



*Innovative nanofiber substrates for /superior agro-inputs /
advanced ceramics / sensors & catalysis / clean energy & filters /*

Office Address: 4/296, Kamarajar St,
Kottivakkam, OMR Perungudi (Near HCL Building
Perungudi) Chennai-600096.

Registered address: 03 A-2, 3rd Floor, IITM Bio-
Incubator, IITM Research Park, Kanagam Road,
Taramani, Chennai-600 113

Phone: 9444718068

Website: www.fibsol.com

Email: mail2fibsol@gmail.com

CIN: U74900TN2013PTC094392, **TAN:** CHEF04536A

GSTIN: 33AACCF3338B1Z9

Dated 22nd of June 2023

FIELD TRIAL REPORT

AIM of the Project: Establish and demonstrate the usefulness of FIB-SOL Package of Practice (POP) in Paddy, maize and tomato, as part of the strategy to introduce new and improved approaches for soil health management.

TRIAL PARTNER: International Fertilizer Development Centre - Accelerating Farm Incomes (IFDC-AFI)

PROJECT TIMELINE: January 2023 to June 2023

INITIAL TERMS OF THE TRIAL and Final Implementation

	INITIAL PROJECT TERMS (Based on the MOU)	ACTUAL IMPLEMENTATION
No. of Farmers to be covered	60 (each farmer dedicating 0.5 acre to FIB-SOL and comparing with 0.5 acre of farmers package of practice (POP))	39
Crop Segment Distribution	20 farmers distributed across 3 primary crops viz. Tomato, Paddy, Maize	Non-uniformly Distributed across 4 different crop segments
POP and PRODUCTS	POP and Products (especially packed for 0.5-acre application) for entire trial set was provided free of cost by FIB-SOL. Initial product application was overseen by FIB-SOL. A minimum 10% reduction in chemical fertilizer was requested in all applied fields	
Implementation and Data collection	Trial Executed and crop specific Data collected from selected AFI champion farmers by IFDC-AFI members in each of the 3 crop segments.	

Deliverables of the Project

1. A POP for mentioned crops with rationalized fertilizer will be achieved
2. Upon successful demonstration of products, FIB-SOL products will be promoted by IFDC-AFI platforms with their Rural entrepreneurs' team
3. Next phase reach-out with 300+ villages associated with IFDC-AFI project

RESULTS

39 farmers were selected and a final crop distribution was done to include 4 major crop segments: Tomato (42%), Chilli (23%), Paddy (23%), Maize (8%) and others (5%)

FIB-SOL POP: Involving the application of the FIB-SOL products in 2 doses during the specific stages of the crop cycle was employed

PRODUCT SUPPLIED

NPK COMBO GEL: N-Fixing, P-Solubilizing and K-Mobilizing Plant Growth Promoting Microbes (PGPM) Consortia

SOIL-GEL and TRI-GEL: Plant Immunity enhancing PGPM

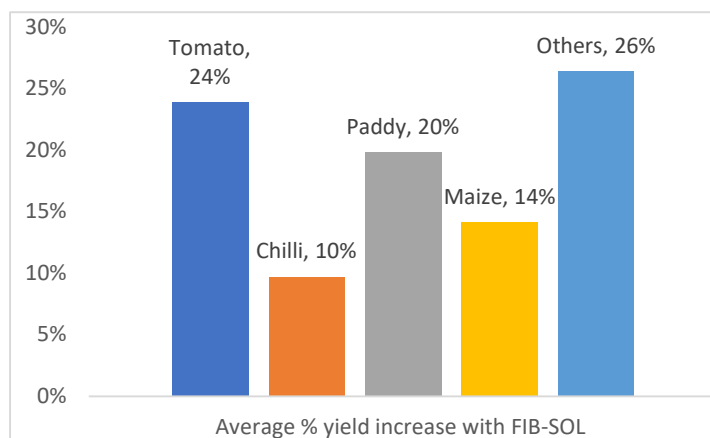


Fig. 2: Average % yield Increase across different crop segments using FIB-SOL

CROP SEGMENTS WITH TRIAL FARMERS

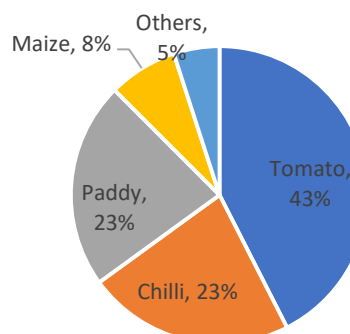


Fig.1: Crop distribution in conducted trials

YIELD across Crop Sectors: Post application of FIB-SOL, Yield data were accordingly collected (from upto 70% of the implemented plots).

The Average yield percentage in the different crop segments is as mentioned in Fig.2 . A positive increase in Yield across various crops is observed upon using FIB-SOL products.

DETAILED CROP SECTOR STUDY

A more detailed study was performed in the 3 crops namely Tomato, Paddy and Maize and the results to understand the overall effects of FIB-SOL on chemical reduction, plant health and crop economics. The same are presented below

STUDY 1: FIB-SOL in TOMATO

Trial Details

Crop: Tomato

Trial data from 6 farmers

FIB-SOL POP: 1st dose: NPK Combo 1, Soil and Tri Gel (0-15 DAT)

2nd dose: NPK Combo 1, Soil and Tri Gel (30-45 DAT)

Suggested to use 10% less chemicals

Control POP: Farmer's usual practice

Plot area: 0.5 acre each for FIB-SOL and Control

FARMER No.	1	2	3	4	5	6
Farmer Name	Krishnaiah	Madhauvlu	Srinu	Kumar	Sikindar	Ramesh
Region	Siddotam	Kakarlaphad	Kondapur	Velijerla	Velijerla	Laxidevpally
Application: dose 1	10 DAT	15 DAT	10 DAT	15 DAT	15 DAT	12 DAT
Application: dose 2	45 DAT	50 DAT	50 DAT	55 DAT	55 DAT	50 DAT
Application method	soil spraying	soil spraying	soil spraying	soil spraying	soil spraying	soil spraying



Fig 3a: Field visit and Application at Farmer No.5 (Mr. Sikindar) field.

RESULTS and INFERENCE

TABLE 1A: Growth Data compilation from 3 random plants from each 0.5-acre plot for all the 6 farmers. N=6x3=18

Plant growth Parameters	AVERAGE		STANDARD DEVIATION		% increase with respect to control	P-Value
	CONTROL	FIBSOL	CONTROL	FIBSOL		
Inter branch distance (cm)	4.07	3.70	0.30	0.27	-9%	0.0004
primary girth (cm)	3.68	4.23	0.42	0.35	15%	0.0001
secondary girth (cm)	2.45	2.82	0.36	0.33	15%	0.0029
tertiary girth (cm)	1.12	1.44	0.11	0.33	28%	0.0004
No.of flowers/branch	24.39	31.56	6.47	7.16	29%	0.0034
No.of fruits/branch	19.00	25.33	3.99	4.47	33%	0.0001
Total Average Yield from 3 pickings (kg/0.5 acre plot)	2160	2790.00	93.67	75.75	29%	0.01

NOTE: 1. (P-values > 0.05 indicate statistically significant data)

2. Yield values were provided as crates. one average tomato filled crate weight is 22.5 kg

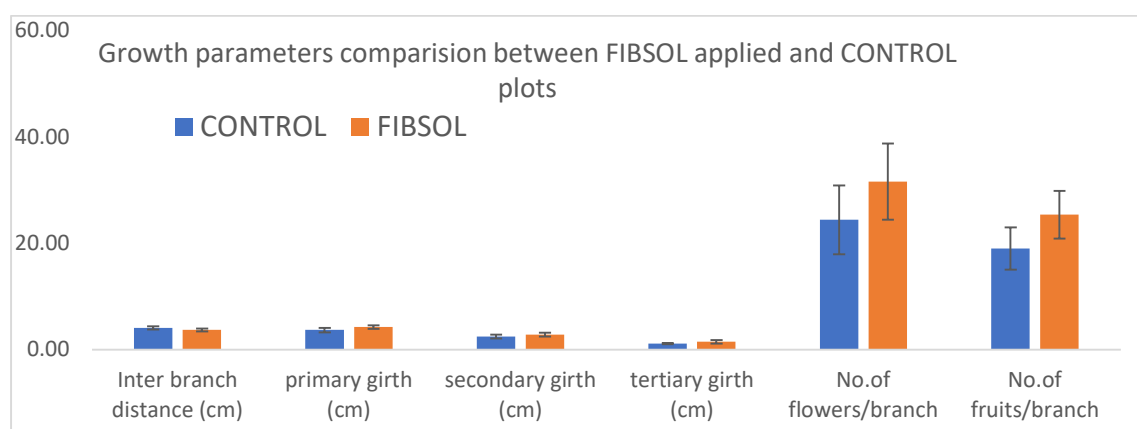


Fig 3b: Plant parameters comparison between FIB-SOL and Control treated plots

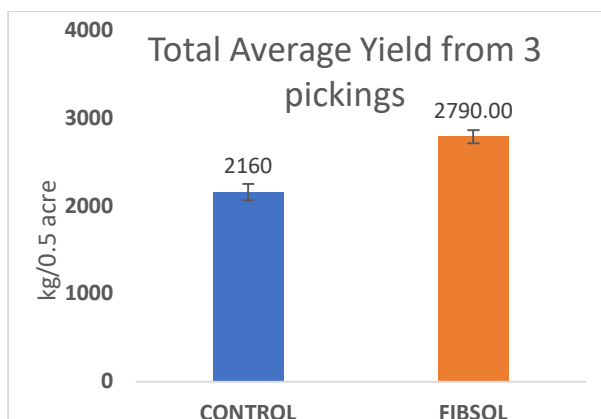


Fig 3 c: Yield difference (kg/0.5 acre) between FIB-SOL and Control. Picture showing tomato yield with FIB-SOL

Significant plant growth differences were found between FIB-SOL and Control plots. Over all plant girth (primary, secondary and tertiary girth) were found to increase along with number of flowers and fruit per branch indicative of improved productivity. Inter branch distance were however found to decrease in FIB-SOL applied plots

Yields (3 pickings) were found to increase significantly (29%) in FIB-SOL applied plot areas

TABLE 1: B) Comparison between chemical used, input cost incurred and Yield

Parameters	CONTROL	FIB-SOL	Std.Dev (CONTROL)	Std.Dev (FIB-SOL)
Average chemicals used(kg/L)/plot	121.38	87.17	22.41	5.56
Average input cost/plot (including manpower)	₹ 15,740.83	₹ 16,825.00	₹ 1,800.06	₹ 1,861.69
Total Average Yield from 3 pickings (kg/0.5 acre plot)	2160	2790.00	93.67	75.75

C) % changes in FIB-SOL treated plots with respect to control

	WRT Control	P-Value
% Reduction in chemicals	28%	0.0046
% decrease in input cost	-7%	0.3
% yield increase	29%	0.01

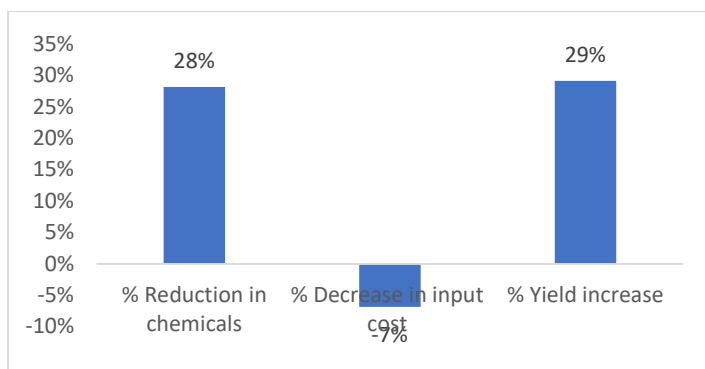


Fig 3d: Comparative Analysis for effects of FIB-SOL and Control.

A significant increase in yield (29%) with major reduction in chemical input (28%) used was observed in FIB-SOL treated field with respect to control. Although an input cost increase of 7% was reported upon using FIBSOL POP it was found to be not statistically significant.

CONCLUSION

The results of the current trials conclude that FIB-SOL in tomato can increase crop productivity simultaneously while reducing the dependency for excessive chemical inputs thus bringing down the carbon foot print. The overall cost of FIB-SOL inputs is recovered via the cost saved by reducing chemicals.

STUDY 2: FIB-SOL in PADDY

Trial Details

Crop: Paddy

Trial data from 3 farmers

FIB-SOL POP: 1st dose: NPK Combo 1, Soil and Tri Gel (0-15 DAT)

2nd dose: NPK Combo 1, Soil and Tri Gel (30-45 DAT)

Suggested to use 10% less chemicals

Control POP: Farmer's usual practice

Plot area: 0.5 acre each for FIB-SOL and Control

FARMER No.	1	2	3
Farmer Name	Raghavendharreddy	Srisailam	Jangaiah
Region	Kondapur	Jangamaiahpally	Mustipally
Application: dose 1	20-25 DAT		
Application: dose 2	60-65 DAT		
Application method	Flooding	Flooding	Flooding

RESULTS and INFERENCE

TABLE 3a: Growth Data compilation from each 0.5-acre plot for all the 3 farmers. N=3x3=9

Plant growth Parameters	AVERAGE		STANDARD DEVIATION		% increase with respect to control	P-Value
	CONTROL	FIBSOL	CONTROL	FIBSOL		
Plant height (45 day) (cm)	85.33	90.44	0.21	2.22	6%	0.0001
No.of tillers	13.11	16.56	0.22	0.48	26%	0.0001
No.of Pannicles	9.78	14.22	1.07	1.4	45%	0.0001
100 grains weight	3.47	3.97	0.46	0.29	14%	0.0483
Average Yield (quintals/0.5 acre)	13.6	15.03	0.46	0.41	11%	0.0021

NOTE: (P-values > 0.05 indicate statistically significant data)

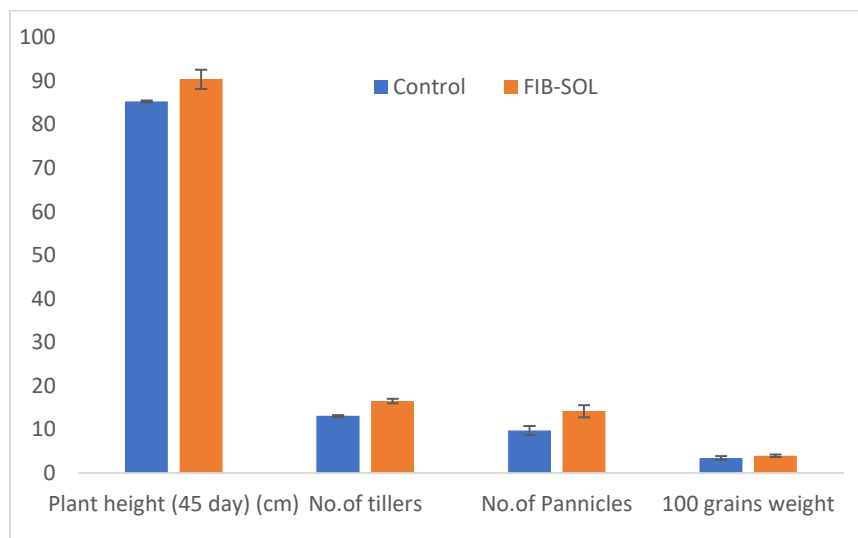


Fig 4a: Paddy parameters comparison between FIB-SOL and Control treated plots

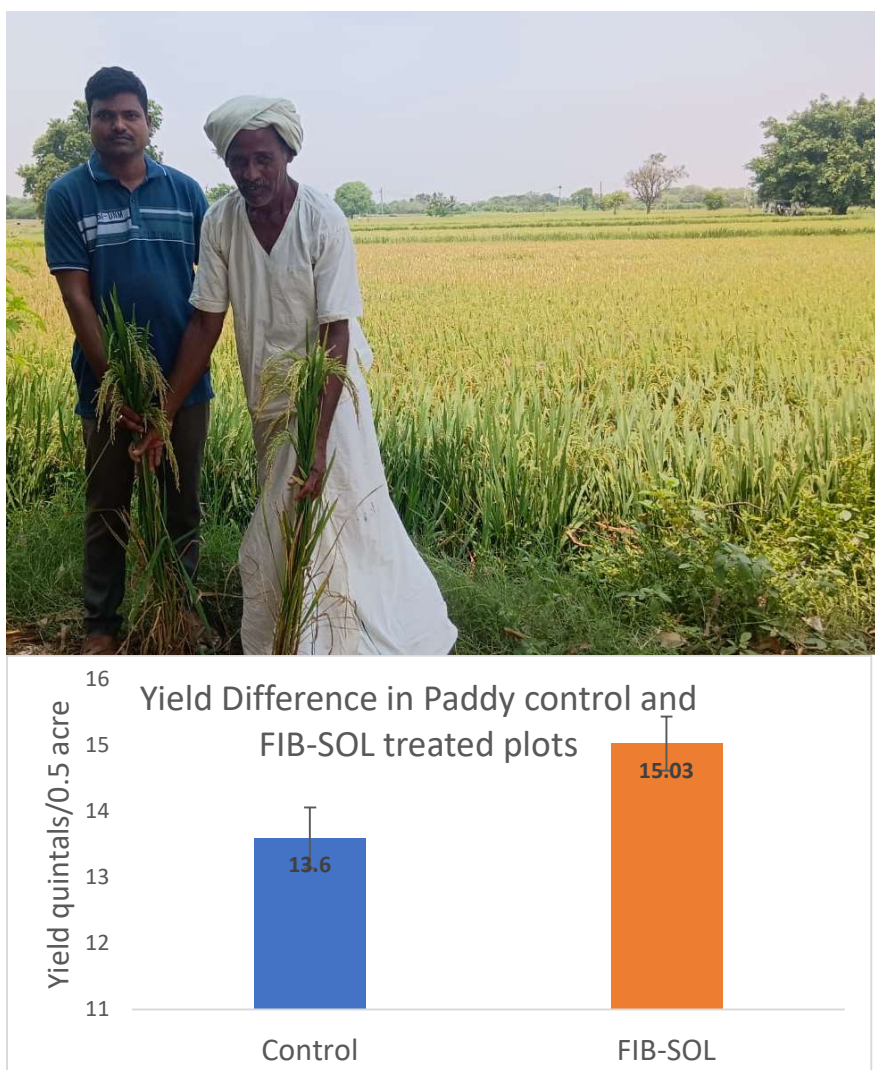


Fig 4b: Yield difference (kg/0.5 acre) between FIB-SOL and Control. Paddy Field photo during harvest (farmer representative is holding FIB-SOL produce and the champion farmer is holding Control produce).

Significant growth differences were found between FIB-SOL and Control plots. Number of tillers and panicles as well as weight of the grain is significantly increased in FIB-SOL applied Plot indicative of improved productivity. Ultimately, yields were found to increase significantly (11 %) in FIB-SOL applied plot areas. FIB-SOL POP was not followed as prescribed and the 2nd doses were given very late which might be indicative of the less than expected increase in yield

TABLE 3: b) Comparison between chemical used, input cost incurred and Yield

Parameters	CONTROL	FIB-SOL	Std.Dev (CONTROL)	Std.Dev (FIB-SOL)
Average chemicals used(kg/L)/plot	117.67	76	14.00	0.5
Average input cost/plot (including manpower)	₹ 8931.67	₹ 10745	₹ 454.46	₹ 458.26

c) % changes in FIB-SOL treated plots with respect to control

	WRT Control	P-Value
% Reduction in chemicals	39.68%	0.0067
% decrease in input cost	-20.30%	0.0082
% yield increase	11%	0.0021

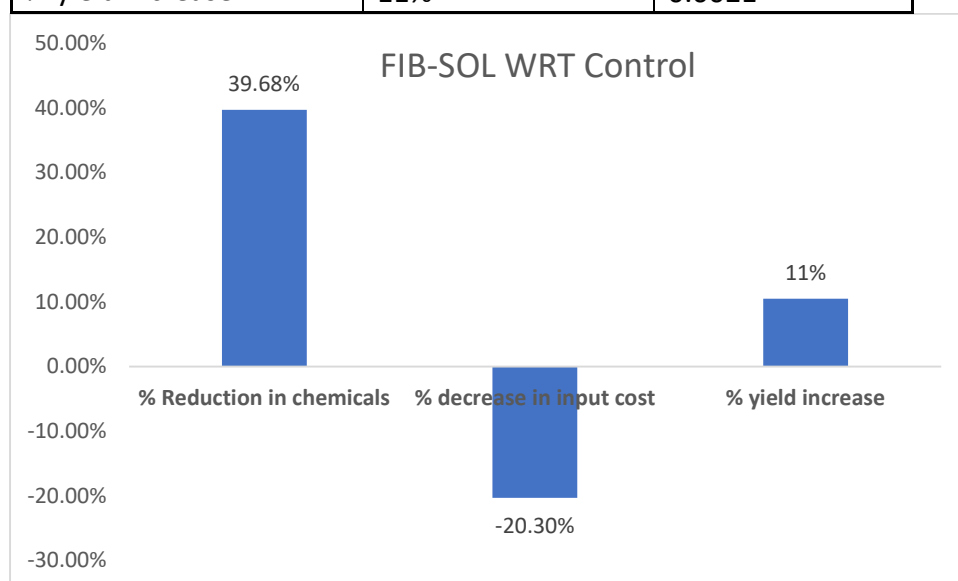


Fig 4c: Comparative Analysis for effects of FIB-SOL and Control.

A significant increase in yield (11%) with major reduction in chemical input (40 %) used was observed in FIB-SOL treated field with respect to control. Although an input reduction was achieved a spike of 20% in input cost was observed upon using FIB-SOL.

CONCLUSION

Significant improvement in Plant growth and yield was achieved using FIB-SOL. Apart from this a move towards less reliance on chemical fertilizers was attained by decreasing the overall chemical input added to the soil. However, a steep rise in the input cost upon using FIB-SOL products was indicative of adopting a more economical input pricing in this crop sector.

Study 3: FIBSOL in MAIZE

Trial Details

Crop: Maize

Trial data from 3 farmers

FIB-SOL POP: 1st dose: NPK Combo 1, Soil and Tri Gel (0-15 DAS)

2nd dose: NPK Combo 1, Soil and Tri Gel (30-45 DAS)

Suggested to use 10% less chemicals

Control POP: Farmer's usual practice

Plot area: 0.5 acre each for FIB-SOL and Control

FARMER No.	1	2	3
Farmer Name	Sivalingam	Tirupathireddy	Varun
Region	Gollapally	Mucharlapally	Alwanpally
Application: dose 1	15-20 DAS		
Application: dose 2	45-50 DAS		
Application method	soil spraying	soil spraying	soil spraying

RESULTS and INFERENCE

TABLE 4a: Growth Data compilation from 3 random plants from each 0.5-acre plot for all the 3 farmers. N=3x3=9

Plant growth Parameters	AVERAGE		STANDARD DEVIATION		% increase with respect to control	P-Value
	CONTROL	FIBSOL	CONTROL	FIBSOL		
Plant height (45 day)	119.11	126.00	3.76	4.18	5.78%	0.0020
Root Length post yield (cm)	18.67	23.11	4.27	5.01	23.81%	0.0599
100 grains weight	32.42	39.58	2.11	1.56	22.11%	0.0001
Cob Yield (Quintals /0.5 acre plot	11.5	12.75	0.20	0.20	10.87%	0.0011

NOTE: 1. (P-values > 0.05 indicate statistically significant data)

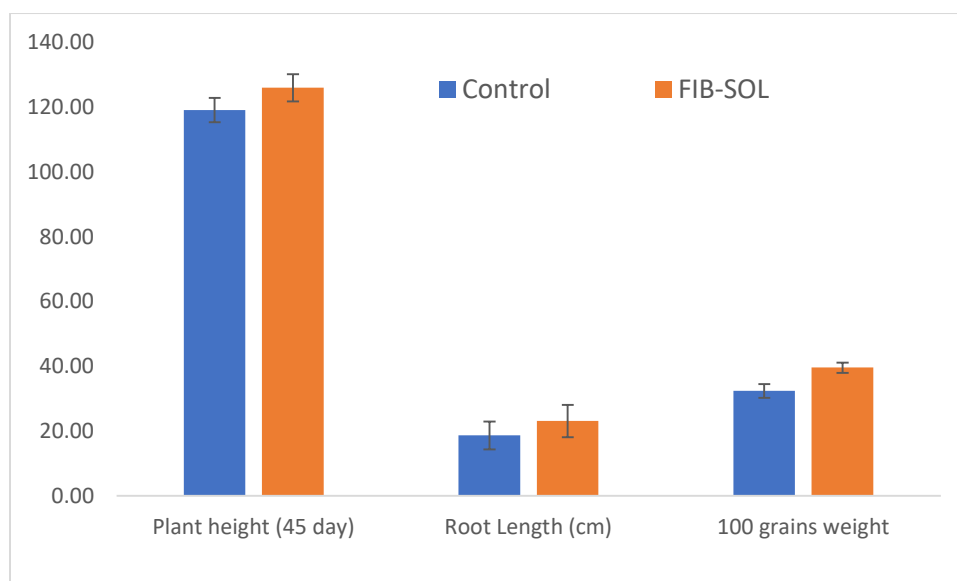


Fig 5a: Plant parameters comparison between FIB-SOL and Control treated plots

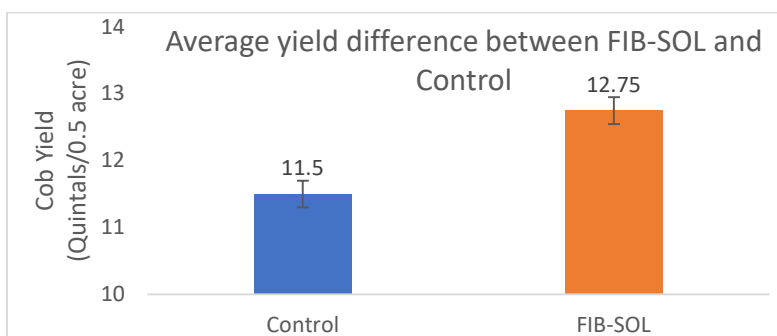


Fig 5b: Yield difference (Quintals/0.5 acre) between FIB-SOL and Control.

Significant plant growth differences were found between FIB-SOL and Control plots. plant height and root length as well grain weight was all found to be positively affected by FIB-SOL. A significant difference in Cob yield (11%) was observed in FIB-SOL treated field.

TABLE 4: b) Comparison between chemical used, input cost incurred and Yield

Parameters	CONTROL	FIB-SOL	Std.Dev (CONTROL)	Std.Dev (FIB-SOL)
Average chemicals used(kg/L)/plot	75.5	25.5	0	0
Average input cost/plot (including manpower)	₹ 4516.67	₹ 6191.67	₹ 175.59	₹ 579.51
Average yield (quintals/0.5acre)	11.5	12.75	0.20	0.20

	WRT Control	P-Value
% Reduction in chemicals	66.23%	0
% decrease in input cost	-41.51%	0.0087
% yield increase	10.87%	0.0011

C) % changes in FIB-SOL treated plots with respect to control

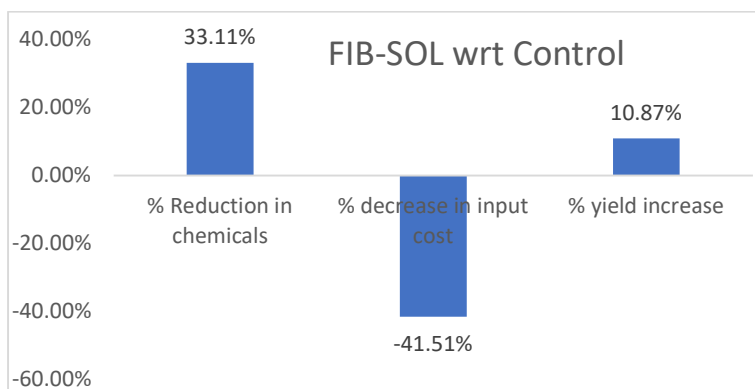


Fig 5c: Comparative Analysis for effects of FIB-SOL and Control.

A significant increase in yield (11%) with major reduction in chemical input (33%) used was observed in FIB-SOL treated field with respect to control. Although a major input reduction of was achieved a sharp spike of 41.5 % in input cost was achieved upon using FIB-SOL.

CONCLUSION

Significant improvement in Plant growth and yield was achieved using FIB-SOL. Apart from this a move towards less reliance on chemical fertilizers was attained by decreasing the overall chemical input added to the soil. However, a steep rise in the input cost upon using FIB-SOL products was indicative of adopting a more economical input pricing in this crop sector

CLOSING REMARKS

Proven Facts: After implementation in over 40 acres in 4 different crop segments we have the following conclusions

- With FIB-SOL, chemicals can be reduced by 30-40% which helps in reducing the carbon footprint and has an overall good environmental impact
- Yield can be improved by 15-30%. this can be attributed to the improvement in plant growth features as showcased by the crop data. With better yields and improved quality (as per the on-ground testimony, FIB-SOL grants an increase in the farmers Income.
- FIB-SOL works across different crop sectors: paddy, chilli, maize, tomatoes as showcased by the results.
- The input costs were markedly increased upon using FIB-SOL products, especially in paddy and maize, a strategy to price the product accordingly will have to be devised to make the product more competitive.