment but effect on germination, shoot population and sucrose per cent was not significant (**Table AS 72.19.1**).

Mid-late

Sugarcane crop was planted on 24-02-2017 and harvested on 23-03-2018. In the tested genotypes of mid-late group CoSe 11453 produced higher shoot population (129.20 thousand per ha), NMC (104.34) and cane yield (92.08 t/ha) followed by BO 155, CoSe 11453 and CoSe 11454 genotypes. Cane yield was found significantly higher in CoSe 11455 genotype (92.08 t/ha) as compared to check varieties and remaining tested genotypes. Effect of row spacing on Shoot population, NMC and cane yield were found significantly lower whereas the sucrose percent was found maximum (17.45) in 120 cm row spacing treatment. Germination and sucrose percent were not affected significantly with different treatments of genotypes and spacing. Maximum value (18.18) of sucrose per cent was obtained in genotype CoSe 11454 (**AS 72.19.2**).

Summary: Among tested genotypes, maximum sucrose per cent value was obtained in CoSe 11454 in mid-late and CoP 11437 in early group genotype. The treatment with 90 cm row spacing gave significantly higher yield as compared to 120 cm row spacing. Sucrose per cent was not affected significantly with different treatments of spacing but maximum value was obtained in 120 cm row spacing treatments in both mid-late and early group of genotypes.

Table AS 72.19.1: Performance of early genotypes at Seorahi

Treatment	Germination %	Shoot (000/ha)	NMC (000/ha)	Cane Yield (t/ha)	Sucrose %
Genotypes					
CoP 11436	48.84	145.23	92.04	81.05	16.03
CoP 11437	55.32	146.79	92.74	82.96	17.84
CoP 11438	56.60	160.47	98.20	94.32	17.49
CoSe 11451	54.28	149.93	91.59	87.02	17.51
Check					

Bo 130	46.06	140.31	77.45	61.82	17.12
CoSe 95422	48.50	144.73	87.22	72.79	17.31
SEm±	1.73	3.63	2.41	2.55	0.22
CD(P=0.05)	5.12	10.74	7.13	7.53	0.64
Spacing					
90 cm	51.66	148.36	94.42	88.82	17.11
120 cm	51.54	147.46	85.33	71.17	17.33
SEm±	1.01	2.10	1.34	1.47	0.13
CD(P=0.05)	NS	NS	4.12	4.34	NS

Table AS 72.19.2: Performance of mid-late genotypes at Seorahi

Treatment	Germination %	Shoot (000/ha)	NMC (000/ha)	Cane Yield(t/ha)	Sucrose %
Varieties					
Bo 155	53.47	125.50	101.28	81.50	17.63
CoSe 11453	52.78	123.09	99.45	79.59	17.64
CoSe 11454	51.50	120.17	94.44	77.55	18.18
CoSe 11455	54.98	129.20	104.34	92.08	18.15
check					
Bo 91	50.81	111.79	82.62	63.94	17.03
CoP 9301	48.84	114.44	86.88	69.91	17.15
CoSe 93423	48.96	119.39	88.05	72.03	17.01
SEm±	1.61	3.13	2.66	1.93	0.42
CD(P=0.05)	NS	9.15	7.78	5.63	NS
Spacing					
90 cm	51.42	138.46	105.58	82.66	17.34
120 cm	51.82	102.56	82.16	70.65	17.45
SEm±	0.86	1.67	1.42	1.03	0.22
CD(P=0.05)	NS	4.88	4.76	3.01	NS

NORTH EASTERN ZONE

20. BURALIKSON

Early

The varieties were planted on 17th March, 2017 and harvested on 15th February, 2018. The experimental soil was clay loam in texture, medium in organic carbon (0.72 %) and low in available P (19.6 kg P_2O_5/ ha) and medium in available K (238 kg K_2O/ ha) with pH 5.04. Significant difference was recorded among all the varieties in case of yield and the yield attributing characters. Among the varieties local check (CoBln 9101) recorded the higher yield (62.21t/ha) than all the other varieties. However, among the tested varieties, CoLk 12207 (52.22 t/ha) performed better than all other tested varieties. However, no significant difference was recorded in case of spacing (**Table AS 72.20.1**).

Mid-late

The result of varietal performance under different spacing is presented in table**AS72.20.2**. Significant difference was recorded among all the varieties in case of yield and other yield attributing characters. Result revealed that among the varieties local check (CoBln9605) recorded the higher yield (60.84 t/ha) than all the other varieties. However, among the tested varieties, CoLK 09204 (58.82t/ha) recorded the higher yield which is statistically at par with the yield recorded by CoP 9301 (Check) (58.80 t/ha).

Table AS 72.20.1: Performance of early genotypes at Buralikson

Treatment	Germination (%)	No of tillers (‘000/ha) 120DAP	No of tillers (‘000/ha) 150 DAP	NMC (‘000/ha)	Plant ht. (m)	Yield (t/ha)
Variety						
CoLk 12207	46.48	57.66	71.86	67.66	2.15	52.22
CoP 12436	47.67	57.77	64.91	67.01	2.03	46.62
CoSe 12451	53.38	58.92	62.86	64.78	2.1	41.92
Bo130 (check)	37.59	56	54.91	69.77	2.12	45.99
CoSe95422(check)	50.23	64.08	62.88	70.67	2.27	47.97
CoBln 9101 (local check)	59.48	67.04	62.21	74.29	2.3	62.21
CD (0.05)	6.89	5.9	4.48	4.32	0.18	5.2
Spacing						
S1: 90 cm	48.58	66.88	82.56	74.51	2.11	50.56
S2: 120 cm	49.69	63.61	71.98	69.55	2.21	48.42
CD(0.05)	NS	NS	NS	NS	NS	NS

Table AS 72.20.2: Performance of mid-late genotypes at Buralikson

Treatment	Germination (%)	Plant ht. (m)	Plant girth (cm)	No. of tillers (‘000/ha)	NMC (‘000/ha)	Cane yield (t/ha)	Sucrose %
Variety							
CoLK 09204	59.1	2.39	2.42	78.36	65.46	58.82	17.07
CoP 12438	56.1	1.69	2.37	53.11	48.80	39.96	17.42
Cose 12453	44.17	2.00	2.48	73.34	62.40	54.03	16.95
BO91 (Check)	22.95	1.91	2.44	38.49	42.86	36.63	17.12
CoP 9301 (Check)	61.04	2.35	2.52	70.35	66.88	58.80	17.95

CoBln 9605 (local check)	55.14	2.37	2.44	76.95	68.21	60.84	17.48
CD(0.05)	11.92	0.162	NS	11.49	2.34	2.49	0.26
90 cm	49.61	2.19	2.43	73.21	67.42	58.18	17.48
120 cm	49.89	2.02	2.46	55.0	51.80	47.84	17.24
CD(0.05)	NS	0.28	NS	19.91	15.42	9.30	NS

Important Observations:

Best performing genotypes across the centres located in different zones are listed herewith:

Sl. No.	Zone	Early genotypes	Mid-late genotypes	Spacing
1	**North Western**	CoPant 12221, CoLk 12203, Co 12027, Co 12026	CoPant 12226, CoPb 12211, CoS 12232, Co 12029, CoLk 12205, CoH 12263,	At almost all the centres cane yield at 90 cm spacing was significantly superior over that of 120 cm.
2	**Peninsular**	Co 11001, CoM 11081, CoM 11082, CoM 11084	Co 11005, CoM 11085, Co 11012, Co 11019, CoM 11086, Co 11007	Except Thiruvalla all the centres used only 150 cm spacing.
3	**East Coast**	CoC 13336, CoA 13323, CoA 13322	CoOr 13346	No variation in inter-row spacing
4	**North Central**	CoSe 12451, CoLk 12207	CoSe 12453, CoLk 09204	Significant yield improvement at closer spacing (90 cm).
5	**North Eastern**	All genotypes performed similar and below the performance of check varieties.	All genotypes performed similar and below the performance of check varieties except CoLk 09204.	Significant yield improvement at closer spacing (90 cm).

SUMMARY OF THE ACHIEVEMENTS FOR THE YEAR 2017-18

In India sugarcane cultivation is facing continual challenges like escalating cost of cultivation, plateaued productivity of the crop, scarcity of labour, depleting soil fertility and productivity in major sugarcane producing regions. Climate change induced weather aberrations mainly rainfall deficit with erratic distribution along with rising minimum temperature have rendered farming of this crop further challenging. Such a scenario has severely dented the profitability of sugar mills which in turn has resulted in their tapered interest for sugarcane development work in their factory command areas. Farmers on the other hand are not getting timely remuneration for the crop and hence often are not in a position to arrange inputs in time. The silver linings of palpable yield and recovery improvement in sub-tropics, however are enough to boost our morale and continue rigorous testing of applicable technologies. In order to provide user-friendly technology to the growers the Crop Production discipline encompassing Agronomy and Soil Science continues to play important role in devising and testing of such technologies for sugarcane cultivation. During the crop season 2017-18five trials (experiments) were conducted through length and breadth of the country. These were concentrated on aspects such as agronomic evaluation of promising genotypes for their performance potential under variable inter-row spacing and enhanced fertility level, integrated nutrient management schedule for sugarcane production system to ensure soil health and crop productivity, carbon sequestration potential of sugarcane based cropping systems impacting soil health, raising water productivity in sugarcane system through mulching and water application regimes and also to assess the effect of plant growth regulators on germination, growth and cane and sugar productivity. Most of the centres carried out these trials in the true research spirit and reported the results as per the prescribed format. However, Akola faced the constraints like scarcity of irrigation water and could not conduct the trials. A summary table showing no. of centres allotted, conducted and not conducted the stipulated experiments during 2017-18 is given in Appendix I.

The experiment wise summary of the results are presented below:

AS 68: Impact of integrated application of organics and inorganics in improving soil health and sugarcane productivity

The trial initiated during the year 20104-15 with allotment to all the centres. However, during the year 2017-18 only 19 centres carried out the trial.

NORTH WEST ZONE

1. FARIDKOT

Plant cane yield (101.4 t/ha) was the highest with application of FYM @ 20 t/ha + inorganic nutrient based on soil test (T6) which was significantly higher over all other treatments except T5.

2. LUCKNOW

Highest number of tillers (176.9 thousand /ha at 120 days after planting), shoot count (165.3 thousand/ha at 180 DAP), number of millable canes (124.8 thousand/ha), plant cane yield (89.20 t/ha) and sugar yield (10.69 t/ha) were recorded under the treatment where

application of FYM @ 20t/ha was done along with soil test (rating chart) based inorganic fertilizer recommendations.

3. PANTNAGAR

Highest cane yield in ratoon was recorded in the treatment T6 - application of FYM @ 20 tonnes/ha + inorganic nutrient application based on soil test (NPK application). Highest cane yield in T6 was due to higher NMC, cane girth, cane length and weight of individual cane. CCS yield was recorded highest in T5 which was significantly higher over rest of the treatments.

4. UCHANI

FYM 20 t/ ha + 100% RDF through inorganic source (T6) and FYM @ 10 t/ ha + biofertilizer (Azotobacter/ Acetobacter + PSB) + soil test basis (T9) were found best and at par treatments in terms of number of tillers (146.4, 144.3 thousands/ha) , millable canes (116.5, 117.2 thousands/ha) and cane yield (101.3, 99.8 t/ha) and sugar yield (12.79, 12.27 t/ha) as compared to rest of the treatments.

5. KAPURTHALA

Soil test based fertilizer application (190 kg N ha-1) along with 20 t ha-1 FYM produced highest plant cane yield that was statistically similar under treatment T3, T5 and T9 but it was significantly higher over the cane yield produced under remaining treatments. Cane yield produced under treatments T2, T4 and T7 were also similar but significantly higher than the cane yield under treatment T1.

6. SHAHJAHANPUR

Application of FYM @ 10 tonnes/ ha + bio – fertilizers (Azotobacter + PSB) + application of nutrients on soil test basis (NPK) produced significantly higher cane yield (114.10 t/ha) than that of other treatments. CCS% in cane was found to be more or less similar.

7. SRIGANGANAGAR

Cane yield (80.3 t/ha) was the highest with the application of FYM @ 20 tones/ha + inorganic nutrient based on soil test (T6) which was significantly higher over other treatments except T5 – application of FYM @ 20 q/ha + 100% RDF (77.9 t/ha), T9 - Application of FYM/Compost @ 10 t/ ha + biofertilizer (Azotobacter/ Acetobacter + PSB) + soil test basis NPK application (77.1 t/ha) and T8 - Application of FYM/Compost @ 10 t/ ha + biofertilizer (Azotobacter/ Acetobacter + PSB) + 100% RDF (75.2 t/ha).

PENINSULAR ZONE

8. THIRUVALLA

In both the ratoon crops (I & II) among the various treatments T8 (FYM/compost @ 10 t/ha + biofertilizer (*Azotobacter/Acetobacter* + PSB) +100 RDF) recorded significantly higher values for cane length (265.07 and 255.83 cm, respectively), MCC (73240 and 71320/ha) and resulted in maximum yield (81.10 and 74.48 t/ha).

9. MANDYA

The data indicated that, application of FYM @ 20 t/ha + inorganic nutrient application based on soil test results recorded significantly higher cane yield (156.93 t/ha) compared to

all other treatments. However, it was on par with application of FYM @ 20 t/ ha + 100% RDF (141.30 t/ha), application of FYM @ 10 t/ ha + biofertilizer (Azotobacter + PSB) + 100% RDF (146.27 t/ha) and application of FYM @ 10 t/ha + biofertilizer (Azotobacter + PSB) + soil test basis fertilizer application (149.80 t/ha).

10. SANKESHWAR

Soil test based nutrients application along with 20 t/ha farm yard manure recorded highest plant cane yield (119.83 t/ha), number of millable canes (97500/ha) and CCS yield (11.36 t/ha). However, treatments with soil test based nutrients application recorded on par cane yield irrespective of application of organics and microbial inoculants. The lowest cane yield (92.43 t/ha) was recorded in 50 percent inorganics without any organics application.

11. PADEGAON

Sugarcane (CoM 0265) was planted on 02.202.2017 and harvested on 07.03.2018. Higher cane yield (176.94 t/ha), CCS yield (21.15 t/ha) and number of millable cane (83093) were observed in treatment T6 receiving RDF as per soil test along with 20 t/ha FYM and it was found at par with treatment T9, T5 and T8. The brix, sucrose (%), CCS (%) and purity (%) were found to be non-significant.

12. NAVSARI

The first ratoon crop was initiated on 12.12.2016 and harvested on 18.12.2017. Ratoon cane yield (120.15 t/ha) was recorded significantly highest with T9 over T3 and remained at par with T4, T5, T6 and T7. CCS yield was not significantly influenced due to various nutrient management treatments. Various quality parameters were not significantly influenced due to different nutrient management treatments at 10 and 12 months.

13. COIMBATORE

In second ratoon sugarcane crop, 20 t FYM + 150 STCR based fertilizer application was found beneficial in improving cane yield over rest of the nutrient management treatments. The treatment 20 t FYM + 150 STCR based fertilizer application recorded the highest NMC (95150 NMC/ha) and cane yield (84.56 t/ha). Sugarcane juice analysis done at 12 months revealed that Sucrose %, Purity % and CCS % were not influenced significantly by application of organics and inorganics.

14. PUNE

The results concluded that application of FYM /compost @ 10 t/ha with inorganic fertilizer based on soil test and biofertilizer or application of FYM /compost @ 20 t/ha with inorganic fertilizer based on soil test increased cane yield by 13.4 t/ha.

EAST COAST ZONE

15. CUDDALORE

Application of FYM/Compost @ 10 tones/ha + biofertilizers (*Acetobacter* + PSB) + soil test based NPK fertilizer recorded significantly the maximum cane yield (157.69 t/ha), CCS (12.35 %) and sugar yield (19.47) with B:C ratio of 3.37 and it was comparable with treatment (T8) application of FYM/Compost @ 10 tonnes ha-1 + biofertilizer (*Azotobacter* + PSB) + 100 % RDF.

16. ANAKAPALLE

The results indicated that application of FYM @ 10 t/ha + biofertilizer + 100% inorganic nutrient (87.6 t/ha) or application of FYM @ 10 t/ha+ biofertilizer+ inorganic nutrient application based on soil test (86.9 t/ha) registered significantly higher cane yield as compared to the other treatments. Application of trash at 10 tonnes /ha + 50% RDF registered lowest cane yield of 69.7 t/ha.

17. NAYAGARH

Results obtained from plant crop indicated that application of FYM/Compost @ 10t/ha + Azotobacter + PSB with 100% RDF (T8) and application of FYM/Compost @ 10t/ha + Azotobacter + PSB + Soil test based (NPK) fertilizer application (T9) recorded higher percentage of germination at 45 DAP i.e. 55.56 and 60.59%, respectively. The NMC and Cane yield were 86660 & 93.04 t/ha in T8 and 91500 & 98.35 t/ha in T9, respectively. This exhibits the positive effect of organic manures and bio fertilizers on cane yield

NORTH CENTRAL ZONE

18. SEORAHI

Application of FYM @ 10 t/ha+ Bio-fertilizer (Azotobacter + PSB) + soil test basis (NPK Application) gave significantly higher cane yield at par with FYM @ 10 t/ha+ Bio-fertilizer (Azotobacter + PSB) +100 per cent RDF and FYM @ 20 t/ha + Inorganic nutrient application based on soil test. Sucrose percent was not affected significantly by different treatments.

19. PUSA

Integrated application of nutrients was found effective in improving soil fertility and cane yield. The application of fertilizers on soil test i.e. 200 kg N, 100 kg P2O5 and 100 kg K2O along with organics @ 20 t/ha was found suitable for boosting cane yield and maintaining soil fertility in calcareous soil of Bihar.

IMPORTANT OBSERVATIONS:

The experiment was carried out at 19 stations out of allotted 24. Following salient points emerged from findings:

- Combined application of organic and inorganic sources of nutrients was found conspicuously better over the use of fertilizers alone across the centres located in different agro-climatic conditions.
- Sugarcane trash used as mulch in ratoon crops has little contribution as a source of nutrients as organic amendments like FYM or compost recorded significant improvement in cane and sugar yield over that with trash mulching under the use of recommended dose of fertilizers across the locations.
- Use of organic sources of nutrients in plant ratoon system brings about substantial enhancement of soil health parameters in most of the sugarcane growing soils.

AS 69: Use of plant growth regulators (PGRs) for enhanced yield and quality of sugarcane

The trial was initiated during 2015-16 with an objective to assess the response of sugarcane crop to plant growth regulators for improvement in germination, growth and yield of the crop. The trial was allocated to all the centres however, only 21 centres conducted the trial. Centre wise summary is given below.

NORTH WEST ZONE

1. FARIDKOT

Germination of sugarcane was better with treating the seed by 50 &100 ppm ethrel solution than no treatment. Ethrel helped in advancing the germination process helping in higher germination at early stage. The highest cane yield (94.7 t/ha) was observed in T8 (planting of setts after overnight soaking in 100 ppm ethrel solution and GA3 (35 ppm) spray at 90, 120 and 150 DAP).

2. KOTA

Based on three years data, combination of PGR, planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 spray at 90,120,150 DAP was found effective for increasing plant growth characters viz., plant height, tillers, leaf area, root dry weight, number of millable cane, cane weight, cane yield and also quality parameters i.e. Brix, Sucrose (%), CCS (%) CCS yield, purity (%), GR and NR which was significantly superior over T1 and T2 treatments and at par with rest of treatments .followed by T 7- Planting of setts after overnight soaking in 50 ppm ethrel solution + GA3 (35 ppm) spray at 90, 120 and 150 DAP treatment also same trend.

3. KAPURTHALA

Overnight setts soaking in water and pre-soaked cane with 100 ppm ethrel solution followed by GA3 (35 ppm) spray at 90, 120 and 150 DAP produced cane statistically similar single cane weight but it was significantly higher over the single cane weight of rest of treatments. Cane yield under treatment T8 was significantly higher than the cane yield under all other treatment which was followed by cane yield under treatment T7 and T4.

4. LUCKNOW

The finding of the AICRP on sugarcane experiment use of plant growth regulators (PGRs) on yield and quality of sugarcane conducted during 2017-18 at ICAR- IISR, Lucknow revealed significantly higher cane bud germination in overnight ethrel soaked setts treatment over conventional and water soaked treatment however 50 and 100 ppm overnight ethrel solution soaked treatments germination per cent was statistically at par. The higher cane yield (98.90 t/ha) was recorded in the planting of setts after overnight soaking in 100 ppm ethrel solution and three GA3 spray (35 ppm) at 90, 120 and 150 days after planting.

5. PANTNAGAR

Germination%, higher shoot population, higher NMC, higher cane weight, length of the cane were recorded in the treatment T4 and T8 of ethrel soaking of setts @ 100 ppm which was triggered by GA3 application 35 ppm applied at 90, 120 and 150 DAP. Higher cane yield in T6 was the result of heavier cane (individual cane), higher NMC, cane length and cane girth. Initial plant population however was lower than T7 and T5 but due to better fertility

status of the soil shoot population was higher at 120, 150 and 180 DAR. CCS yield and sucrose % were also higher in T6 followed by T5 and found at par. Juice cane yield, CCS yield and sucrose % at harvest were higher in T5 and T6 so available sugar % at harvest was highest in T6 followed by T5.

6. SHAHJAHANPUR

Germination % recorded under overnight soaking in 100 ppm ethrel solution was at par with overnight soaking in 50 ppm ethrel solution and it was significantly superior to conventional and overnight soaking in water. Planting of setts after overnight soaking in 100 ppm etheral solution + Gibberellic acid (35 ppm) resulted significantly higher cane yield (90.00t/ha) than those of other treatments.

7. UCHANI

Dipping of setts in 50 ppm and 100 ppm ethrel being at par recorded significantly higher germination at 20, 30, 40 and 50 DAP as compared to control and water soaked treatments. Soaking of setts in 50 ppm ethrel+ GA3 spray (T7) and 100 ppm ethrel+GA3 (T8) being at par recorded significantly higher number of tillers, NMC, cane yield and sugar yield as compared to soaking of setts in ethrel at 50 and 100 ppm ethrel alone, conventional practices with and without GA3 and water soaking treatments with and without GA3 spray at 90, 120 and 150 Days after planting.

8. SRIGANGANAGAR

The highest cane yield (99.7 t/ha) was recorded in T8 (planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 (35 ppm) spray at 90, 120 and 150 DAP which was significantly better than T1, T2 and T5 but at par with T7 - T3 + GA3 (35 ppm) spray at 90, 120 and 150 DAP (98.8 t/ha), T4 - Planting of setts after overnight soaking in 100 ppm ethrel solution (95.7 t/ha), T6 - T2+ GA3 spray (35 ppm) at 90, 120 and 150 DAP (94.6 t/ha) and T3 - Planting of setts after overnight soaking in 50 ppm ethrel solution (94.4 t/ha).

PENINSULAR ZONE

9. PADEGAON

The germination was found significantly higher with planting of setts after overnight soaking in 50 ppm ethrel solution followed with GA3 spray (T7) and it was found at par with treatments T3, T5, T6 and T8 at 40 DAP and with T4 and T6 at 50 DAP. The planting of setts after overnight soaking in 50 ppm ethrel solution with GA3 spray (35 ppm) at 90, 120 and 150 DAP (T7) recorded significantly the highest cane yield while CCS yield was not affected significantly by different treatments. All quality parameters like, brix, sucrose (%), purity (%) and CCS (%) were not affected by different treatments.

10. NAVSARI

Significantly highest cane yield (121.48 t/ha) was noticed with treatment T8 (planting of setts after overnight soaking in 100 ppm ethrel solution + GA3 (35 ppm) spray at 90, 120 and 150 DAP) but remained at par with T3, T4, and T7 over T1. CCS yield was recorded significantly highest with T4 and found at par with T3, T6, T7 and T8. Various quality parameters were not significantly influenced due to different treatments.

11. MANDYA

Overnight soaking of setts in 100 ppm ethrel solution followed by 35 ppm GA3 spray at 90, 120 and 150 DAP found to enhance the germination percentage and cane yield. However, at par yield to above treatments was also recorded in overnight soaking of setts in 100 ppm ethrel solution.

12. POWARKHEDA

The cane yield increased significantly due to planting of setts after overnight soaking in 50 ppm ethrel solution (126.95 t/ha) as compared to T2 + GA3 (35 ppm) spray at 90, 120 and 150 DAP (117.90 t/ha), planting of setts after overnight soaking in water (118.21 t/ha), T1 + GA3 (35 ppm) spray at 90, 120 and 150 DAP (119.03 t/ha) and conventional planting/Farmers practice (3- bud setts) (119.24 t/ha).

13. PUNE

The pooled results of the three plant crops indicated that, maximum germination (62.94%) at 30 DAP, NMC (0.81 lakh/ha), cane girth (11.60 cm), cane yield (167.22 t/ha) and B:C ratio (1:3.17) was recorded when the setts were overnight soaked in 100 ppm Ethrel before planting and foliar spraying of Gibberellic acid 35ppm at 90,120 &150 DAP. The maximum tillering (1.34 lac/ha) at 120 DAP was found in overnight soaking of setts in 50 ppm Ethrel and spraying of G.A. (35ppm).

14. THIRUVALLA

Maximum cane length (260.33 cm), MCC (83180/ ha), cane yield (111.23 t/ha) were recorded under T8. Sugar yield also showed same trend and recorded significantly higher value (11.60 t/ha) for the very same treatment (T8). There was some variation in the soil fertility parameters prior to and after the conduct of the trial (Table AS 69.13.1). The highest BC ratio of 1.40 was also recorded by T8.

15. SANKESHWAR

Overnight soaking of setts in water or 50 ppm ethrel solution followed by GA3 sprays at 90, 120 and 150 days after planting and overnight soaking of setts in 100 ppm solution alone without any sprays to the crop further has enhanced the germination percent, cane yield and yield attributes without impairing the quality parameters.

16. KOLHAPUR

The conventional planting of 2-bud sugarcane setts with GA3 spray (35 ppm) at 90, 120 and 150 DAP) recorded numerically higher cane yield (100.83 t/ha) whereas, planting of 2-bud setts after overnight soaking in 50 ppm ethrel solution recorded numerically higher CCS yield (14.55 t/ha).

EAST COAST ZONE

17. ANAKAPALLE

During 2017-18 studies on use of plant growth regulators (PGRs) for enhanced yield and quality of sugarcane was studied at Regional Agricultural Research Station, Anakapalle and plant growth regulators influenced was not observed on growth as well as yield of sugarcane as the crop was affected due to yellow leaf disease. Pooled mean indicated that highest number of millable canes (69,728 /ha) and cane yield (75.3 t/ha) was noticed with planting of setts after overnight soaking in 100 ppm ethrel solution +GA3 Spray (35 ppm) at 90,120 and 150 DAP.

18. CUDDALORE

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 canes (175630/ha), cane yield (148.65 t/ha), CCS (12.78 %) and sugar yield (19.00 t/ha).

19. NAYAGARH

Planting of setts after soaking in 100 PPM ethrel solution along with GA3 spray at 90, 120 & 150 DAP proved to be the best with highest number of net millable canes (90.11 thousand/ha), cane yield (102.97 t/ha) and CCS yield (12.82.t/ha).

NORTH CENTRAL ZONE

20. PUSA

On the basis of economics, planting of setts after overnight soaking in 50 ppm ethrel solution was found optimum as it has resulted in statistically comparable yield (96.3 t/ha) and B : C ratio (1.26) over higher level of ethrel and GA3 application.

NORTH EASTERN ZONE

21. BURALIKSON

In case of cane yield planting of setts after overnight soaking in 100 ppm ethrel solution followed by spraying of GA3 spray (35ppm) at 90,120 and 150 DAP recorded the higher yield (71.1 t/ha) followed by planting of setts after overnight soaking in 50 ppm ethrel solution followed by spraying of GA3 spray (35ppm) at 90,120 and 150 DAP (68.5 t/ha). The same treatment also recorded also higher growth parameters than all other treatments.

Important Observations:

- There was significant improvement in the rate and extent of germination of sugarcane due to overnight soaking of setts in ethrel solution.
- The effective concentration of ethrel solution for germination improvement was found to be 100 ppm in north western zone and east coast zone and 50 ppm in peninsular, north central, north eastern zones.
- Foliar spray of GA_3 during tillering phase could not improve the cane yield significantly over sett soaking in ethrel solution at most of the centres.

AS 70: Scheduling irrigation with mulch under different sugarcane planting methods

The trial was initiated during 2016-17 and was allocated to all the centres. In all 18 centres carried out the trial as per common technical programme for the year. Centre wise summary of findings are given below.

NORTH WEST ZONE

1. FARIDKOT

Among the planting methods paired row trench planting with trash mulching recorded maximum (100.7 t/ha) and significantly higher cane yield than all methods of planting. Trash mulching resulted in significantly higher cane yield than without trash mulching irrespective of planting methods. Cane yield increased successively and significantly with increase in irrigation water application from 0.6 to 1.0 IW/CPE. Apparent water productivity (AWP) and total water productivity (TWP) were significantly higher in paired row trench planting than conventional planting.

2. KOTA

Based on the two year of study, it can be concluded that paired row trench planting (30:120 cm row spacing) with organic mulching sugarcane trash @ 6 t/ha was found better with respect to number of tillers, plant height, millable canes, cane yield, cane weight, brix (%) and water use efficiency, resulted in significantly higher net return over P1 and P2 planting methods. However, irrigation water at IW: CPE ratio of 0.80 was found economical in sugarcane yield when compared with 0.60 and 1.00 IW: CPE ratios and also noted significantly enhancement in economics with each successive increase in irrigation regimes from 0.60 to 0.80 IW: CPE ratio which was proportionally more than the increase in irrigation water i.e. IW: CPE ratio of 1.00.

3. KAPURTHALA

Paired row trench planting with mulch produced significantly higher cane yield than other planting methods (105.1 t/ha). Planting sugarcane in paired row without mulch (97.3 t/ha), in single row with mulch (95.6 t/ha) and without mulch (92.1 t/ha) produced statistically similar cane yield.Irrigations scheduling did not significantly influence the germination %, plant height at 150 DAP and cane diameter whereas other parameters were significantly influenced by irrigation scheduling. Irrigation application at IW/CPE ratio 1.0 produced significantly higher no of shoots and that were at par with irrigation application at IW/CPE ratio 0.8 but these were significantly better over irrigation application at IW/CPE ratio 0.6.

4. LUCKNOW

Sugarcane yield (114.3 t/ha) was significantly higher under paired-row trench planting with trash mulching than conventional flat method of planting along with trash mulching (101.9 t/ha) followed by paired-row trench planting with no mulching (98.3 t/ha) and conventional flat method of planting with no mulching (95.9 t/ha).The WUE was found maximum under paired-row trench planting with trash mulching (0.982 t/ha- cm) followed by conventional flat method of planting with trash mulching (0.877 t/ha-cm) and paired-row trench planting (0.845 t/ha-cm).

5. PANTNAGAR

On the basis of present study it was observed that significantly higher cane yield and NMC were recorded in paired row planting (30: 120) with mulch over flat and with or without mulch. However germination % at 45 DAP could not influenced due to method of sugarcane planting and use of mulch. Cane yield was highest in 1.0 IW/CPE ratio over 0.6 IW/CPE. Cane yield was statistically similar in 0.8 or 1.0 IW/CPE ratio.

6. SHAHJAHANPUR

Paired row trench planting (120:30 cm row spacing) with organic mulch@ 6 t/ha produced higher cane yield (79.17 t/ha) and maximum water use efficiency (1109.30 kg/ha cm) than those of other planting methods and mulch practices. Irrigation schedule at 1.00 IW/CPE ratio (I3) produced significantly higher cane yield (79.80t/ha) with minimum water use efficiency (1088.75) followed by 0.80 IW/CPE ratio (I2) with cane yield of 75.58 t/ha and water use efficiency (1228.25 kg/ha cm).

7. UCHANI

Significantly higher germination, tillers, NMC, cane weight and cane yield were recorded in paired row trench planting (30:120 cm) as compared to conventional planting at 75 cm row

spacing. Trash mulching resulted in significantly higher cane yield as compared to without mulching treatments. Interaction between method of planting and irrigation levels was found non-significant. Total (Irrigation+ rainfall) water was calculated as 175.7, 190.7 and 205.7 cm in conventional and 153.7, 162.7 and 171.7 cm in paired row trench planting at 0.6, 0.8 and 1.0 IW/CPE irrigation schedule, respectively. Highest yield of cane produced/1000 litres of irrigation (12.18 kg) water was recorded in trench planting at 0.8 IW/CPE irrigation schedule

PENINSULAR ZONE

8. PADEGAON

Furrow planting (120 cm row spacing) with green manure (sunnhemp) sown at 30 DAP, mulched at 75 DAP followed by earthing-up at 110 DAP (P2) was found significantly superior for cane and CCS yields. While irrigation schedules not affects the Cane and CCS yields. The higher water use efficiency was recorded in Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing –up with green manure/brown mulching (P4) and irrigation schedule with 0.60 IW/CPE. (I1). All quality parameters were found to be non-significant.

9. POWARKHEDA

Results revealed that the cane yield was influenced significantly due to different planting methods. Furrow planting (120 cm row spacing) with green manure (cowpea) sowing at 30 DAP, mulching at 75 DAP and earthing -up at 110 DAP recorded higher cane yield of (104.82 t/ha) than Furrow planting (120 cm row spacing) with alternate skip furrow irrigation, after earthing- up without mulching (97.44). Significantly higher cane yield obtained at I3 1.00 (102.49 t/ha) as compared to cane yield recorded with I1 0.60 (97.23) but at par in I2 0.80 (100.35 t/ha).

10. MANDYA

Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing up + *dhaincha* green manure mulching found to enhance the water use efficiency and gave at par yield as that of 120 cm row spaced furrow planting with *dhaincha* green manure with full irrigation at IW/CPE ratio 1.0.

11. NAVSARI

Significantly highest cane (114.19 t/ha) and CCS (15.24 t/ha) yield was noticed with planting method P4 but cane yield remained at par with P2 over other methods and CCS yield at par with P1 and P2. Significantly highest cane (118.62 t/ha) and CCS (15.82 t/ha) yield was observed with irrigation level I3 over I1 and I2.

12. THIRUVALLA

The growth and yield attributes recorded in P4 (furrow planting at 120 cm spacing with alternate skip furrow irrigation after earthing up + green manure/brown mulching was significantly superior to other planting methods and mulch practices tried. The maximum cane length (262.56 cm), cane diameter (3.18 cm), single cane weight (1.56kg), MCC (82000/ha), cane yield (101.0 t/ha) and sugar yield (9.47 t/ha) were recorded by P4. With regard to irrigation schedule, the highest value for cane length (259.92 cm), cane diameter (3.10 cm), MCC (77020/ha), cane yield (81.55 t/ha) and sugar yield (7.99t/ha) were recorded by I3 (IW/CPE ratio 1.00).

EAST COAST ZONE

13. ANAKAPALLE

Studies on scheduling irrigation with mulch in sugarcane indicated that significantly higher cane yield (85.0 t/ha) was recorded in scheduling irrigations at frequent intervals at 1.0 IW/CPE (I3) as compared to scheduling irrigations at longer intervals at 0.6 IW/CPE (74.0 t/ha) and on par with scheduling irrigation at IW/CPE of 0.8 (79.5 t/ha) treatments. Furrow irrigation with mulching recorded significantly higher cane yield of 83.7 t/ha over all the other treatments. Interaction effect was found non-significant.

14. CUDDALORE

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 (142.56 t/ha), sugar yield (18.13 t/ha) and B:C ratio of 3.65 and adopting the IW/CPE ratio of 1.0 recorded significantly the maximum cane yield (136.14 t/ha), sugar yield (16.99 t/ha) and B:C ratio 3.64.

15. NAYAGARH

Furrow planting (120 cm row spacing) with alternate skip furrow irrigation after earthing-up + brown mulching method produced higher NMC and cane yield of 91442/ha and 100.59 t/ha respectively which was closely followed by furrow planting (120 cm row spacing) with brown mulching (NMC and cane yield 90699/ha and 100.06 t/ha). Irrigating the crop at IW/CPE ratio of 1.0 produced highest NMC and sugarcane yield of 92930/ha and 106.30 t/ha, respectively which is significantly different from irrigating the crop at IW/CPE ratio of 0.6 (NMC and cane yield 85.03'000/ha and 92.433 t/ha respectively).

NORTH CENTRAL ZONE

16. PUSA

Paired row trench planting (30: 120 cm row spacing) with trash mulching @ 6 t/ha (P3) being at par with paired row trench planting (30: 120 cm row spacing) without trash mulching (P4) produced significantly higher millable canes (143300/ha) and cane yield (99.5 t/ha) over other planting methods.Among the levels of irrigation, irrigation scheduled at IW: CPE ratio 1.00 recorded the significantly higher plant population (224500/ha), cane diameter (2.37 cm) and millable canes (125000/ha).

17. SEORAHI

Among planting methods, paired row trench planting (120:30 cm row spacing) with organic mulch @6t/ha (P3) treatment gave significantly higher germination per cent, shoot population, NMC and cane yield over conventional flat planting (75 cm row spacing) with organic mulch @6t/ha (P1) and conventional flat planting (75 cm row spacing) without mulch (P2) treatments but among the irrigation scheduling IW/CPE 1.0 ratio was found the best. Cane yield increased with increase in IW/CPE ratio. Sucrose per cent was not affected significantly with different treatments.

NORTH EASTERN ZONE

18. BURALIKSON

Data revealed that no significant difference was observed among the irrigation schedule on yield and quality of sugarcane. However, the highest cane yield was recorded by paired row trench planting (30:120 cm row spacing) with organic mulching @ 6 t/ha (88.92t/ha) which is statistically at par with paired row trench planting (30:120 cm row spacing without mulch (86.70t/ha) but superior over other two planting methods. Moreover, no significant differences were recorded in case of quality of sugarcane.

Important Observations: The experiment was initiated during the year (2016-17) and was allotted to all the centres, however only 18 centres carried out the trial as per the technical programme. Salient findings are enumerated below:

- Planting of sugarcane in paired rows (120: 30) with mulching of trash (6 t/ha) in the inter-row spaces out yielded the conventional flat method with or without mulch at all the centres in north western, north central and north eastern zones. Being in the climatic region of high evaporative demand sugarcane crop responded up to 1.0 IW/CPE irrigation regime in the zones, however similar yields have been recorded with 0.8 IW/CPE ratio at many centres. Trash mulching could effectively save 20-26% irrigation water over no-mulching.
- Sugarcane crop in peninsular and east coast zones responded to furrow planting (120 cm) and skip furrow irrigation combined with the use of leguminous crop as green manure till 75 DAP, as a mulch during tillering and thereafter residue incorporation. As far irrigation regimes, IW/CPE ratio 1.0 was found to result in higher cane productivity, however it can be restricted to 0.8 for getting higher water use efficiency in these zones.
- Use of mulch in sub-tropical zones and green manuring followed by mulching and residue incorporation resulted in higher net return.

AS 71: Carbon sequestration assessment in sugarcane based cropping system

The trial was initiated during 2016-17 with allocation to all the centres. In all 15 centres conducted the trial in accordance with the approved technical programme.

NORTH WEST ZONE

1. FARIDKOT

During 2017-18 wheat yield was significantly higher when sown after rice. The wheat following sugarcane was significantly better in T7 and T8 than T3 and T4. Sugarcane yield was better in T3, and T7 where trash was incorporated and was significantly higher than T4, T6 and T8 where trash was removed. Cane equivalent yield was also higher in T3, T5 and T7 than other treatments

2. KOTA

Based on the two year study of soil properties, it can be concluded that soybean-wheat - moongbean (residue retention with *Trichoderma*) treatment was found better with respect to significantly enhancement in OC, infiltration rate, bulk density, WHC and Nutrient status of

soil over T3 and T4 treatments. Whereas in case of ratoon T6 recorded significantly higher germination, tillers, plant height, cane diameter, cane weight, cane yield as well as juice quality parameters over rest of treatments.

3. KAPURTHALA

Cane equivalent yield was significantly higher in T3 that was at par with cane yield in treatments T5, T6 and T7 but it was significantly higher than the yield under remaining treatments.

4. LUCKNOW

Ratoon crop yielded 109.8 t/ha in sugarcane based cropping system. Higher wheat yield (46.9 q/ha) was recorded in sugarcane based cropping system just after harvest of ratoon crop as compared to 35.9 q/ha in rice-wheat system. Residue retention with *Trichoderma* in wheat improved the wheat yield by 11.2% in rice-wheat based cropping system. However, trash mulching with *Trichoderma* in ratoon crop improved the cane yield by 9.5% as compared to mulching without *Trichoderma*.

5. PANTNAGAR

Highest cane yield and wheat yield in ratoon recorded in T5 – Trash mulching with *Trichoderma*. Sucrose % in ratoon at harvest was not influenced by trash mulching or removal. There was no significant difference in organic carbon build up in any of the treatment however highest organic carbon % was recorded in T5 – sugarcane-ratoon (trash mulching with *Trichoderma*) – wheat.

6. UCHANI

Higher cane equivalent yield was recorded in Sugarcane plant- ratoon-wheat cropping system as compared to Rice- wheat cropping system. Highest cane equivalent yield of 115.4, 115.0 and 110.0 t/ha was recorded in treatment T7 (sugarcane – Ratoon- Wheat (ZT) without Trichoderma, T5 (sugarcane – Ratoon (trash mulch with Trichoderma) – Wheat) and T3 (sugarcane – Ratoon (trash mulch without Trichoderma) – Wheat). Physical properties of soil were adversely affected in treatment T1 and T2 after harvest of puddled transplanted rice. The bulk density increased from 1.63 (initial) to 1.72 g/cc after harvest of rice crop. The bulk density and WHC improved after rice residue retention in wheat crop through happy seeder machine in treatment T1 and T2. Sugarcane proved superior in maintaining soil physical properties in comparison to puddled transplanted rice- wheat rotation.

PENINSULAR ZONE

7. PADEGAON

During 2017-18 soybean grain yield recorded in treatment T1 was 10.6 q/ha and T2 11.6 q/ha while wheat grain yield was recorded in T1 was 29.39 q/ha and T2 was 31.01 q/ha. Mean sugarcane ratoon yield was observed to be 72.9 t/ha to 100.8 t/ha.

8. NAVSARI

NMC (111430/ha) was recorded significantly higher with treatment T5 over T7 and remained at par with T3. Cane length and cane diameter at harvest was failed to show any significant effect due to different treatments. Single Cane weight was recorded significantly highest with treatment T5 and remained at par with T3, T6 and T7. Significantly highest

Cane yield (121.17 t/ha) was noticed with treatment T5 over T7 and remained at par T3. CCS yield was not significantly influenced due to different treatments.

9. MANDYA

In the second year sugarcane was ratooned in T2 to T7 treatment and soybean-maize was grown in T1 treatment. All the sugarcane treatments recorded on par yield and yield attributing parameters and in soybean-maize treatment soybean yield was 16.5 q/ha and maize yield was 85.0 q/ha (Table AS 71.9.1). Soil chemical parameters viz., soil pH, EC, OC, BD and soil available N, P2O5 and K2O content after the harvest of ratoon crop were not influenced significantly due to different cropping systems.

10. THIRUVALLA

Sugarcane-Ratoon (trash mulching with Trichoderma)-cowpea recorded the maximum cane length (260.68 cm), cane diameter (2.47 cm), single cane weight (1.70 kg) etc. and resulted in significantly higher cane and sugar yield (77.17 and 8.23 t/ha respectively) followed by T6 - Sugarcane-ratoon-cowpea(trash incorporation through rotavator and Trichoderma incorporation before sowing of cowpea) which recorded the values of 254.33 cm, 2.41 cm, 1.65 kg and 69.65 and 6.81 t/ha respectively for the said parameters.

11. POWARKHEDA

The significantly highest Sugarcane equivalent yield (246.32 t/ha) was obtained with sugarcane- ratoon (trash mulching with Trichoderma)- wheat followed by Sugarcane-Ratoon (trash mulching without Trichoderma)- Wheat (241.71 t/ha) cropping systems. Among these treatment the equivalent yield recorded at par. The equivalent yield recorded Sugarcane-Ratoon- Wheat (Zero tilled with Trichoderma) (240.49 t/ha), Sugarcane- Ratoon - Wheat (trash incorporation through rotavator and Trichoderma incorporation before sowing of Wheat) (238.11 t/ha), Sugarcane- Ratoon (trash removal without Trichoderma)- Wheat (237.83 t/ha), Sugarcane- Ratoon-Wheat (Zero tilled without Trichoderma) (237.39 t/ha), Sugarcane-Ratoon- Moong bean (236.32 t/ha), Soybean- Wheat (100.51 t/ha). The highest net return (Rs.132951/ha) and B:C ratio(1:1.30) was recorded under Sugarcane-Ratoon (trash mulching with Trichoderma)- Wheat cropping system then other sugarcane cropping system.

EAST COAST ZONE

12. ANAKAPALLE

Studies on carbon sequestration assessment in sugarcane based cropping system indicated that there is no significant variation in yield and quality of sugarcane ratoon crop in T2 to T8 treatments.

13. CUDDALORE

Sugarcane – Ratoon (trash mulching with Trichoderma) – Maize recorded significantly higher number of millable cane (145600/ha), cane length (286.5 cm) cane diameter (2.14 cm) and individual cane weight (1.71 kg) of sugarcane. The treatment (T5) Sugarcane – Ratoon (trash mulching with Trichoderma) – Maize has significantly recorded the highest cane yield (145.2 t/ha) and sugar yield (17.89 t/ha) and it was on par with Sugarcane – Ratoon – Maize (trash incorporation through rotavator and Trichoderma incorporation before planting of Maize) cropping sequence (142.2 t/ha and 17.16 t/ha respectively).

14. NAYAGARH

In the second year cowpea and sesame crop was grown along with ratoon crop to compare with sugarcane based cropping system. The observations on growth parameters and yield and yield attributes were analysed. The ratoon crop with trash mulching with Trichoderma produced highest number of net millable canes (90700/ha), cane (94.14 t/ha) and CCS yield (11.34 t/ha).

NORTH CENTRAL ZONE

15. PUSA

Data on growth, yield attributes, ratoon yield and quality of sugarcane and yield of rice, wheat system and organic carbon content on post-harvest soil indicated that none of treatments except straws yield of wheat could establish significant effect in improving the growth, yield, quality and organic carbon content. However, comparatively higher ratoon cane yield (82.0 t/ha) was obtained with sugarcane-ratoon-wheat (trash incorporation through rotavator and Trichoderma incorporation before sowing of wheat) (T6). Comparatively higher grain (3.73 and 3.91 t/ha) and straw yield (4.80 and 5.40 t/ha) of rice and wheat, respectively was obtained with rice-wheat-rice-wheat (residue retention with Trichoderma cropping system (T2).

IMPORTANT OBSERVATIONS:

- In the north-west zone use of sugarcane trash as mulch with or without Trichoderma inoculation in the ratoon crop resulted in highest sugarcane equivalent yield and brought about palpable improvement in soil health indicators.
- Trash mulching along with the use of Trichoderma in ratoon crop yielded in highest cane equivalent yield of the system comprising sugarcane- ratoon- cowpea/ greengram crops in peninsular and east-coast zones.
- For north central zone ratavator operation after ratoon harvest followed by spray of Trichoderma resulted in highest cane equivalent yield in sugarcane –ratoon – wheat cropping system.

AS-72: Agronomic performance of elite sugarcane genotypes

The trial was initiated during 2016-17 and was allotted to all the centres. During the year (2017-18) 21 centres reported the results. Centre wise summaryof findings for the year 2017-18are given below:

Important Observations:

Best performing genotypes across the centres located in different zones are listed herewith:

Sl. No.	Zone	Early genotypes	Mid-late genotypes	Spacing
1	**North Western**	CoPant 12221, CoLk 12203, Co 12027, Co 12026	CoPant 12226, CoPb 12211, CoS 12232, Co 12029, CoLk 12205, CoH 12263,	At almost all the centres cane yield at 90 cm spacing was significantly superior over that of 120 cm.
2	**Peninsular**	Co 11001, CoM 11081, CoM 11082, CoM 11084	Co 11005, CoM 11085, Co 11012, Co 11019, CoM 11086, Co 11007	Except Thiruvalla all the centres used only 150 cm spacing.
3	**East Coast**	CoC 13336, CoA 13323, CoA 13322	CoOr 13346	No variation in inter-row spacing
4	**North Central**	CoSe 12451, CoLk 12207	CoSe 12453, CoLk 09204	Significant yield improvement at closer spacing (90 cm).
5	**North Eastern**	All genotypes performed similar and below the performance of check varieties.	All genotypes performed similar and below the performance of check varieties except CoLk 09204.	Significant yield improvement at closer spacing (90 cm).

COMMENTS

- Most of the participating centres have reported the results and other required information like initial soil fertility level, date of planting and harvest and weather conditions as per the suggested format. This need to be regularly followed and may be made more systematic.
- Use of organics in nutrient management schedule for sugarcane has shown its potential as reflected from the results obtained under the trial AS 68 for plant – ratoon system. Addition of 20 t/ha FYM/ compost along with inorganic fertilizers applied on the basis of soil test, soil test crop response for targeted yield or on the basis of general recommendation for the region has shown positive effect on sugarcane growth and yield both in plant and ratoon crops. Response of bio-fertilizers (*Azotobacter/ Acetobacter/ Azospirillum/* PSB) was more pronounced in peninsular zone.

- Efficacy of ethrel on accelerating and enhancing germination in sugarcane has been reported from almost all the centres and 50 ppm solution was found equally effective as 100 ppm. Spray of GA_3 (35 ppm) during tillering enhanced cane yield effectively across the zones, however for north west zone sett soaking in ethrel performed equally well and there was no additional yield increment with GA_3 spray during tillering phase.
- Planting of sugarcane in paired rows (120: 30) with mulching of trash (6 t/ha) in the inter-row spaces out yielded the conventional flat method with or without mulch at all the centres in north western, north central and north eastern zones. Being in the climatic region of high evaporative demand sugarcane crop responded up to 1.0 IW/CPE irrigation regime in the zones, however similar yields have been recorded with 0.8 IW/CPE ratio at many centres. Trash mulching could effectively save 20-26% irrigation water over no-mulching.
- Sugarcane crop in peninsular and east coast zones responded to furrow planting (120 cm) and skip furrow irrigation combined with the use of leguminous crop as green manure till 75 DAP, as a mulch during tillering and thereafter residue incorporation. As far irrigation regimes, IW/CPE ratio 1.0 was found to result in higher cane productivity, however it can be restricted to 0.8 for getting higher water use efficiency in these zones.
- Use of mulch in sub-tropical zones and green manuring followed by mulching and residue incorporation resulted in tropical zones resulted in higher net return.
- All the centres are requested to give meaningful summary of different trials by making it more informative and true representative of the findings.

SUGGESTIONS

- The crop performance, in general, must be given in light of prevailing climatic condition particularly with reference to sucrose content & flowering behaviour.
- The treatments as decided should not be modified/ deleted.
- One or two pages of research highlights of all the experiments conducted at the centre must be enclosed with the annual report.
- Summary must be clear, to the point and self-explanatory.

ACKNOWLEDGEMENT

The hard work, sincerity and scientific rigour on the part of investigators at respective centres in implementation of different trials included in this report are acknowledged and put on record that without the same it was not possible to come out with the findings having country wide applicability. All round support and guidance received from Dr S. K. Shukla, Project Coordinator is duly acknowledged. Facilities and official provisions extended by Director, Indian Institute of Sugarcane Research, Lucknow for effective and timely implementation of various trials are sincerely recorded and acknowledged. The group humbly record its indebtedness to Indian Council of Agricultural Research, New Delhi for providing all required facilities, manpower and guidance in the course of implementation of the programme.

Annexure I

Details of Experiments allotted to and conducted by different Centres during 2016-17

Sl. No.	Centre	Experiments allotted					Experiments conducted				
1	Faridkot*	AS 68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
2	Kota*	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
3	Lucknow	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
4	Kapurthala	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
5	Pantnagar	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
6	Shahjahanpur	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	-	AS72
7	Sriganganagar	AS68	AS69	AS70	AS71	AS72	AS68	AS69	-	-	-
8	Uchani	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
9	Akola	AS68	AS69	AS70	AS71	AS72	-	-	-	-	-
10	Coimbatore	AS68	AS69	AS70	AS71	AS72	AS68	-	-	-	-
11	Kolhapur	AS68	AS69	AS70	AS71	AS72	-	AS 69	-	-	AS72
12	Mandya	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
13	Navsari	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
14	Padegaon	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
15	Powarkheda	AS68	AS69	AS70	AS71	AS72	-	AS69	AS70	AS71	AS72
16	Pune	AS68	AS69	AS70	AS71	AS72	AS68	AS69	-	-	AS72
17	Sankeshwar	AS68	AS69	AS70	AS71	AS72	AS68	AS69	-	-	AS72
18	Thiruvalla	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
19	Anakapalle	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
20	Cuddalore	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
21	Nayagarh	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
22	Pusa	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	AS71	AS72
23	Seorahi	AS68	AS69	AS70	AS71	AS72	AS68	-	AS70	-	AS72
24	Bethuadhari*	AS68	AS69	AS70	AS71	AS72	-	-	-	-	-
25	Buralikson	AS68	AS69	AS70	AS71	AS72	AS68	AS69	AS70	-	AS72

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