Yield, net return and B:C ratio of Soybean as influenced by Soybean-Mustard cropping system under drip irrigation

Treatment			Seed yield (q/ha)	Net return (Rs ha^{-1})	B:C ratio
T_1	:	75% RDF through fertigation	21.75	37236	1.28
T_2	:	100% RDF through fertigation	26.89	49301	1.51
T_4	:	75% RDF (25 % Basal + 75 % through fertigation)	21.03	37207	1.38
T_7	:	100% RDF through DSA	17.14	31069	1.46
T_8	:	Control	8.11	13235	1.15
		CD	3.25	-	-

Yield, net return and B:C ratio of Mustard as influenced by Soybean-Mustard cropping system under drip irrigation

Treatment		Seed yield (q ha^{-1})	Net return (Rs ha^{-1})	B:C ratio
T_1 :	100% RDF with DSA	23.31	64,929	2.29
T_2 :	100% RDF through Fertigation	31.83	86,383	2.11
T_3 :	75% RDF (25%DSA+75% through Fertigation	29.50	83,634	2.43
T_4 :	75% RDF through Fertigation	30.39	84,849	2.31
T_5 :	100% RDF (25% DSA+ 75% through Fertigation)	31.50	88,220	2.34
T_6 :	125% RDF (25% DSA+ 75% through Fertigation)	34.06	95,076	2.31
T_7 :	150% RDF (25% DSA+ 75% through Fertigation)	35.72	98,310	2.20
T_8 :	Control	8.62	18,910	1.22
	CD(p=0.05)	4.97	-	-

Season: Rabi, 2017-18

Crop: Mustard (Variety: Pusa Bold)

Design: RBD

Replications : 3

Size of plot: 5m x 5m= $25m^2$

Spacing: 45cm x 20cm

RDN: 120:60:40 kg ha^{-1} (N:P:K)

Date of sowing: 01 Nov , 2017

Agron 5: Yield maximization of buck wheat for Northern hills zone

Locations: Ambikapur

Treatment	Seed Yield (q/ha)
Main plot : Row spacing S1 - 20cm S2 - 30cm S3 - 40cm	11.80 10.24 9.80
CD at 5%	1.64
Sub plot: Fertility level (NPK g/ha)	
F1 - 40:30:10 F2- 60: 40: 20 F3 -80: 50: 30	8.63 11.41 11.97
CD at 5%	2.72

Design : Split Replications : 3

Agron 6: Yield maximization of chickpea under varying sowing time

Main plot : Sowing time	
D1	First week of November
D2	Third week of November
D3	First week of December
D4	Third week of December
Sub plot : Spacing	
S1	30x20 cm
S2	40x20 cm
S3	50x20 cm
Sub-sub plot : Nipping	
N1	No nipping
N2	Nipping at 30 DAS
N3	Nipping at 40 DAS

Variety: JG-130 Design: Split-split plot Replication: 3

Seed yield of chickpea as influenced by sowing time, spacing and nipping.

Treatment	Seed yield, kg/ha		
	2016	2017	Mean
Date of Planting			
Nov. 1st week	2226	2889	2558
Nov. 3rd week	2349	2573	2461
Dec. 1st week	1827	2099	1963
Dec.3rd week	1411	1590	1501
CD (p=0.05)	NS	93	129
Spacing			
30x20 cm	1903	2276	2090
40x20 cm	1978	2296	2137
50x20 cm	1980	2292	2136
CD (p=0.05)	51	NS	
Nipping			
No nipping	1921	2271	2096
At 30 DAS	1993	2293	2143
At 40 DAS	1947	2299	2123
CD (p=0.05)	NS	30	NS

Recommendation:

- The chickpea should be sown between 1st week of Nov. to 3rd week of Nov. for obtaining high seed yield at a spacing of 40x20 cm or 50x20 cm.
- The nipping should be done between 30 DAS to 40 DAS.

Agron 7 : Exploring possibility of Lathyrus on rice bunds during kharif season

Factor 1. Sowing time (6) (10 days interval)
16 June, 2017
26 June, 2017
06 July, 2017
16 July, 2017
26 July, 2017
05 August, 2017
Factor 2: Lathyrus variety (4)
Prateek
Mahateora
RLS 2012-2
RLS 2010-5

Effect of oat varieties, crop geometry and nitrogen dose on green fodder yield, seed yield and economics

Treatment		GF Yield at 1st cut of 45 DAS(q/ha)	Seed Yield (q/ha)	Net return (Rs 000 /ha)	B:C
Varieties	V_1: JHO-822	53	32.5	63.65	3.32
	V_2: RO-19	82	17.0	29.20	2.08
	CD(P=0.05)	5	1.11	2.69	0.1
Crop Geometry	S_1: 30 cm RXR	72	25.3	48.20	2.77
	S_2: 45 cm RXR	64	24.2	44.65	2.64
	CD(P=0.05)	4.6	1.01	2.69	0.1
Nitrogen dose	N_1: 80 kg/ha	61	23.5	42.64	2.57
	N_2: 100 kg/ha	68	24.4	45.47	2.66
	N_3: 120 kg/ha	74	26.4	51.17	2.87
	CD(P=0.05)	6	1.56	3.30	0.12

Achievements: The oat variety JHO-822 produced the highest seed yield, net return and B:C ratio. The spacing of 30cm RXR found to be suitable for seed production along with 120kg nitrogen/ha applied in two splits.

Agron 9 : Possibility of mid season crops in rice-rice cropping system for canal command area
Location : Dhamtari

S. No.	Crops	Date of Sowing	Date of Harvesting
1	Chickpea (JG-130)	28.11.17	14.03.18
2	Pea (Sweet Rubi)	28.11.17	18.02.18 and 26.02.18
3	Radish (Pusa Chetki)	28.11.17	10.01.18,12.01.18 and 15.01.18
4	Coriander (Selection-51)	28.11.17	15.01.18, 21.01.18
5	Carrot (Pusa Vrishti)	28.11.17	15.02.18 , 18.02.18 and 25.02.18

Yield and economics of different crops grown between rice-rice system

Crops	Yield (q/ha)	Net return (Rs/ha)	B:C Ratio
Chickpea	27.60	84433	3.28
Pea	45.34	40130	1.79
Radish	125.67	27275	1.76
Coriander	34.52	93080	3.06
Carrot	136.72	86220	2.70

Agron 10: Identification of suitable intercrop for hybrid tomato crop

Location: Durg, Bemetara and Ambikapur

Total area in Chhattisgarh State: 62803 ha Prodn:1089976 MT;Durg: 9500 ha; Prodn: 190000 MT; Bemetara: 2650ha – Prodn: 66250 MT

Durg: Dhamdha, Berla and Ahiwara, Bemetara: Bemetara and Saja

No of survey :04 No of farms surveyed: 10

1. Most If a crop of tomato fails they plant another crop of tomato.
2. If required they plant tomato 3-4 times from July to October.
3. They do not give space to any crop as inter crop in tomato.
4. They grow tomato with mulch and drip.
5. Tomato is grown in paired rows with wider spacing plant to plant 0.90m, paired row 1.2m and between two paired rows 2m.
6. All varieties of tomato were F1 hybrids of different companies and all are indeterminate in nature.
7. During July to Nov. prices varied from 250-550/- per caret (25kg) and in early *kharif* they get prices up to 1200-1300/- per caret.
8. During surplus market condition farmers get lowest prices up to Rs. 20-30 per caret in Dec. or Jan. for 10-20 days.
9. Feb. onwards prices again goes higher up to 700-800/- per caret.
10. Extreme Glut situations (excess supply)comes in every 3-4 years, generally in Dec- January.
11. Tomato growers do not want to take any crop other than tomato with knowing all the market situations. This year early crops of tomato fails due to viral disease and farmers did 4-5 transplanting of tomato but do not change the crop.
12. Some farmers shifted to banana/ arhar/ chilli looking to last year glut condition of the farmers take two crops in a year
13. After survey we chosen 10 farmers and suggested to substitute 10-20% area or at least 1-2 acre in other crops like banana, papaya, Chilli, Sweet Corn and okra.

Suggested Intervention

Durg and Bemetara

S. No.	No of Farmers	Crops
1.	02	Tomato & Banana
2.	02	Tomato & Papaya
3.	02	Tomato & Chilli
4.	10	Tomato & Sweet corn
5.	02	Tomato & Arhar
6.	10	Tomato & Okra

Economic Assessment of Tomato Based Intercropping System at Ambikapur

Treatment	Yield Main Crop (q/ha)	Yield Ist IC (q/ha)	Yield IInd IC (q/ha)	Tomato EY(q/ha)	Net income (Rs. in lakh /ha)	B :C Ratio
Tomato+ Cabbage	327	164	-	737	2.38	4.17
Tomato + onion	338	138	-	683	2.12	3.48
Tomato + Maize +Onion	239	42	119	642	1.94	3.07
Tomato + Garlic	226	38	-	610	1.86	3.17
Tomato + Maize +Garlic	228	46	32	663	2.11	3.45
Tomato + Sweetcorn	262	81	-	566	1.71	3.10
Tomato + Cauliflower	274	139	-	622	1.91	3.35
Tomato+ Cauliflower + Chilli	286	162	-	691	2.12	3.67
Tomato +French beans	316	82	-	726	2.38	4.58
Tomato +Maize + F. Bean	286	61	42	649	2.12	3.79

Agron 11: Fodder production Barseem in Behra land

Location: Ambikapur& Jagdalpur

1. The seed production was taken at Ambikapur and Jagdalpur. At Ambikapur, seed setting was not satisfactory and moreover crop was affected due to heavy hail storm.
2. At Jagdalpur, Berseem seed production was taken in 5 acre area two times green fodder production was taken and their after productivity of 25kg /acre which is very low.

Agron 12: Collection of biodiversity of typha grass in Chhattisgarh

Germplasm collected from

S.N.	Place	S.N.	Place	S.N.	Place
1	Ambikapur city	18	Korba city	35	Uslapur
2	Ghunkhuta Nala, Ambikapur	19	Kharsia	36	Durg, Padnabhpur
3	Udaypur, Ambikapur	20	Mahamand, Bilaspur	37	Pulgaon, Durg
4	Gharjiyabadhan, Pathalgaon	21	Pendri, Bilaspur	38	Anjora
5	Naharpali, Raigarh	22	Ratanpur	39	Khursipar
6	Chiraipani, Raigarh	23	Pamgarh	40	Thakurtola, Rajnandgaon
7	Kuswabahara, Raigarh	24	Beltara	41	Rajnandgaon city
8	Raigarh, city	25	Risda, Pamgarh	42	Kumhari
9	Sakreli, Sakti	26	Shivrinarayan	43	Kusalpur, Raipur
10	Bhatagaon, Sakti	27	Berla, Bilaspur	44	IGKV, campus
11	Baradwar	28	Fasterpur	45	Urla, Raipur
12	Kamrid, Champa	29	Chaterkhar	46	Bus stand, Bilaspur
13	Seoni, Champa	30	Karhi	47	Beltara, city
14	Champa city	31	Kathakoni	48	Siltara
15	Gharghora	32	Dashranpur	49	Jagdalpur
16	Madwarani	33	Mungeli	50	Balod
17	Urgaa, Korba	34	Jarahgaon	51	Kachandur, Balod road

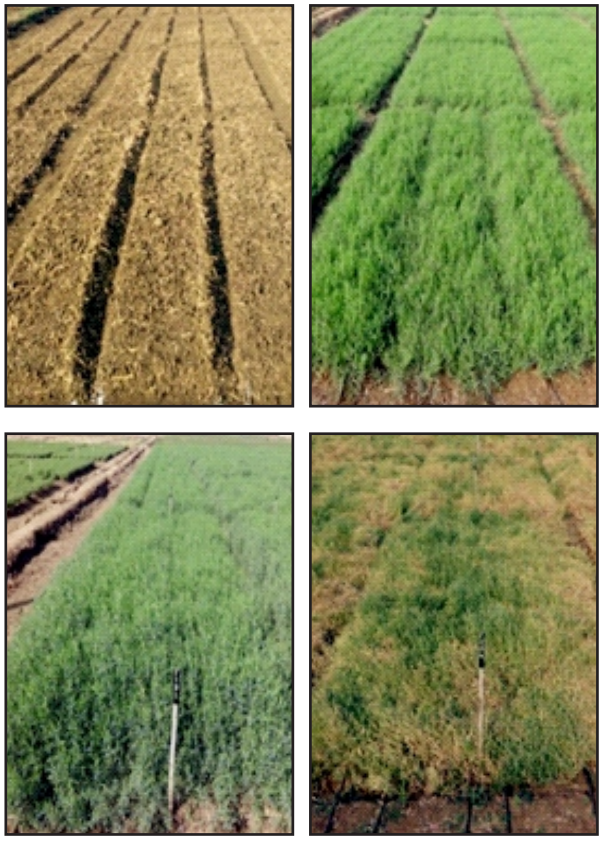
Establishment of Typha germplasm at Dhamtari KVK

Agron 13: Evaluation of agrotechniques for enhancing productivity of lathyrus under drip irrigation

Location: Raipur

Design: Split plot Replication: 3

Main plot : Nutrient levels	
F1	75% RDF
F2	100% RDF
F3	125% RDF
Sub plot : Spacing	
S1	30x10 cm
S2	30x20 cm
S3	40x10 cm
S4	40x20 cm
S5	Regular sowing at 30 cm



Seed Yield of lathyrus as influenced by nutrient levels and spacing under drip irrigation

Treatments		Filled pods/plant	Seed yield, q/ha
Nutrient levels			
F1	75% RDF	57.5	23.16
F2	100% RDF	59.8	26.05
F3	125% RDF	62.3	24.82
CD (P=0.05)		3.45	0.63
Spacing			
S1	30x10 cm	57.58	25.37
S2	30x20 cm	69.71	24.91
S3	40x10 cm	67.13	25.04
S4	40x20 cm	81.42	22.64
S5	Regular sowing 30cm	23.40	25.44
CD (P=0.05)		5.73	1.30

Agron14: Evaluation of establishment methods for productivity and profitability of chickpea under drip irrigation

Locations: Raipur

M1	Planting at 50x20 cm (Nursery raising on the same day of direct sowing)
M2	Planting at 50x40 cm (Nursery raising on the same day of direct sowing)
M3	Planting at 50x20 cm (Planting 15 days old seedlings on the day of direct sowing)
M4	Planting at 50x40 cm (Planting 15 days old seedlings on the day of direct sowing)
M5	Line dibbling at 50x20 cm (2 seeds/hill)
M6	Random dibbling (10 hills/m2, 2seeds/hill)
M7	System of chickpea intensification (50x20 cm, 2 seeds/hill)
M8	Recommended practice (30x10 cm)

Design: RBD Replication: 3 Date of sowing: 27.11.2017 Variety: JG-130 Nursery raising and planting of chickpea












Yield of chickpea as influenced by establishment methods under drip irrigation

Treatments		Seed yield, q/ha	HI %
M1	Planting at 50x20 cm	28.22	50.37
M3	Planting at 50x20 cm (Planting 15 days old seedlings on the day of direct sowing)	31.47	52.70
M5	Line dibbling at 50x20 cm (2 seeds/hill)	29.22	50.54
M6	Random dibbling (10 hills/m2, 2seeds/hill)	27.69	48.93
M7	System of chickpea intensification (50x20 cm, 2 seeds/hill)	30.52	52.04
M8	Recommended practice	22.28	47.30
CD (P=0.05)		1.58	3.34

Expt.: Evaluation of selected rice germplasm for response to low and high nutrient application.

Locations: Raipur

	Low (30:40:30 kg NPK/ha)
	High (90:50:40 kg NPK/ha)
Sub plot : Entries:37	
C1	S. No. 1 to 23 : Transplanted 25 days old on 24.7.2017
C2	S. No. 24 to 37: Transplanted 25 days old nursery on 10.8.2017



Yield attributes and grain yield of selected germplasm under different nutrient levels

S. No.	Germplasm	Grain yield kg/ha		Plant height, cm	Test weight, g	Duration, days
		30:40:30	90:50:40			
1	HYG-1	2892	1869	176	11.4	138
2	HYG-2	3684	3848	157	20.8	139
3	HYG-3	2367	983	157	20.0	123
4	HYG-4	5595 (2)	5703 (1)	155	23.1	140
5	HYG-5	5427 (3)	4648	146	25.6	146
6	HYG-6	4955 (4)	4762	176	24.1	139
7	HYG-7	4128	4345	158	21.7	142
8	HYG-8	5609 (1)	4728	162	21.4	142
9	HYG-9	3741	4683	179	25.4	140
10	HYG-10	876	486	169	23.2	150
11	HYG-11	4613 (5)	3616	178	25.9	129
12	HYG-12	3384	3823	170	28.2	126

Grain yield of selected germplasm under different nutrient levels

S. No.	Germplasm	Grain yield kg/ha		Plant height, cm	Test weight, g	Duration, days
		30:40:30	90:50:40			
13	HYG-13	4562	1753	174	26.1	139
14	HYG-14	5079	4462	156	22.2	146
15	HYG-15	3774	3052	187	31.8	137
16	HYG-16	4489	1865	144	15.3	137
17	HYG-17	4554	2702	150	28.8	137
18	HYG-18	4286	2647	190	33.3	146
19	HYG-19	5858	3974	158	21.1	126
20	HYG-20	4988	5064	153	27.1	146
21	HYG-21	4668	3392	167	24.5	139
22	HYG-22	5327	5018	154	20.4	146
23	Cross 116	NP	4850	171	30.8	133

Grain yield of selected germplasm under different nutrient levels (late planted)

S. No.	Germplasm	Grain yield kg/ha		Plant height, cm	Test weight, g	Duration, days
		30:40:30	90:50:40			
24	BD 811	3718	1805	147	21.1	133
25	BD813	NP	1829	139	18.0	139
26	BD 30	3921	2683	170	27.1	138
27	BD 200	NP	3281	153	23.7	138
28	BD 452	3330	4006	157	21.8	140
29	BD 207	4423	4260	137	22.9	140
30	BD 3668	3829	3706	154	22.9	139
31	BD 368	2882	3548	165	20.2	139
32	BD 108	3895	2779	146	23.4	146
33	BD 153	3790	2856	160	16.9	144
34	EC 611	3750	3197	136	28.9	139
35	EC 626	3016	3013	144	25.3	133
36	EC 689	4169	3264	146	26.8	138
37	EC 739	3603	3418	140	21.8	133

Exp: Evaluation of kopar running on performance of rice in different establishment methods.

Main plot: Establishment method	
M1	Broadcast-biasi
M2	Line sowing
M3	Transplanting
Sub plot : Kopar run frequency	
T1	Kopar run at 20 DAS/DAB/DAT
T2	Kopar run at 20 and 30 DAS/DAB/DAT
T3	Kopar run at 20, 30 and 40 DAS/DAB/DAT
T4	Recommended practice (Herbicidal)

Design : Split plot
Replication : 3
Variety : IGKV R1

Plant damage due to kopar run in transplanted rice

Treatments	Total plants/m2	Damaged plants/m-^{2}	Damaged plants, %
Kopar – once	45.6	1.9	4.22
Kopar- twice	45.9	4.2	9.15
Kopar-Thrice	45.8	5.3	11.57
Rec. practice	45.7	-	-

Grain yield and net return of rice as influenced by kopar run in different establishment methods

Treat.	Grain yield q/ha				Net return, Rs 000/ha			
	BC-biasi	LS	TP	Mean	BC -biasi	LS	TP	Mean
Kopar –once	48.27	37.10	56.60	47.32	47.17	28.75	54.20	43.38
Kopar- twice	51.13	38.73	60.50	50.12	51.12	30.78	59.75	47.22
Kopar-Thrice	47.80	42.80	53.27	47.96	45.45	36.59	48.04	43.36
Rec. pract.	54.33	56.47	63.20	58.00	54.71	56.90	63.93	58.51
Mean	50.38	43.78	58.39		49.61	38.26	56.48	
CD at 5%	Method	WM	WM at same M		Method	WM	WM at same M	
	3.77	2.73	4.73		5.85	4.24	7.34	

Technology Generated
AICRP on Rice
Expt.1:Evaluation of nutrient management practices for enhancement of the productivity of rice-chickpea under different rice establishment methods and nutrient management.

Main plot : Methods : Rice/Chickpea)	
M1	Line sowing before onset of monsoon with normal seed rate (75 kg/ha)
M2	Line sowing after monsoon with reduced seed rate (40 kg/ha)
M3	Transplanting
Sub plot: Varieties : Rice/Chickpea)	
S1	100%RFD
S2	75% inorganic+ 25% organic
S3	150% of RDF
S4	LCC based N
S5	100%RFD+ 5t FYM
S6	Control
Sub-sub plot : Nutrient levels (Chickpea)	
N0	No fertilizer
N1	RDF

Design: Split/split split plot Rep.: 3
RDF: 100:60:40 kg NPK/ha (Rice)
20:50:30 kg NPK/ha (Chickpea)
Variety: IGKV R1 (Rice)
JG-130 (Chickpea)

Grain yield of rice and chickpea under different establishment methods (Mean of 3 years)

Treatments		Rice (kg/ha)	Chickpea (kg/ha)
Rice establishment methods	LS before monsoon	4938	2240
	LS after monsoon	4676	2234
	Transplanting	4955	1854
CD (p=0.05)		146	67
Nutrient level: Direct for rice and residual for chickpea	100% RDF	5039	2138
	75% I+ 25% O	4782	2060
	150% RDF	5370	2118
	LCC	4943	2068
	100% RDF +5t FYM	5357	2191
	Control	3149	2070
CD (p=0.05)		182	86
Nutrients in chickpea	No fertilizer	-	1992
	RDF	-	2227
CD (p=0.05)		-	47

Recommendation:

1. Line sowing before onset of monsoon and transplanting produced the comparable grain yield of rice. But line sowing produced 20.8% higher seed yield of chickpea in succeeding season.
2. Among the different source of nutrient applied, application of 150% RDF + 5t FYM in rice produced higher seed yield of rice as well as chickpea.
3. No application of fertilizer in chickpea reduced the seed yield by 11.92 % as compared to RDF.
4. Line sowing of before onset of monsoon or transplanting of rice found to be equally effective for grain yield of rice.
5. The chickpea succeeded after line sown rice produced higher grain yield of chickpea that succeeded after transplanted rice.

EXP-2: Evaluation and identification of suitable varieties to enhance the productivity in different rice establishment methods

Main plot : Methods			
M1	Line sowing before onset of monsoon		
M2	Broadcast sowing before onset of monsoon		
	Line sowing after onset of monsoon		
M3	Broadcast sowing after onset of monsoon		
M4	Transplanting		
Sub plot: Varieties			
V1	Swarna	V5	Arize 6444
V2	Indira aerobic-1	V6	Mahamaya
V3	IGKV R1	V7	MTU 1010
V4	IGKV R1244		

Design: Split plot Replication: 3

Fertilizer :100:60:40 kg NPK/ka

Grain yield of rice under different establishment methods.

Treatments		**Grain yield, kg/ha**			
Establishment method		**2015**	**2016**	**2017**	**Mean**
M1	Line sowing before monsoon	4955	5285	4969	5070
M2	Broadcast sowing before monsoon	4443	4864	-	4654
M3	Line sowing after monsoon	-	-	4852	4852
M4	Broadcast sowing after monsoon	-	-	4393	4393
M5	Transplanting	5166	5530	5208	5301
CD (P=0.05)		127	284	433	
Varieties					
V1	Swarna	5744	6334	6571	6216
V2	Indira aerobic-1	4110	4490	4160	4253
V3	IGKV R1	4807	5072	4431	4770
V4	IGKV R1244	4096	4496	-	4296
V5	Arize 6444	5319	5553	-	5436
V6	Mahamaya	5052	5414	-	5233
V7	MTU 1010	-	-	4261	4261
CD (P=0.05)		141	304	279	

Conclusion:

1. Line sowing before onset of monsoon produced at par grain yield of rice in comparison to transplanting.
2. Among the varieties, Swarna produced the highest seed yield of rice, wheat was followed by Arize 6444 and Mahamaya, respectively.

AICRP on Dry Land

Varietal screening of upland early rice under rainfed conditions.

Variety	**Yield (q/ha)**	**HI (%)**
IR-88839-10-1-1-2	59.00	44.00
IR-84887-B-15	55.63	38.52
IR-83929-B-B-132-2	55.13	37.55
Danteswari	44.38	42.58
Dagad deshi	27.38	27.14
Sahabhagi dhan	38.75	42.46
OTL-1-1-71	56.75	47.99

Recommendation: IR-88839-10-1-1-2 was found of higher seed yield as compared to remainings except IR-84887-B-15 and IR-83929-B-B-132-2 which were second higher yielder after IR-88839-10-1-1-2. Sahabhagi dhan, 72.67, OTL-1.1(29-16), OTL-1.1(324-81) and OTL-3.2(82-39) were found lesser plant height and resisted lodging.

Evaluation of alternate land use systems at Jagdalpur-(i) Horti-agro model

Treatment	Seed Yield 2016-17	Mean Seed Yield (4yrs)	NR (Rs/ha)	B:C ratio	RWUE (kg/ha-mm)
Maize (Hyb)	2730	3020	19348	1.84	3.30
Pigeonpea (Asha)	919	1016	16117	2.79	1.11
Upland rice (CR-40)	1377	1524	6948	2.37	1.66
Cowpea (Hyb 12)	952	1053	18738	1.93	1.15
Chikma (Little millet) var.- JK 8	473	523	7044	2.18	0.58

Recommendation: Utilization of interspaced area of fruit plantation, different crops were tested on fruit plantation where pigeon pea gave higher net return among the tested crops followed by cowpea as green pod. In case of rain water use efficiency (RWUE) by crops, it was observed that maize attained higher RWUE than remaining crops followed by cowpea.

Effect of relay cropping under rainfed condition

Treatment	Yield (kg/ha)		Net return (Rs/ha)	B:C ratio	RWUE (kg/ha-mm)
	Rice	Field pea			
Rice fallow	2651	-	28884	2.34	1.97
Rice-relay crop of field pea	2583	1664	51958	3.89	3.16
Rice-field pea on conventional tillage with line sowing	2556	3012	68262	3.93	4.14
Rice-field pea on conventional tillage with broadcasting	2747	1961	57552	3.87	3.50

Recommendation : Under relay cropping rainfed condition, Rice-field pea on conventional tillage with line sowing gave the highest seed yield and economic returns.

AICRP on Soybean

Seed yield, Net return and B:C ratio of soybean as influenced by foliar nutrition (Mean of 3 years)

S. N.	Treatment
1	RDF + water spray at pod initiation
2	RDF + Urea 2% spray at pod initiation
3	RDF + DAP 2% spray at pod initiation
4	RDF + MOP 0.5% at pod initiation
5	RDF + 19:19:19 (NPK) 2% at pod initiation
6	RDF + Molybdenum 0.5% at pod initiation
7	RDF + Boron 0.5% at pod initiation
8	RDF +Zinc chillated 0.5% at pod initiation
9	RDF only (20:60:30 kg N:P:K /ha)

Expt.: Seed yield, Net return and B:C ratio of soybean as influenced by foliar nutrition

Treatment	Seed yield (kg/ha)	Net returns (Rs/ha)	B:C ratio
RDF + water spray at pod initiation	1941	46540	2.40
RDF + Urea 2% spray at pod initiation	2025	49027	2.52
RDF + DAP 2% spray at pod initiation	2227	55496	2.83
RDF + MOP 0.5% at pod initiation	2135	52753	2.72
RDF + 19:19:19 (NPK) 2% at pod initiation	2102	49377	2.28
RDF only	1866	44089	2.30
CD (P=0.05)	134	3924	0.19

Recommendation: Application of RDF+ DAP 2% spray at pod initiation produced the maximum seed yield (2227 kg/ha) of soybean and gave maximum net return and B:C ratio (2.83).

Evaluation of new molecules of herbicides for controlling of weeds in soybean

Treatment
F 8072 premix @ 725 g ai/ha (1250 ml/ha) as pre-emergence
Pendimethalin 30% EC + Imazethapyr 2% SL premix @ 960 g ai/ha (3000 ml/ha) as pre-emergence
PIH 485 85% WG @ 102 g ai/ha (120 g/ha) as PPI
PIH 485 85% WG @ 127.5 g ai/ha (150 g/ha) as PPI
Pendimethalin 30% EC @ 1kg ai/ha as pre-emergence
Weedy Check

Evaluation of new molecules of herbicides for controlling of weeds in soybean

Treatment	Seed yield (kg/ha)			
	2015	2016	2017	Mean
F 8072 premix @ 725 g ai/ha (1250 ml/ha) as pre-emergence	1491	1749	1705	1648
Pendimethalin 30% EC + Imazethapyr 2% SL premix @ 960 g ai/ha (3000 ml/ha) as pre-emergence	1394	1987	1968	1783
PIH 485 85% WG @ 102 g ai/ha (120 g/ha) as PPI	1553	1388	1729	1557
Weedy Check	1112	1143	1027	1094
CD (P=0.05)	229	165.6	203	199

Recommendation: Application of premix of Pendimethalin 30% EC + Imazethapyr 2% SL premix @ 960 g ai/ha (3000 ml/ha) as pre-emergence increased seed yield of soybean significantly among testing chemicals.

Expt. Effect of fertigation on soybean productivity (mean of 3 years)

Treatment	Seed yield (kg/ha)	Net returns (Rs/ha)	B:C ratio
Fertigation at flowering (50% RDF as basal + 50 % RDF through fertigation)	2546	66444	3.33
Fertigation at pod initiation (50% RDF as basal + 50 % RDF through fertigation)	2446	63033	3.16
Fertigation at seed filling (50% RDF as basal + 50 % RDF through fertigation)	2632	68930	3.46
Irrigation at flowering (RDF as basal)	2511	65458	3.31
Irrigation at pod initiation (RDF as basal)	2477	64084	3.24
Irrigation at seed filling (RDF as basal)	2504	64688	3.28
Flat sowing (RDF as basal)	2345	60752	3.26
CD (P=0.05)	169	4420	0.18

Recommendation:

- Fertigation at seed filling (50% RDF as basal + 50 % RDF through fertigation) significantly increased seed yield, net income and B:C ratio of soybean.



AICRP on MULLaRP

Expt. : Weed management in Urdbean

Objective : To study the appropriate rate and time of application of herbicides for Urdbean

Treatment:

T_1	Weedy check
T_2	Pendimethalin @ 0.75 kg/ha-PE
T_3	Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg/ha – PE
T_4	Imazethapyr 10 % SL @ 55 g/ha at 20 DAS
T_5	Imazamox 35 WG + imazethapyr 35 WG @ 40 g/ha at 20 DAS
T_6	Imazamox 35 WG + imazethapyr 35 WG @ 60 g/ha at 20 DAS
T_7	Clodinafop propargyl 8 % + Aciflourfen sodium 16.5 % @ 125 g/ha at 20 DAS
T_8	Clodinafop propargyl 8 % + Aciflourfen sodium 16.5 % @ 187.5 g/ha at 20 DAS
T_9	Two manual weeding at 20 and 40 DAS Design: RBD Repli. : 3

Seed yield and economic returns of Urdbean under different weed management practices (pooled mean of 2 year)

Treatment	Seed Yield kg/ha)	Net Return (Rs/ha)	B:C Ratio
Weedy check	344	6366	0.65
Clodinafop propargyl 8 % + Aciflourfen sodium 16.5 % @ 125 g/ha at 20 DAS	698	22122	2.11
Clodinafop propargyl 8 % + Aciflourfen sodium 16.5 % @ 187.5 g/ha at 20 DAS	713	22651	2.12
Two manual weeding at 20 and 40 DAS	849	25627	1.82
CD (P=0.05)	109	4919	0.44

Recommendation:

1. The highest seed yield of Urdbean was recorded in the treatment of hand weeding twice at 20 and 40 days (849 kg ha^{-1} with highest net return of Rs. 25627/ha.
2. Application Clodinafop propargyl 8 % + Aciflourfen sodium 16.5 % @ 187.5 g/ha at 20 DAS of gave the highest B:C ratio.

Weedy check

Two manual weeding at 20 and 35-40 DAS

Expt : Foliar nutrition on urdbean productivity

S. No.	Treatment
1	Control
2	Urea 2% spray at flower initiation
3	TNAU Pulse Wonder @ 5kg flower initiation
4	Salycilic acid 75 ppm flower initiation & 7 days later
5	18:18:18 (NPK) 2 % at flower initiation
6	Urea 2 %+salicylic acid at flower initiation
7	Boron 0.25 ppm at flower initiation
8	Nitrobenzene 500 ppm flower initiation

Design: RBD **Replication : 3**

Economics of the Urdbean cultivation as influenced by foliar nutrition (pooled Mean of 3 year)

Treatment	Seed Yield (kg/ha)	Net Return (Rs/ha)	B:C Ratio
Control	500	9468	0.69
Urea 2% spray at flower initiation	672	17231	1.22
TNAU Pulse Wonder @ 5kg flower initiation stage	798	22872	1.60
18:18:18 (NPK) 2 % at flower initiation	699	17416	1.14
CD (P=0.05)	106	4800	0.33

Recommendation: The highest seed yield of Urdbean was recorded in the treatment of TNAU Pulse Wonder @ 5kg/ha at flower initiation (798 kg ha^{-1}), with net return of Rs. 22872/ha and B:C ratio (1.62).

Expt: Yield maximization in Lathyrus under Rice-utera system through foliar nutrition and seed treatment

Treatment Details

A: Foliar nutrients

1. No spray (Control)
2. 2 % NCU at branching stage
3. 2 % NCU branching stage and 15 days after 1st spray
4. 0.5 % NPK (19:19:19) at branching stage
5. 0.5 % NPK (19:19:19) at branching stage and 15 days later

B: Seed treatment

1. No treatment (control)

2. Sodium Molybdate @ 0.5 g/kg seed

Design: RBD **Replication: 3**

Germinating LATHYRUS SEEDS in Rice stubble cutting height maintained at 30 cm in the field

F_5St_2 0=0.5%19:19:19 Bran &15 days + Sodium Mol @ 0.5 g

Effect of foliar nutrition and seed treatment on yield and economics of Lathyrus (Pooled mean of 2 year)

Treatment	Seed yield (kg/ha)	NR (Rs/ha)	B:C ratio
Foliar nutrition (5)			
No spray	907	9427	0.87
2 % NCU at branching	979	10685	0.96
2 % NCU twice	1156	14099	1.24
0.5 % NPK (19:19:19) once	1139	13862	1.24
0.5 % NPK (19:19:19) twice	1309	17426	1.51
CD at 5 %	129.0	2522	0.23
Seed treatment (2)			
No treatment	1023	11537	1.02
Sodium Molybdate	1173	14663	1.30
CD at 5 %	82	1595	0.14

Recommendation: The higher seed yield (1309 kg/ha) with maximum net return (Rs. 17426/ha) and B:C ratio (1.51) were obtained with the foliar application of 0.5 % NPK (19:19:19) at branching stage and 15 days later.

Among the seed treatment, maximum seed yield (1173 kg/ha) net return (Rs. 14663/ha) and B:C ratio (1.30) were obtained, when lathyrus seeds were treated with Sodium Molybdate @ 0.5 g/kg seed.

Expt: Standardization of crop geometry and nutrient management for rabi Pigeonpea

Treatment

Factor (A) – Crop geometry (3)

G_1 – 30 cmX15 cm , G_2 – 45 cmX15 cm, G_3 – 60cm X15 cm

Factor (B) – Fertilizer levels (3)

F_1 – FYM at 5.0 t/ha + RDF (NPKS :: 20-50-20-20 kg/ha)

F_2 – F_1 + 2 % Urea + 0.50 % Borax spray at Flower initiation

F_3 – F_1 + 0.2 % Multi micronutrient spray at 50 % Flowering initiation

Design: Factorial RBD Replication : Three

Date of Sowing: 06.11.2016, 10.11.2017

Yield and economics of Pigeonpea as influenced by different crop management practices (Mean of 2 years)

Treatments	Seed Yield (kg ha^{-1})	Net Return (Rs. ha^{-1})	B : C Ratio
Factor (A) – Crop geometry			
G_1 – 30 cm X 15 cm	1523	59768	3.05
G_2 – 45 cm X 15 cm	1359	52250	2.79
G_3 – 60 cm X 15 cm	1205	44533	2.44
CD (P=0.05)	149	7488	0.40
Factor (B) – Fertilizer levels			
F_1 – FYM at 5.0 t/ha + RDF	1169	42322	2.28
F_2 – F_1+2% Urea+0.50 % Borax spray at Flower Initiation	1486	58643	3.08
F_3 – F_1+0.2%MMN spray at 50 % Flower Initiation	1432	55586	2.92
CD (P=0.05)	149	7488	0.40

Recommendation: The highest seed yield (1523 kg/ha), net return (Rs. 59768/ha) and B:C ratio (3.05) was recorded when Pigeonpea sown with the closure planting geometry *i.e.* 30 cm X 15 cm.

Among the fertility, the maximum seed yield (1512 kg/ha), Net return (Rs. 58643/ha) and B:C ratio (3.08) of Pigeonpea was obtained when it was nourished with level of FYM at 5.0 t/ha + RDF + 2% Urea+0.50 % Borax spray at Flower initiation stage.

AICRP on Linseed

Effect of date of sowing on varietal performance of linseed (mean of 3 years)

Treatments	Seed yield, kg/ha	HUE	HTUE
Date of sowing			
D1: 20 October	902	0.45	0.58
D2: 5 November	1183	0.59	0.75
D3: 20 November	1213	0.60	0.76
D4: 5 December	990	0.47	0.61
CD	83		
Varieties			
V1: T-397	1095	0.42	0.52
V2: RLC 92	1162	0.48	0.63
V3: Indira Alsi 32	998	0.43	0.59
V4: Shekhar	1033	0.35	0.41
CD	86		

Recommendation: The crop sown during November produced higher seed yield than other sowing dates. In case of varieties, the highest seed yield was obtained with variety RLC-92.

Variety RLC-92 showing best for 20th November

Effect of establishment methods and varietal performance on seed yield, oil content and B:C ratio of linseed (mean of 3 years)

Treatment	Seed yield (kg/ha)	Oil content (%)	B:C ratio
Method of establishment			
Dry seeding with planking f/b by come up irrigation	1298	38.8	1.88
Dry seeding without planking f/b by come up irrigation	1261	38.9	1.99
Seeding after pre-sowing irrigation	1069	38.6	1.37
CD (0.05)	69	NS	-
Varieties			
National check	1188	37.9	1.68
RLC 92	1293	41.4	1.91
Indira Alsi 32	1127	39.1	1.54
Shekhar	1229	36.9	1.77
CD (0.05)	76	0.41	-

Recommendation (AICRP on Linseed)

- The linseed yield of 21.79 q/ha with net return of 74086 and B:C ratio of 2.96 was obtained by seeding in mid of November with seed rate of 30 Kg/ha at a spacing of 30 cm (R x R). The linseed variety RLC-92 may be preferred.
- The nutrients may be applied @ 60:30:30 Kg/ha N, P & K along-with 10 tonne/ha of FYM. The 50% N and full dose of P, K and FYM should be given as basal, while 25% N should be applied after 1st irrigation *i.e.* at 30 DAS and 25% after second irrigation *i.e.* at 60 DAS.
- The two foliar spray of 19:19:19 NPK grade soluble fertilizer @ 3g/ltr of water at 20 & 40 DAS may be also applied.
- The weed control should be done by the use of metsulfuron methyl @ 4g *a.i.* /ha as post emergence (2-3 leaf stage of broadleaf weed). The plant protection measure should be adopted when it is required.

AICRP on Chickpea

Expt. : Effect of tillage practices on crop establishment methods and productivity of chickpea in rice- fallow

Treatments:

T_1-Conventional tillage (two harrowing + planking) followed by line sowing

T_2-Direct seeding in un-tilled field using plough (manually)

T_3-Direct seeding in un-tilled field using zero till drill

T_4- Zero/reduced tillage (one harrowing + planking) followed by line sowing

T_5-Broadcasting seed followed by reduced tillage (one harrowing + planking)

T_6-Broadcasting seed in standing rice before 15 days of its harvest

Design : RBD Replications : 3

Date of Sowing : 10.11.2017 Date of Harvesting : 03.03.2018

Seed yield and economics of chickpea as effected by different treatments (Pooled data of 3 years)

Treatment	Seed Yield (kg ha^{-1})	Net return (Rs ha^{-1})	B:C ratio
Conventional tillage (two harrowing + planking) followed by line sowing	1530	50587	2.46
Direct seeding in un-tilled field using plough	1483	48211	2.32
Reduced tillage (one harrowing + planking) followed by line sowing	1586	53953	2.73
Broadcasting seed followed by reduced tillage (one harrowing + planking)	1441	46899	2.33
CD (P=0.05)	150	6934	0.35

Bioefficacy of different herbicides for broad spectrum weed management in chickpea

T_1- Pendimethalin EC formulation (1.0 kg/ha), PE + one hand weeding at 30 DAS

T_2- Pendimethalin CS formulation (1.0 kg/ha), PE

T_3- Pendimethalin CS formulation (1.0 kg/ha), PE + one hoeing at 30 DAS

T_4- Sulfenotrazon @50g/ha PE + one hoeing at 30 DAS

T_5- Fenoxyprop ethyl @ 60 g/ha POE at 30 DAS

T_6- Pendimethalin 30 EC formulation + Imazethapyr 2 % (Ready mix combination) @ 1.0 kg/ha PE

T_7- Pendimethalin 30 EC formulation + Imazethapyr 2 % (Ready mix combination)* @ 1.0 kg/ha PE + one hoeing at 30 DAS

T_8- Pendimethalin CS formulation (1.0 kg/ha, PE + Imazethapyr 2 % (tank mix combination @ 1.0 kg/ha)

T_9- One hoeing/hand weeding at 30 DAS

T_{10}- Weed free hand weeding at 20 & 40 DAS

T_{11}- Weed check

Design : RBD **Replications: 3**

Date of Sowing : 15.11.2017 Date of Harvesting: 07.03.2018

WCE, WI, seed yield and economics of chickpea as affected by different treatments (pooled data of 3 years)

Treatment	WCE at 60 DAS	WI	Seed Yield (Rs/ha)	NR (Rs/ha)	B:C ratio
Pendimethalin CS formulation (1.0 kg/ha), PE + one hoeing at 30 DAS	74.26	7.38	1780	59944	2.60
Pendimethalin 30 EC+Imazethapyr 2 % (Ready mix comb.)*@ 1.0 kg/ha PE+one hoeing at 30 DAS	74.28	1.37	1894	64579	2.75
Weed free hand weeding at 20 & 40 DAS	85.52	-	1935	64097	2.48
Weed check	0.00	75.64	469	3937	0.21
CD (P=0.05)	7.97	2.00	52	2357	0.10

AICRP-Weed Management

Weed management in rice-wheat –cowpea cropping system under conservation agriculture

Objectives

1. To monitor weed dynamics, crop productivity and herbicide residues under long-term tillage and residue management practices.
2. To evaluate the effect on crop productivity and resource-use efficiency.
3. To study C-sequestration and changes in physico-chemical and biological properties of soil.

Treat.	Kharif (Rice)	Rabi (Wheat)	Summer (Cowpea fodder)
1	CT (Transplanted)	CT	CT
2	CT (Transplanted)	ZT	ZT
3	CT (Direct Seeded)	CT	ZT
4	ZT (Direct Seeded)	ZT + R	ZT
5	ZT (Direct Seeded)+ R	ZT + R	ZT

Total productivity of rice-wheat-cowpea cropping system under conservation agriculture

Treatment	Yield, t/ha					Total Net Income Rs	B:C ratio
	Rice	Wheat	Cowpea, GFY	Total System	Rice equivalent		
Main Plot	Mean of 3 yr.	Mean of 3 yr.	Mean of 3 yr.	2016-17			
CT (Transplanted) –CT-CT	3.70	2.13	12.83	18.65	6.72	27839	1.82
CT (Transplanted) –ZT-ZT	3.45	2.14	13.33	18.93	6.71	32132	1.97
CT (Direct seeded)-ZT- ZT	2.63	2.07	14.29	19.00	6.16	27592	1.70
ZT (Direct seeded)-ZT-R-ZT	2.23	2.07	16.20	20.50	6.00	29134	1.82
ZT (Direct seeded)-R-ZT +R-ZT	2.24	2.18	16.94	21.36	6.05	26585	1.86
LSD (P= 0.05)	-	-	-	-	-	-	-
Sub-plot (weed management)							
Recommended herbicides	3.71	2.39	18.95	25.04	8.12	52273	1.82
Integrated weed management	3.74	2.53	21.90	28.17	8.28	58722	2.29
Unweeded Control	1.11	1.43	3.24	5.78	2.58	-25207	0.46
LSD (P= 0.05)	-	-	-	-	-	-	-

In rice-wheat-cowpea fodder cropping system under conservation agriculture, the higher yields were obtained under CT (transplanted) –ZT (with or without residue)- ZT (with residue) respectively with integrated weed management of oxadiargyl 80g ha^{-1} PE fb hand weeding at 25 DAT/S in rice, 1 HW at 20 DAS fb metsulfurn 4 g ha^{-1} at 35 DAS in wheat and PE application of pendimethaline 1.0 kg ha^{-1} fb 1 HW at 20 DAS in cowpea. Net return and B:C ratio was also higher in this system.

AICRP on IFS

Expt. Identification of new cropping system for yield and profitability

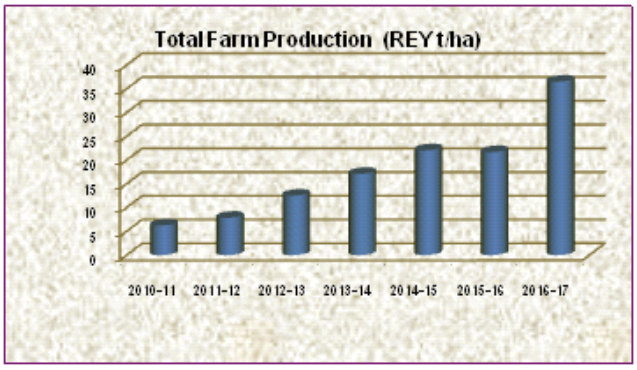
Location: Raipur

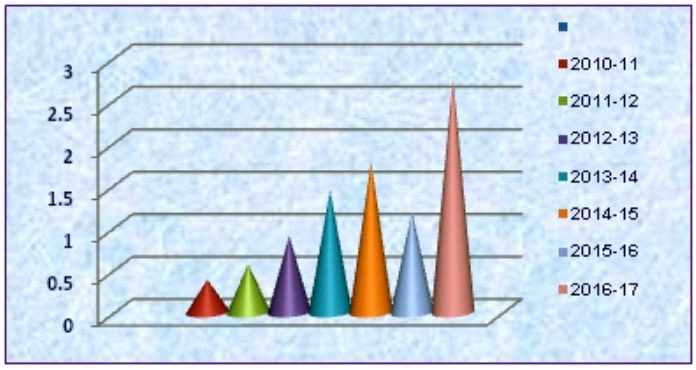
Treatments	Total Productivity (q/ha)		Net Return (lakh Rs/ha)	
	Mean 2 yr.	2016-17	Mean 2 Yr.	2016-17
T1- Rice – Wheat -Dhaincha	**108**	**111**	**1.01**	**1.08**
T3-Rice-Sweet corn-Cluster bean	201	206	1.90	2.01
T8-Rice- Onion + Coriander (leaf) (3:1) -Cowpea	231	245	2.24	2.51

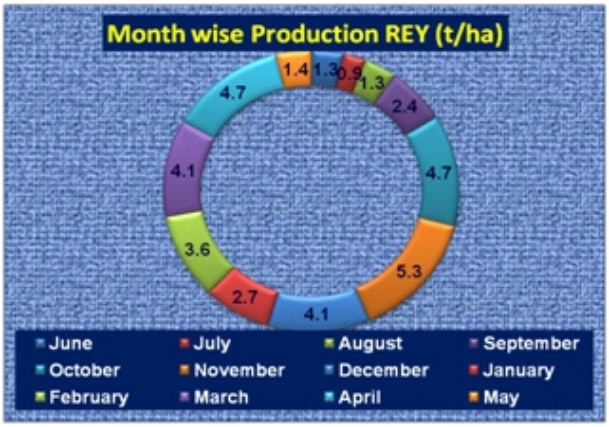
Maximum total productivity of the system and total net return were recorded under rice – onion + coriander – cowpea followed by Rice- sweet corn – cluster bean cropping system

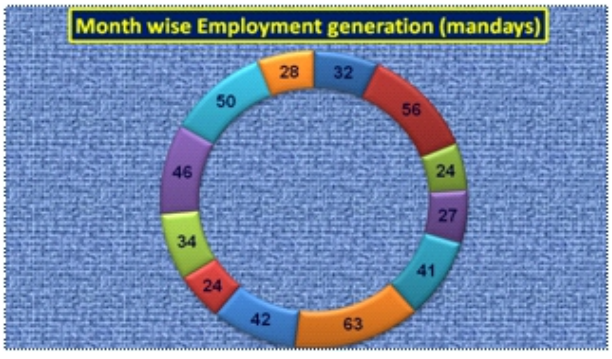
Integrated farming system model (1.0 ha), IGKV, RAIPUR

Performance of the IFS model over the years









IFS model

Cabbage

Tomato

Onion + Coriander (3:1)

Cauliflower

Summary: Net return of Rs. 2,78689/- and B:C ratio of 2.08 was achieved from the 1.0 ha model with employment generation of 467 man days. Rs.74284/- was residue recycled in the system.

Network Projects on Organic Farming

Performance of soybean based cropping system under organic farming

Location: Raipur

Treatments :

Nutrient Management Practices (06)	
NM_1 = 100% Organic	
NM_2 = 75% Organic + one 10% V.W. and one 10 % C.U. spray	
NM_3 = 50% N through organic + 50% N through inorganic sources	
NM_4 = 75% N through organic + 25% N through inorganic sources	
NM_5 = 100% N through inorganic sources	
NM_6 =100% N through inorganic + 5t FYM	
Cropping System (04)	
CS1	Soybean-Maize
CS2	Soybean- Garden pea
CS3	Soybean-Chilli
CS4	Soybean-Onion

Effect of organic, inorganic and INM practices on economics of Soybean based cropping system (mean of 3 years)

Treatment	System Productivity (kg ha^{-1})	NR (Rs ha^{-1})	B:C ratio
Nutrient management			
100% organic	10916	254090	4.35
75% Organic + one 10% V.W. and one 10% C.U. spray	11531	290611	5.30
50% organic+50% inorganic	9950	215492	3.30
75% organic +25% inorganic	10095	224040	3.56
100% inorganic	10710	236107	3.39
100% inorganic +5 t FYM	11438	260530	3.46
CD at 5%	474		
Cropping system			
Soybean-Maize	11284	253988	3.55
Soybean-Pea	9358	218968	3.90
Soybean-Chili	10492	231517	3.62
Soybean-Onion	11959	282773	4.50
CD at 5%	348		

Inorganic soybean treatments
Organic soybean treatments



Response of different traditional and improved scented rice varieties and improved chickpea varieties under organic farming in rice-chickpea cropping system.

Treatments:

Kharif - 15(Traditional /improved scented rice varieties)

Rabi - 15 Popular Chickpea varieties

Organic Package:

- Rice - 80:60:40 kg/ha N:P_2O_5:K_2O (100% organic source)
- Chickpea – 20:50:20 kg/ha N:P_2O_5:K_2O (100% organic source)
- N through *in-situ* green manure + Cowdung manure + Vermicompost + Vermiwash and Azotobacter
- Meeting the balance P through PSB and rock phosphate (22 % grade)

Response of different traditional and improved scented varieties of rice under organic production system.

Variety	Grain yield (kg/ha)	Net return (Rs ha^{-1})	B:C ratio
Badshah Bhog Sel.01	3500	40845	2.07
Gopapl Bhog	3978	49622	2.52
Vishanu Bhog Sel.01	4000	50030	2.54
C.G. Sugandhit Bhog	4578	60644	3.08
IndiraSugandhit dhan	3574	42206	2.14
Dubraj Sel.01	4043	50812	2.58
Lohandi	3528	41355	2.10
Karigilash	4169	53126	2.70
Tarun bhog Sel.01	3833	46968	2.38
CR Sugandha dhan 907	4326	56017	2.84
CD at 5%	583	-	-

Response of different improved chickpea varieties under organic production system.

Variety	Grain yield (kg/ha)	Net return (Rs ha^{-1})	B:C ratio
Jaki	1486	57450	2.91
RG2009-01	1407	53535	2.72
Vaibhav	1726	69527	3.53
JG130	1593	62999	3.20
Vishal	1508	58660	2.98
JG226	1652	66202	3.36
Vijay	1685	67820	3.44
BGD-128) Kabuli	1364	51218	2.60
JG-11	1466	56352	2.86
JG-14	1511	58806	2.98
PKV Kabuli	1470	56720	2.88
RG2003-28	1372	51645	2.62
CD at 5%	245	-	-

AICRP on Irrigation Water Management Bilaspur

Effect of change of micro-environment on wheat crop by sprinkler irrigation.

Location :Bilaspur

Horizontal plot: Levels of Irrigation
Sprinkler after 30 mm CPE Sprinkler after 24 mm CPE Sprinkler after18 mm CPE Sprinkler after 12 mm CPE
Vertical plot: Foliar spray of Bio regulator
KCL 0.2% CaCl2 0.1% Tricontinol

Design: Strip plot Replication : 4 Year of start: 2015-16

Grain yield, Water expanse and economics of wheat as influenced by change of micro-environment.

Treatment	Yield (q/ha)	Water expanse (cm)	WEE (kg/ha-cm)	Net profit (Rs/ha.)	BC ratio
Levels of irrigations					
$I_{1(30mm)}$	25.55	28.64	117.14	22062	0.74
$I_{2(24\ mm)}$	30.45	34.64	116.77	35752	1.18
$I_{3(18\ mm)}$	34.90	40.64	103.10	38498	1.27
$I_{4\ (12\ mm)}$	40.85	52.64	92.80	51127	1.59
Foliar spray of Bio regulator					
$S_{1(KCL\ 0.2\ \%)}$	33.58	39.14	105.13	37513	1.21
$S_{2(CaCl2\ 0.1\%)}$	32.35	39.14	90.32	25321	0.84
$S_{3\ (tricontinol)}$	34.10	39.14	120.34	48906	1.59

Recommendation: Irrigation level of 12 mm CPE gave significantly maximum grain yield, net return and B:C ratio. Among different bio regulator tricontinol gave significantly highest grain yield net return and B:C ratio.




Views of experiment on Wheat

AICRP- Forage Crops

Expt: Performance of perennial fodder sorghum (*sorghum bicolor* cv. COFS- 29) as influenced by planting geometry and cutting intervals under irrigated conditions

Location : Raipur

Treatments:*A. Planting geometry:*

30 cm inter-row spacing
45 cm inter-row spacing
60 cm inter-row spacing

B. Cutting interval

45 days
60 days
75 days
90 days

Design: Split plot design

Expt: Geern fodder yield (q/ha) of perennial sorghum as influenced by planting geometry and cutting intervals under irrigated conditions (mean of 3 year)

	B Cutting interval				
A. Planting geometry	**45 Days**	**60 Days**	**75 Days**	**90 Days**	**Mean A**
30 cm	1,030	1,088	970	890	995
45cm	1,013	1,041	961	819	959
60 cm	947	948	910	709	878
Mean B	996	1,026	947	806	

Recommendation:

Combination of 30 cm plant to plant distance and cutting after every 60 days interval perennial fodder sorghum gives higher green fodder , dry fodder ,crude protein yield and economic return under Raipur condition.

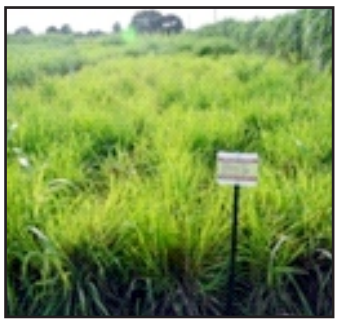
Expt. Studies on intensive fodder cropping systems for yield maximization

Location : Raipur

Treatments:

BN Hybrid + Lucerne
Setaria + Lucerne
BN Hybrid + Cowpea (summer) / Lucerne (winter)
Setaria + Cowpea (summer)/ Lucerne (winter)
BN Hybrid + Berseem (winter)
Setaria + Berseem (winter)
BN Hybrid + Cowpea (summer)/ Berseem (winter)
Setaria + Cowpea (summer)/ Berseem (winter)

Design : RBD



Expt. Studies on intensive fodder cropping systems for yield maximization (Mean of 3 years)

Treatment	Green fodder Yield (q/ha	Dry matter yield (q/ha)	Crude Protein yield (q/ha)	Net Income (RS/ha)	B:C
BN Hybrid + Lucerne (winter)- Cowpea (summer)	764	156	21.0	51902	1.46
BN Hybrid + Berseem (winter)	758	158	18.2	50468	1.55
BN Hybrid + Berseem (winter)- Cowpea (summer)	784	162	22.8	53031	1.50
Setaria + Berseem (winter)- Cowpea (summer)/	705	148	17.5	45324	1.32

Recommendation:

Intercropping of berseem in winter and cowpea in summer with perennial BN hybrid proves superior green fodder (783.8 q/ha), dry matter (161.8 q/ha) and crude protein (22.8 q/ha) with net return (Rs 50468) and benefit cost ratio of (1.55) as compared to other BN hybrid and setaria based cropping system under Raipur situation.

Expt: Study of intensive annual fodder crop based cropping system

Location : Raipur

Treatment details

Sorghum multi cut + Cowpea (2:1) - Lucerne

Maize + Cowpea (2:1) - Lucerne

Pearl millet multi cut + Cowpea (2:1) - Lucerne

Maize + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1)

Maize + Rice bean (2:1) – Oat multi cut - Sorghum multi cut + Cowpea (2:1)

Pearl millet multi cut + Rice bean (2:1) –Oat multi cut – Maize + Cowpea (2:1)

Pearl millet multi cut + Rice bean (2:1) – Berseem – Maize + Cowpea (2:1)

Pearl millet multi cut + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1)

Design: Randomized block design Replication: Three

Expt: Study of intensive annual fodder crop based cropping system

Treatment	Green fodder Yield (q/ha)	Dry matter yield (q/ha)	Green fodder yield per day (q/ha)	Dry fodder yield per day (q/ha)	B:C ratio
Maize + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1)	1046	217	3.53	0.73	1.55
Maize + Rice bean (2:1) – Oat multi cut - Sorghum multi cut + Cowpea (2:1)	1180	247	4.15	0.86	1.94
Pearl millet multi cut + Rice bean (2:1) –Oat multi cut – Maize + Cowpea (2:1)	1129	235	3.91	0.81	1.83
Pearl millet multi cut + Rice bean (2:1) – Berseem – Maize + Cowpea (2:1)	1101	227	3.68	0.76	1.64

Recommendation:

Sequential cropping system of Maize and rice been in 2:1 row ratio in kharif multi cut oat in Rabi and intercropping of multi cut sorghum with cowpea in 2:1row ratio yielded significantly higher green fodder yield (1180 q/ha), dry matter yield (247 q/ha), green fodder per day (4.15 q/ha) and dry fodder per day (86 q/ha) as well as higher net return of Rs 89108 and benefit cost ratio of 1.94 as compared to other cropping system in Raipur situation.

Expt: Study of intercropping system of Pigeonpea with different annual fodder crops (Mean of 3 year)

Location : Raipur

Technical details

(Additive series two row of pigeon pea at 45 cm)

1. Pigeonpea + Sorghum (2:1)
2. Pigeonpea + Maize (2:1)
3. Pigeonpea + Pearl millet (2:1)
4. Pigeonpea + Soybean (2:1)
5. Pigeonpea + Rice bean (2:1)
6. Pigeonpea + Cowpea (2:1)
7. Pigeonpea + Cluster bean (2:1)

Note: The recommended package of practices for all crops or according to main crop will be adopted.

Technical details: Design: Randomized block design

Expt: Study of intercropping system of Pigeonpea with different annual fodder crops (Mean of 3 year)

Treatments	GFY (q/ha)	DMY (q/ha)	Pigeon pea Seed yield	B:C ratio
1. Pigeon pea + Sorghum (2:1)	158	35.43	12.06	2.33
2. Pigeon pea + Maize (2:1)	181	46.89	10.75	2.21
3. Pigeon pea + Pearl millet (2:1)	170	36.46	11.69	2.40
4. Pigeon pea + Soybean (2:1)	131	23.33	13.95	2.55

Recommendation: Pigeonpea intercropped with Maize or Pearl millet in row ratio of 2:1 is best suited combination for green fodder, dry matter and crude protein yield under Raipur condition.

Expt: Effect of irrigation scheduling and straw mulch on the water requirement and productivity of BN hybrid

Location : Raipur

Treatments

Main-plot: Irrigations (3):

(A)0.8 IW/CPE

(B)1.0 IW/CPE

(C)1.2 IW/CPE

Sub-plot: Straw mulch (4):

(A)Control

(B)5.0 t/ha

(C)7.5 t/ha

(D)10 t/ha

Variety: RBN -13 Seed rate: 27500 root slips/stem cutting/ha

Spacing :60cm x 60cm Fertilizers: 50 t FYM + 75 kg N/ha/cut

Design : Split-plot Replication :3

Expt: Effect of irrigation scheduling and straw mulch on the water requirement and productivity of BN hybrid (Mean of 2 years)

Treatment	GF yield (q/ha)	D M Yield (q/ha)	B:C Ratio	WEE (kg DW-ha/mm)
A. IW/CPE Ratio				
I_1-0.8	894	168	2.3	10.51
I_2-1.0	1007	189	2.5	10.36
I_3-1.2	1071	201	2.4	9.61
CD (p=0.05)	91	16	0.62	1.06
B. Straw mulch (t/ha)				
M_1- Control	855	156	2.2	8.54
M_2-5.0	969	181	2.4	9.84
M_3-7.5	1037	198	2.5	10.81
M_4-10	1101	209	2.6	11.45
CD(p=0.05)	48	12	0.48	0.70

Recommendation: The *1.0 IW/CPE ratio* increased green, dry matter and crude protein yields and B:C ratio, which was at par with 1.2 IW/CPE ratio. As regards to *straw mulch application of @ 10 t/ha* proved significant superior higher green, dry matter and crude protein yields as compare to other treatments"

Soil Science & Agril. Chemistry

Technology recommended: AICRP LTFE

- On the basis of long term fertilizer experiment (19 years) under continuous rice - wheat cropping, it can be concluded that, Integrated use of inorganic and organic manure proved better for long term sustained productivity and improvement in SYI, Sqi (Soil quality Index) and Bci (Biochemical Index) under rice – wheat cropping sequence.
- The nutrient status after harvest of rice and wheat was improved with the application of 100% NPK + FYM @ 5 t ha^{-1}.
- Application of BGA @ 10 kg ha^{-1} along with sub - optimal dose of NPK is not a viable solution to get sustainable yield as compared to incorporation of GM along with sub-optimal dose of NPK.
- Imbalanced fertilization (100 % N) and application of BGA along with 50% NPK could not sustain productivity on long run.
- Fertilizer prescription equations were developed for Sri Hybrid rice-mustard cropping sequence.

S. No.	Crop/soil	Equations
1.	SRI Hybrid Rice (IRH-103) *Vertisol*	FN = 3.66 Y -0.66 SN - 0.30 FYM FP = 0.95 Y - 2.16 SP - 0.25 FYM FK = 1.62 Y - 0.14 SK - 0.11 FYM
2.	Mustard (Pusa Bold) *Vertisol*	FN = 13.05 Y -0.55 SN - 0.20 FYM FP = 4.11 Y - 2.45 SP - 0.33 FYM FK = 4.63 Y - 0.08 SK - 0.06 FYM

- ❑ Prescriptions generated for different crops and cropping systems were tested and validated at farmer's field within results obtained within 10% variation

Technology recommended: AICRP –Rice-Voluntary centre

- ➢ Among the 23 rice genotypes tested for tolerance to soil acidity and found that RP5974-3-2-8-38-12 (5.84 t/ha) performed best followed by Indira Maheshwari (5.73 t/ha) whereas Danteswari is not recommende under acidic soil conditions.
- ➢ **RKVY Funded Project: Studies on Arsenic in continuum with irrigation water, soil and crop system in Ambagarh chowki block of District Rajnandgaon (CG)**
- ➢ The content of Arsenic in Hand Pumps and tube well water were **above the WHO recommended Arsenics limit (0.01 mg L^{-1}) for drinking water.**
- ➢ Among all the soil orders, *Vertisoils* contained relatively higher amount of arsenic than *Alfisols* and *Inceptisols.*

Code		Recommendations
SOIL-01	Assessment of feasibility of establishment of rice with intact roots in FY M and through mud ball under different methods of sowing	Rice nursery can be grown in FYM trays with full dose of P and K for getting higher yield (7.08 t ha^{-1}).
SOIL-02	Crop response based assessment of nutrient deficiencies in two major soil group of six districts of CG	In Chhattisgarh plains Sulphur, Zinc and Boron are yield limiting nutrients in almost all the ditrics whereas Mo is included in these for Bastar, Kondagaon and Janjgir
SOIL-03	Assessment of long term impact of different tillage practices and possible management for higher crop productivity under rice based cropping system in soils of Chhattisgarh	Among the different methods of rice cultivation hard pan formation is observed under sub soil layer in transplanted rice whereas it was not observed in in line sowing and biasi.
Code	Title	Recommendations
SOIL-06	Demonstration of technique of SRI and use of urea brequettes with SRI for higher NUE	Field demonstrations were undertaken on farmers field covering six KVK's
SOIL-10	Influence of different source of organic manure on soil quality and production of rice	First year results indicate that compost prepared from waste of Maize industries recorded comparatively higher yield than yield obtained with application of compost prepared from w aste of other industries.

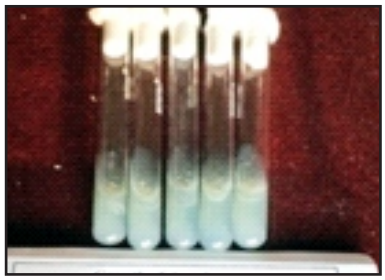
Agricultural Microbiology

Micro-1

"Identification and utilization of effective isolates of *Acetobacter* for increasing sugarcane production in Chhattisgarh."

Objective:

Technology demonstration among sugarcane growers for nitrogen saving by using properly screened *Acetobacter* isolates against national check



Work Done during 2017-18

Three promising local *Acetobacter* isolates (Dharampura-1, Root-18 and RD-15) were tested against national check in 12 farmers' fields at 4 villages of Kabirdham district.

Among 4 isolates Root-18 isolate performed best with reference to height, stalk diameter and sugar content

Isolates of *Acetobacter* on LGIP Agar Medium

Distribution of Input Materials:

Inoculation of sugarcane sets

Sowing of inoculated sugarcane sets

Performance of promising *Acetobacter* isolates in sugarcane farmers' fields of Kabirdham district

S.N.	Name of Farmer	Village	Effect of *Acetobacter* Isolates on sugarcane plant growth (at 265DAS)							
			Dharampura-1		Root-18		Rahuri		RD-15	
			Plant Height (cm)	Stalk Diameter (cm)	Plant Height (cm)	Stalk Diameter (cm)	Plant Height (cm)	Stalk Diameter (cm)	Plant Height (cm)	Stalk Diameter (cm)
1	Sukhnandan	Bhedali	195.07	10.92	243.74	11.77	205.47	10.60	207.18	10.50
2	Dhaniram	Bhedali	214.37	11.01	262.14	13.12	210.23	11.00	211.36	10.71
3	Labhsingh	Khairjhiti	233.68	10.24	252.07	11.43	218.15	10.00	214.90	10.04
4	Bharat sahu	Limo	254.00	9.74	259.08	9.65	228.37	8.13	215.13	9.83
5	Bhagirathi	Bhedali	214.38	9.23	258.06	10.83	210.18	8.22	211.12	9.50
6	Mulchand	Bhedali	225.55	10.75	264.16	10.41	215.07	10.25	214.45	10.15
7	Hemnath	Bhedali	211.33	10.50	243.83	11.09	207.00	10.03	210.33	10.13
8	Maniram	Bhedali	223.23	10.26	254.10	12.12	213.28	10.13	211.10	10.10
9	Kedarsingh	Khairjhiti	223.10	10.30	254.25	13.02	225.55	9.40	216.41	10.75
10	Santosh	Khairjhiti	219.05	9.88	250.12	12.62	210.02	9.23	208.28	10.33
11	Rikhhi	Khairjhiti	220.36	9.53	248.60	11.09	216.40	9.06	186.94	9.57
12	Shurabh	Bhedali	219.16	10.25	243.74	10.87	214.52	9.64	233.68	9.48
	Average		**221.11**	**10.22**	**254.19**	**11.50**	**214.52**	**9.64**	**211.74**	**10.09**

Promising Isolate Root-18

Comparative performance of *Acetobacter* isolates *w.r.t.* plant growth and Brix percent of sugarcane crop

Acetobacter Isolates	Plant height (cm) at 265DAS	Stalk diameter (cm) at 265DAS	Brix percentage of cane juice at 265DAS
Dharampura-1	221.11	10.22	19.31
Root-18	254.19	11.50	21.51
Rahuri	214.52	9.64	20.03
RD-15	211.74	10.09	19.73
Control	183.99	8.29	17.75
CD (0.05)	**27.42**	**1.11**	**2.18**

Study of sugarcane recovery (BRIX percentage)

Conclusion:

***Acetobacter* isolate Root-18 found best among all isolates under study. This isolate is now being used for mass production of *Acetobacter* biofertilizer**

AMB-2

Identification and Utilization of Effective Isolates of Zinc Solubilizing Bacteria for Growth Promotion and

Zinc Nutrition of Rice

Work Done during 2017-18

20 soil samples were collected from Zinc deficient fields of Palari block of Balodabazar district (where Zn level was recorded below 0.25 ppm*). Similarly 5 soil samples were collected from Zn sufficient soils of dharsiwa block of Raipur district. Out of total 25 samples only 7 ZSB isolates could be isolated from Zn deficient areas. These isolates were further tested for selection of effective ZSB isolates and 3 isolates showed Zn solubilization capacity up to 15-20ppm at 15 DAI.

* Based on soil analysis report of Dept. of Soil Science, IGKV, Raipur

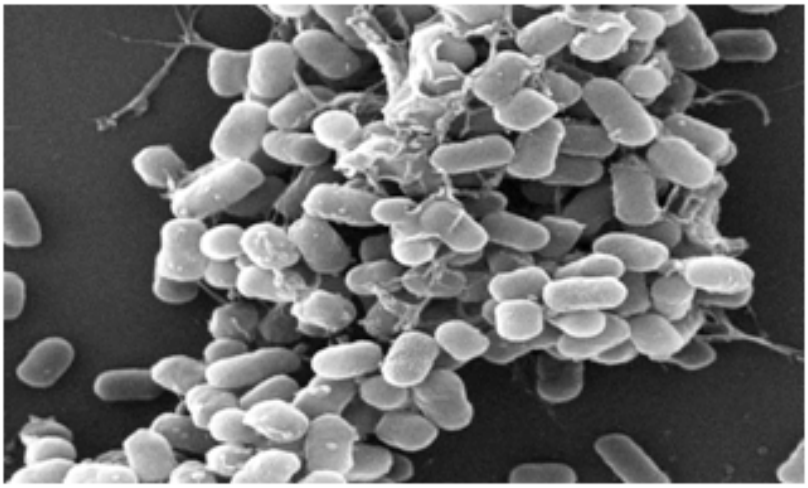
Zinc solubilizing isolates from Balodabazar(Solubilization of ZnO)

Zinc solubilizing capacity of isolated bacterial isolates in Zinc solubilizing broth medium

Zn solubilizing bacterial isolates	Zn solubilization at 15 days of incubation (ppm)
Zn-Lat-2,4 & 8	15-20ppm
Zn-Lat-3,7, Zn-Dat-13	10-15ppm
Zn-Lat-5	<10ppm

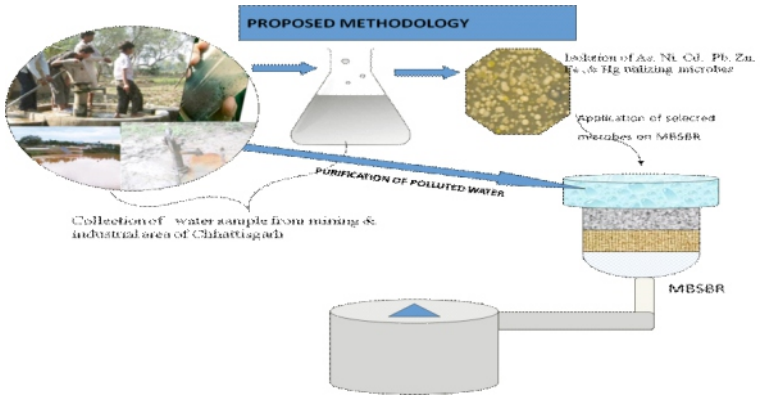
Conclusion

At present no local culture of **IGKV ZSB Isolates. Now Hence, aftwe will able to add ZSB in our repository for mass production**.



AMB-3

Microbes Based Soil Bed Reactor (MBSBR) to Mitigate the Drinking Water Problem in Mining and Industrial Areas of Chhattisgarh



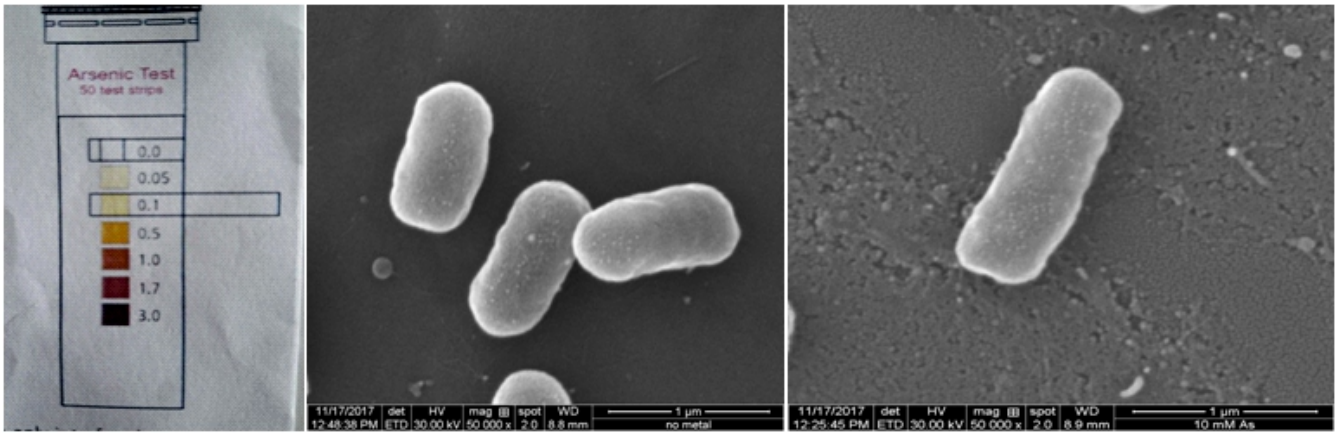
Objective

*Collection of soil and water sample from mining and industrial areas of Chhattisgarh.

***Isolation and characterization of the microbes having heavy metal absorption/utilization ability.**

*To design specific MBSBR.

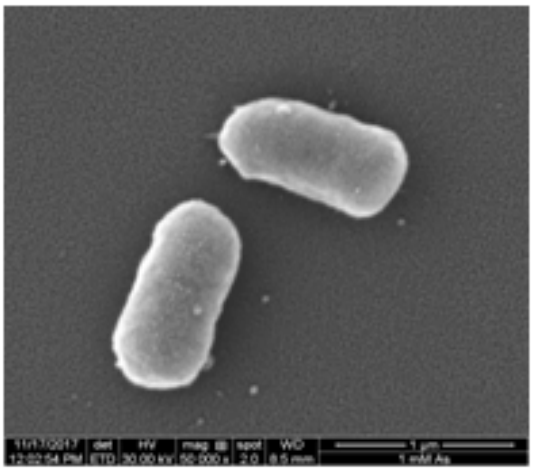
Fresh Sample, Sample after 1 hr, Sample after 3 hr, Sample after 6 hr
Reduction in Arsenic concentration by MBSBR



No metal **10 mM As**

Cell size enlargement

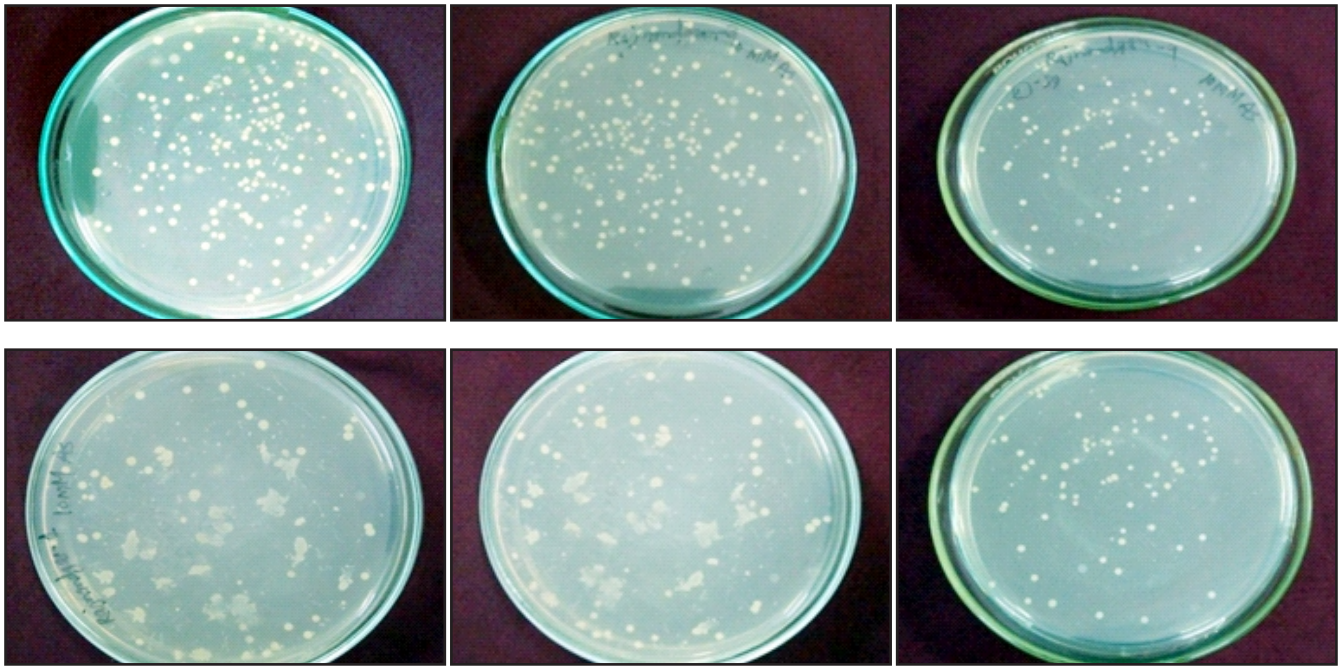
No Metal < 1 mM As < 10 mM As



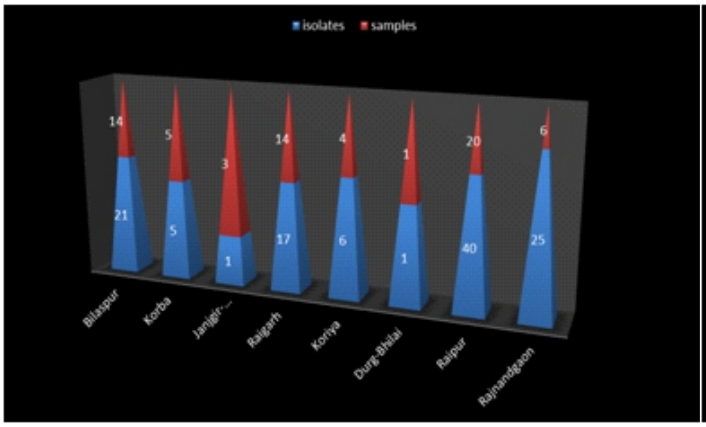
Effect of Arsenic on Bacterial Cell Growth

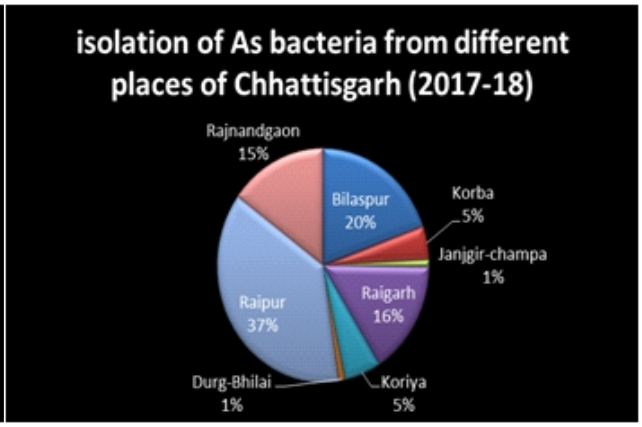
Sample Collection from Industrial and Mining affected area of Chhattisgarh

S.N.	Full Name	S.N.	Full Name
1	Bilaspur Arpa Water	16	Raighar Ujalpur Soil
2	Bilaspur Gatori Water	17	Raighar Nalwa Soil
3	Bilaspur Gatori Soil	18	Raighar Chhal Water
4	Bilaspur Mohatari Soil	19	Raighar Chhal Water
5	Bilaspur Parsada Soil	20	Koriya Water
6	Bilaspur Sirgitti Water	21	Koriya Soil
7	Bilaspur Sirgitti Soil	22	Raipur Bhanpuri Soil
8	Bilaspur Hardikola Water	23	Raipur Urla Water
9	Bilaspur Hardikola Soil	24	Raipur Urla Soil
10	Korba Dipka Water	25	Raipur Siltara Water
11	Korba Dipka Soil	26	Raipur Mandhar Soil Arsenic
12	Korba Jhagarha Soil	27	Durg Bhilai Water Arsenic
13	Janjgir Champa Soil	28	Rajnandgaon Ambagharchowki Water
14	Raighar Kirodimal Soil	29	Rajnandgaon Ambagharchowki Soil
15	Raighar Ujalpur Water	30	Rajnandgaon Soil



Isolation of As bacteria from different mining and industrial affected area of Chhattisgarh





Conclusion

***Entererobacter cloacae* NCBI gene Bank accession number MG857855** and ***Klebsiella spp* NCBI gene Bank accession number MF375214** have been identified under this project as an effective tool for purification of **Arsenic** (heavy metal) contaminated ground and surface water of mining and industrial areas. Similarly, another two local bacterial isolates, ***Bacillus xiamenensis* NCBI gene Bank accession number MG859245)** and ***Fictibacillus halophilus* NCBI gene Bank accession number MG859246** have also been identified by this department as an effective tool for bioremediation of **Nickel** (heavy metal) contaminated ground and surface water. Work on Bioremediation of Cadmium polluted water is in progress.

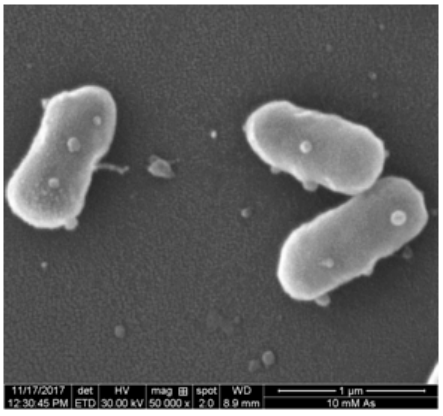


Fig: Scanning electron micrograph of IGKV local bacterial isolate ***Entererobacter cloacae* NCBI Acc. No. MG857855** (grown at 10mM As viewed under 50,000X magnification) as an effective tool for **bioremediation of Arsenic polluted water**

Micro-3: Influence of foliar biofertilizers on foliar biomass of mulberry to enhance silk production

Locations from where mulberry leaf samples collected for isolation and screening of foliar *Azotobacter* and *Azospirillum* isolates from Janjgir Champa

Name of Village	Mulberry Sample No.	Foliar Azotobacter Isolate No.	Foliar AzospirillumIsolate No.
Kulipota	1,2	Azot-M1,2	Azos-M 1,2
Khisora	3,4,5,6	Azot-M 3,4,5,6	Azos-M 3,4,5,6
Baloda	7,8,9,10,11,12,13,14	Azot-M 7,8,9,10,11,12,13,14	Azos-M 7,8,9,10,11,12,13,14
Parsahi II	15,16,17,18,19,20,21,22	Azot-M 15,16,17,18,19,20,21,22	Azos-M 15,16,17,18,19,20,21,22

BNF capacity of *Azotobacter* & *Azospirillum* isolates collected from foliar parts of mulberry

Foliar Azotobacter (mg N/ml broth)			*Foliar Azospirillum* (mg N/ml broth)		
Mulberry *Azotobacter* isolate No.		**Foliar (from washed leaf)**	**Mulberry *Azospirillum isolate* No.**		**Foliar (from washed leaf)**
1		0.0286	1		0.0654
2		0.0305	2		**0.0792**
3		0.0289	3		0.0669
4		0.0283	4		**0.0814**
5		0.0278	5		0.0749
6		0.0295	6		0.0622
7		0.0309	7		0.0756
8		0.0299	8		0.0707
9		0.0262	9		0.0756
10		**0.0349**	10		0.0728
11		0.0244	11		0.0713
12		0.0284	12		0.0779
13		0.0252	13		0.0553
14		0.0318	14		0.0778
15		0.0261	15		0.0554
16		0.0323	16		0.0691
17		0.0261	17		0.0742
18		0.0271	18		0.0668
19		0.0346	19		0.0540
20		**0.0357**	20		0.0575
Mean		**0.0294**			**0.0692**
Range		**0.0244-0.0357**			**0.0540-0.0814**

Experimental details :

Crop : Mulberry

Design of Experiment : RBD

Number of treatment : 5

Number of replication : 4

Expermintal Site Village Baloda (Janjgir Champa)

Tr. No.	Treatment
T1	Control
T2	Foliar inoculation by foliar *Azotobacter* 10 and *Azospirillum2*
T3	Foliar inoculation by foliar *Azotobacter* 10 and *Azospirillum 4*
T4	Foliar inoculation by foliar *Azotobacter*-20 and *Azospirillum*-2
T5	Foliar inoculation by foliar *Azotobacter*-20 and *Azospirillum*-4

Influence of foliar inoculation on leaf fresh biomass of mulbery

Tr. No.	Treatment	Average fresh wt. (g) of 10 leaf				Average wt. of 10 cocoon (g)
		After Ist Spray	After IInd Spray	After IIIrd Spray	Mean	
T1	Control	4.01	5.40	7.24	5.55	16.95

T2	Foliar inoculation by foliar *Azotobacter* 10 and *Azospirillum2*	4.95	5.71	7.80	6.15	17.87
T3	Foliar inoculation by foliar *Azotobacter* 10 and *Azospirillum 4*	5.07	6.23	8.84	6.71	17.72
T4	Foliar inoculation by foliar *Azotobacter*-20 and *Azospirillum*-2	5.29	5.61	7.87	6.26	17.85
T5	Foliar inoculation by foliar *Azotobacter*-20 and *Azospirillum*-4	5.95	6.84	9.10	7.30	18.27

Tr. No.	**Treatment**	*Azotobacter* population density on leaf at 105 dilution			
		Ist picking	IInd Picking	IIIrd Picking	Mean
T1	**Control**	2.35	2.04	1.72	2.04
T2	**Foliar inoculation by foliar *Azotobacter* 10 and *Azospirillum2***	3.09	4.52	5.28	4.30
T3	**Foliar inoculation by foliar *Azotobacter* 10 and *Azospirillum 4***	3.39	5.13	5.65	4.72
T4	**Foliar inoculation by foliar *Azotobacter*-20 and *Azospirillum*-2**	3.05	4.68	5.07	4.27
T5	**Foliar inoculation by foliar *Azotobacter*-20 and *Azospirillum*-4**	**3.66**	**5.51**	**6.20**	**5.12**

Tr. No.	**Treatment**	***Azospirillum* population density on leaf at 105 dilution**			
		Ist picking	**IInd Picking**	**IIIrd Picking**	**Mean**
T1	Control	5.44	5.37	5.20	5.34
T2	Foliar inoculation by foliar *Azotobacter* 10 and *Azospirillum2*	6.73	8.38	9.04	8.05
T3	Foliar inoculation by foliar *Azotobacter* 10 and *Azospirillum 4*	7.15	9.13	10.10	8.79
T4	Foliar inoculation by foliar *Azotobacter*-20 and *Azospirillum*-2	6.82	8.54	9.36	8,24
T5	Foliar inoculation by foliar *Azotobacter*-20 and *Azospirillum*-4	7.41	9.39	10.53	9.11

Conclusion:

*BNF ability of foliar *Azospirillum* isolates was observed higher over *Azotobacter* isolates

**Significant variation among isolates for BFAN*

*Population density of *Azospirillum* on inoculated leaf much higher than *Azotobacter*

*Foliar dual inoculation of *Azotobacter*-2 and *Azospirillum*-2 performed best wrt leaf biomass,

cocoon wt etc among other combination under study.

Micro-2: Testing of liquid foliar biofertilizers (*Azospirillum* and *Azotobacter)* in order to enhance production of leafy vegetable like palak(*Spinacia oleracea)*

Experimental details Expt 3 :

Crop : Palak
Variety : Hariya
Design of Experiment : RBD
Number of treatment : 10
Number of replication : 3

Technical details :

- Full dose of P, K & first split of N followed by irrigation) as basal uniformly
- Fertilizer dose N, P_2O_5, K_20 dose: 100:50:60 kg/ha
- Line to line distance : 30 cm (seed covered by thin layer of FYM followed by irrigation)
- Leaf Inoculation by means of spray : First spray at 15 and next spray after 10 days of each cutting

Treatment Details

Tr. No.	Treatment
T1	Control 100% of split dose of N
T2	Seed inoculation by carrier based *Azotobacter* and *Azospirillum* , 100% of split dose of N
T3	Seed inoculation + Foliar *Azotobacter*-A and *Azospirillum*-A ,50% of split dose of N
T4	Seed inoculation + Foliar *Azotobacter*-B and *Azospirillum*-A, 50% of split dose of N
T5	Seed inoculation + Foliar *Azotobacter*-A and *Azospirillum*-B, 50% of split dose of N
T6	Seed inoculation + Foliar *Azotobacter*-B and *Azospirillum*-B, 50% of split dose of N
T7	Seed inoculation + Foliar *Azotobacter*-A and *Azospirillum*-A, 67% of split dose of N
T8	Seed inoculation + Foliar *Azotobacter*-B and *Azospirillum*-A, 67% of split dose of N
T9	Seed inoculation + Foliar f *Azotobacter*-A and *Azospirillum*-B, 67% of split dose of N
T10	Seed inoculation + Foliar *Azotobacter*-B and *Azospirillum*-B, 67% of split dose of N

Tr. No.	Treatment	Weight of fresh leaf biomass q/ha
		total
T1	Control 100% of split dose of N	68.8
T2	Seed inoculation by carrier based *Azotobacter* and *Azospirillum* , 100% of split dose of N	77.5
T3	Seed inoculation + Foliar *Azotobacter*-A and *Azospirillum*-A ,50% of split dose of N	69.6
T4	Seed inoculation + Foliar *Azotobacter*-B and *Azospirillum*-A, 50% of split dose of N	70.4
T5	Seed inoculation + Foliar *Azotobacter*-A and *Azospirillum*-B, 50% of split dose of N	72.2
T6	Seed inoculation + Foliar *Azotobacter*-B and *Azospirillum*-B, 50% of split dose of N	70.8
T7	Seed inoculation + Foliar *Azotobacter*-A and *Azospirillum*-A, 67% of split dose of N	77.4
T8	Seed inoculation + Foliar *Azotobacter*-B and *Azospirillum*-A, 67% of split dose of N	79.5
T9	Seed inoculation + Foliar f *Azotobacter*-A and *Azospirillum*-B, 67% of split dose of N	84.4
T10	Seed inoculation + Foliar *Azotobacter*-B and *Azospirillum*-B, 67% of split dose of N	81.3

Conclusion: About 25-30 Kg mineral N/ha can be saved by application of foliar *Azotobacter* and *Azospirillum* by mean of foliar spray

AMB- 1

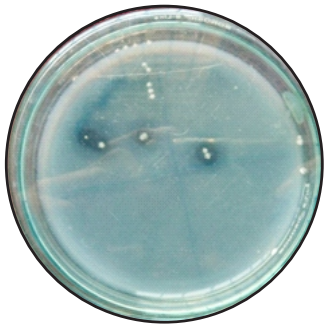
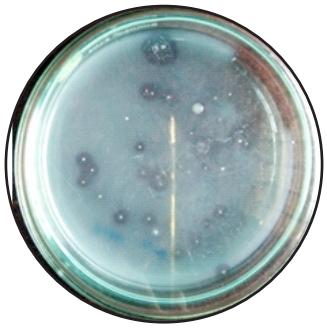
Collection of native K solublizing bacteria from different soils of C.G. for organic farming

Total 50 soil Samples collected from 5 districts of Chhattisgarh.

Out of them only 10 samples gave promising appearance of K solublizing bacteria in Alksandrow Agar Medium (used Potassium alumino silicate as source of insoluble K to develop clearing zone around KSB colonies)

Name of District	No. of Sample collected	No . KSB isolates obtained at 10^5 dilution
Balod	10	01
Bilaspur	10	01
Raipur	10	02
Rajnandgoan	10	02
Sarguja (Mainpat)	10	04

Clearing zone around KSB colonies in Alksandrow Agar Medium containing Potassium alumino silicate


Experiment Details
Experimental details
Crop -Maize (Sweet corn) Variety : Sugar 70
Fertilizers doses (GRD) -120:60:60:: N:P:K
Soil Type - Inceptisol
No. of Treatment - 12
Replication -03
Design -CRD
Date of Sowing -25-01-2018
Isolates were multiplied by using Alksandrow broth medium for inoculation purpose.

Influence of KSB Isolates on Biomass Accumulation By Sweet Corn

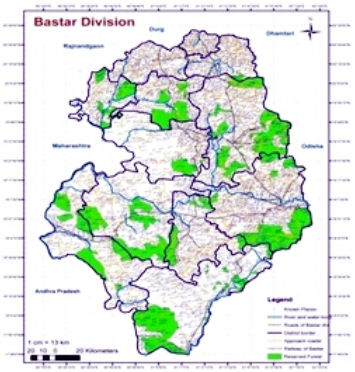
Isolate Source (Soil)	Isolate No.	Plant Height			Dry Matter g/plant at 80 DAS
		30DAS cm	60DAS cm	80 DAS cm	
	Control (No K & No inoculum)	29.13	54.33	70.37	12.18
	K::60 Kg/ha	28.20	64.40	80.27	18.17
Balod	Isolate No. 1	30.83	62.17	78.17	14.80
Rajnadgoan 02	Isolate No. 2	27.43	64.67	79.67	15.67
Raipur 03	Isolate No. 3	27.60	62.40	76.80	13.51
Mainpat 07	Isolate No. 4	28.27	64.47	77.90	17.28
Rajnadgoan 04	Isolate No. 5	30.47	58.93	81.60	16.07
Bilaspur 05	Isolate No. 6	28.93	63.27	82.53	18.54
Maipat05	Isolate No. 7	29.57	61.67	77.07	13.01
Mainpat 06	Isolate No. 8	25.67	63.30	78.93	15.68
Mainpat o1	Isolate No. 9	27.83	60.80	81.67	18.10
Raipur02	Isolate No. 10	27.93	63.70	84.20	18.92

Conclusion : Wrt biomass accumulation of sweet corn, isolates No. 10 performed best followed by isolate 6, among all the isolates under study. These isolates will be utilized for mass production after proper field testing

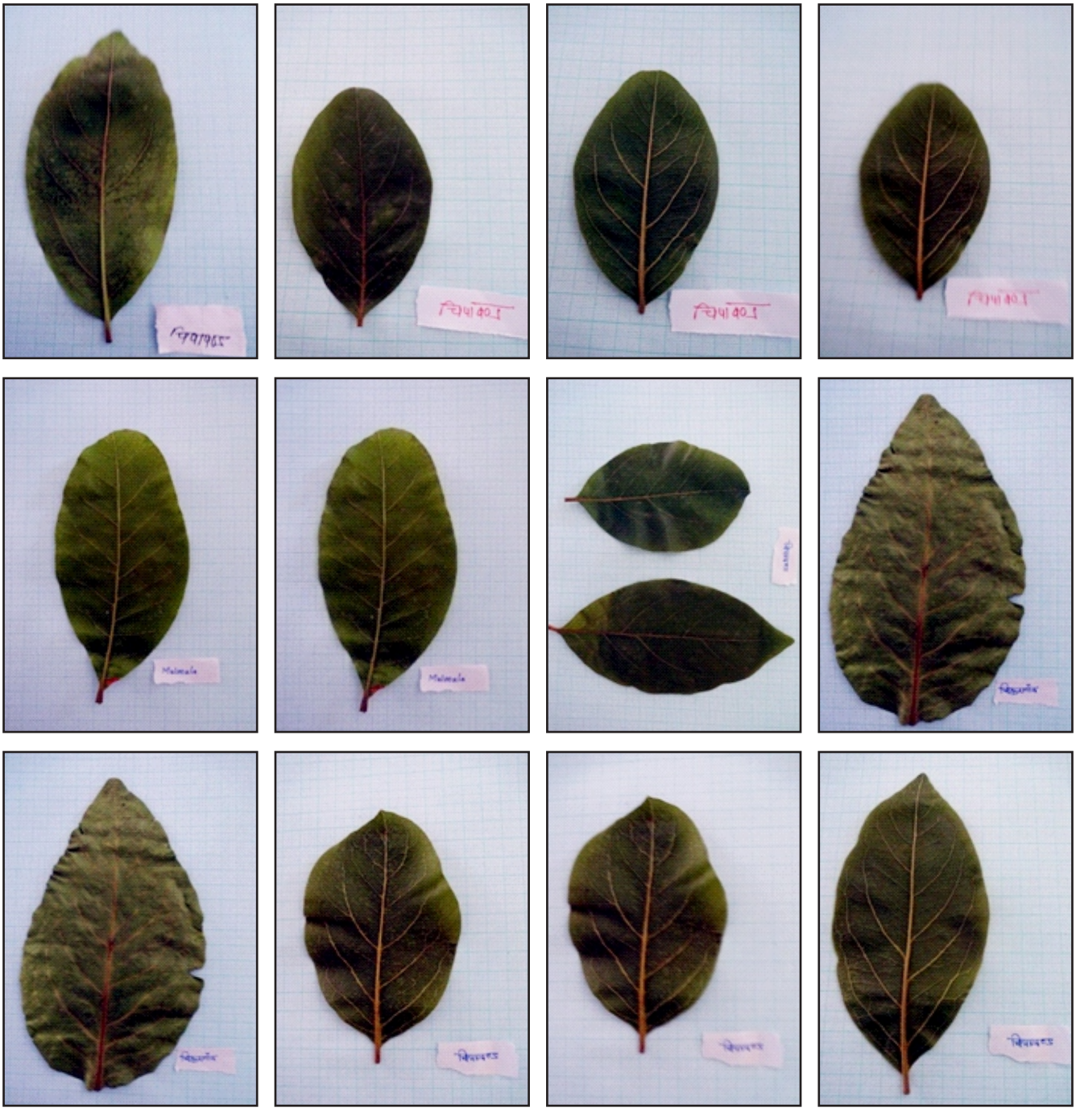
Agro Forestry

RPF 1:Description of quality parameters of bidi patta and its biodiversity

S. N.	Name of District	SN	Name of Block	SN	Name of villages
1.	Kanker	1	Narharpur	1	Marwadi
				2	Narharpur
		2	Kanker	1	Dhanelikanhar
				2	Aturgaon
2.	Kondagaon	1	Kondagaon	1	Kokodi
				2	Baniyagaon
		2	Pharasgaon	1	Alor
				2	Bang Gaon
3.	Bastar	1	Jagdalpur	1	Nangur
				2	Alnar
		2	Bastanar	1	Jamgaon
				2	Kodenar
4.	Dantewada	1	Dantewada	1	Teknar
				2	Chitaloor
		2	Geedam	1	Karli
				2	Binjam
5.	Bijapur	1	Bijapur	1	Manjhiguda
				2	Naimed
		2	Bhairamgarh	1	Nelasnar
				2	Kodoli
6.	Sukma	1	Chhindgarh	1	Rokel
				2	Chindgarh
		2	Sukma	1	Ramaram
				2	Gongla
7.	Narayanpur	1	Narayanpur	1	Edka
				2	Mjunjhmeta
		2	Orcha	1	Kurusnar
				2	Basing



Visit of collection site



CGCOST mini research project on

Exploration of genetic diversity in Bamboo species in Baster plateau of Chhattisgarh

List of sixteen Bamboo for primary DNA finger print analysis (2016-17)

S N	Name of germplasm/	Area
1.	Bamboo spp (N)	N (2 sample)
2.	Bamboo spp (N-1)	N-1 (2 sample)
3	Bamboo spp (N-2)	N-2 (2 sample)
4.	*Dendrocalamus strictus*	Deer park Kanger valley
5.	*Cephalotachys pergracil*	Kutumsar cave-1
6.	*Bambusa vulgaris*	Kutumsar GH-1
7.	*Bambusa bambos*	Kutumsar GH-2
8.	*Schizostachyum pergracile* (Timi bans)	Kanger Valley

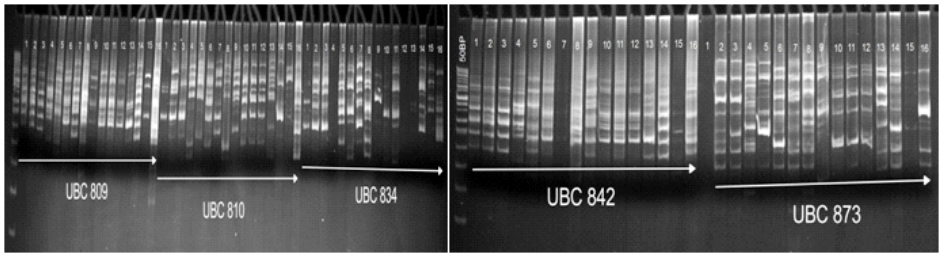
9.	*Gigantochloa rostrata (*Bodari bans)	Kanger valley
10.	*Bambusa striata*	Forest nursery
11.	*Bambusa womin (long internodes)*	Forest nursery
12.	*Bambusa womin (short internodes)*	Forest nursery
13.	*Bambusa tulda*	Forest nursery
14.	*Bambusa balcooa*	Forest nursery
15.	Herb bamboo	Forest nursery
16.	*Dendrocalamus gigantichloa*	Forest nursery

Identification of genetic relationships or genetic divergence in bamboo is very difficult because of the lack of morphological differences and erratic flowering. Authentic identification of taxa is necessary both for breeders to ensure protection of intellectual property right and also for propagators and consumers. The most traditional method of identifying species by phenotypic characters is now replaced by protein that is Shalini *et al* 2013 more reliable & authentic or DNA profiling largely because of several limitations of morphological data. In this study all the sixteen genotypes have taken for molecular data by using 5 polymorphic ISSR primers (UBC 809, UBC 810, UBC 34, UBC 42 & UBC 73).

Polymorphism Information Content: Polymorphism Information Content provides an estimate of determining power of a marker based on the number of alleles at a locus and relative frequencies of these alleles. PIC value represents the relative informativeness of each marker and in the present study, highest PIC value was reported for UBC-834 (0.4128) followed by UBC-810 (0.4023), UBC-809 (0.3769), UBC-873 (0.3602) and lowest**.**

PIC value was reported for UBC-842 (0.3219).

SN	Marker	No. of allele	PIC value
1	UBC-809	5	0.3769
2	UBC-810	10	0.4023
3	UBC-834	12	0.4128
4	UBC-842	5	0.3219
5	UBC-873	9	0.3602



Gel images of 5 ISSR markers on 16 Bamboo germplasm accessions (50bp ladder)

List of Bamboo species available in Baster region

S N	Name of germplasm/	Area
1.	Bamboo bambos	Jagdalpur, Narayanpur, Kanker, Kondagaon
2.	Bamboo spp (New spp)	Jagdalpur,
3	*Bambusa vulgaris*	Jagdalpur, Narayanpur, Kanker, Kondagaon
4.	*Bambusa tulda*	Jagdalpur
5.	*Bambusa striata*	Jagdalpur, Narayanpur, Kanker, Kondagaon
6.	*Bambusa womin*	Jagdalpur
7.	*Cephalotachys pergracil*	Jagdalpur
8.	*Dendrocalamus strictus*	Jagdalpur, Narayanpur, Kanker, Kondagaon
9.	*Dendrocalamus* (New spp)	Narayanpur
10.	*Gigantochloa rostrata*	Narayanpur

Bambusa womin

Dendrocalamus strictus

Bambusa bambos

Cephalotachys pergracil

Bambusa tulda

Bambusa striata

Bambusa vulgaris

Gigantochloa rostrata

Bambusa tulda

Bamboo New spp

C.pergracil

Thesis Title	**Impact of Intercropping on Growth and Productivity of *Abelmoschus moschatus* Medic. (Muskdana) under *Acacia mangium* based Multitier Agroforestry System in Chhattisgarh**
Objectives	➢ Effect of organic manure on growth and productivity of *Abelmoschus moschatus* as sole crop and under Multitier system. ➢ Effect of shade effect on growth, and productivity of *Abelmoschus moschatus.* ➢ Effect of organic and inorganic fertilizer on oil yield and seed test weight under Multitier system and as a sole crop. ➢ Effect on height and DBH increment of trees during study period.
Salient finding	Performance of Muskdana crop in Vermicompost treated crop resulted higher yield attributing characters and yield viz., crop height (63.71cm), collar diameter (1.12 cm), number of leaves (29.8), capsule length (7.67 cm), capsule weight (2.70 g), number of capsules (22.37), number of seed (110.33), seed weight (1.78 gm), volatile oil (1.16 kg/ha) and seed yield (10.04 q/ha) also found under *Acacia mangium* based Multitier Agroforestry System. The package of practice developed for Muskdana crop as a sole crop with recommended dose of fertilizer showed lowest oil yield (0.54), seed yield (8.93) and poor growth viz., crop height (56.70 cm), collar diameter (0.90 cm), number of leaves (22.89), of plants. However the first flowering (105.67 day) and 50% flowering (118.33 day) in control plot was better as compare with other parameter.

Thesis Title	**Documentation of Non Timber Forest Product Collection, Processing and Value Addition of Dhamtari Forest Area of Chhattisgarh**
Objectives	1. Documentation of NTFP & medicinal plants available in Dhamtari forest area. 2. Documentation of traditional collection methods of defferent NTFP. 3. Documentation of Post harvest methods and value addition if any. 4. The role of NTFP in livelihood of tribes and local residents
Salient finding	During documentation and identification of NTFPs 26 trees, 10 shrubs, 7 herbs and 9 climber NTFPs species were identified in the study area. IVI value for trees was recorded highest (185.71) for *Shorea robusta* in the range of Nagri, and recorded lowest (2.26) for *Schleichera oleosa* in Dugli range. IVI value for shrubs and climber was recorded highest (191.24) for *Holarrhena antidysenterica* and lowest (6.10) for *Ziziphus xyloppyra* in the range of Sihawa. IVI val ue for herbs was recorded highest (207.28) for *Andrographis panicuata*and lowest (32.38) for *Flacourtia indica*in the range of Sihawa range of study area. Average yearly collection of NTFPs among all the villages were basically comprises of Tendu leaves (268 26.67 bundles), Mahul leaves (6801.67 bundles) and Mahua (78.33 kg.). The household annual income varied from Rs. 13917 - 25150. It was highest in village Bhathkhar (Rs. 25150) and lowest in Satbahna (Dongripara) (Rs.13917). The overall role in collection of NTFPs the trend observed was Women>Men>Children.

Plate- Observation on collar diameter recording of Kalmegh in Shihawa forest area study site 03.

Plate- A view of NTFPs village Market of Sihawa Char *(Buchanania lanzan)*

Thesis Title	**Effect of Auxin concentrations and species on rooting of stem cuttings of *Terminalia* Genus**
Objectives	1. To standardize concentrations of auxins (IBA and NAA) on rooting of stem cuttings of species *Terminalia arjuna* and *Terminalia catappa.* 2. To compare the variation due to species (*T. arjuna* and *T. catappa*) in rooting of stem cuttings of *Terminalia* genus. 3. To compare the morphological growth traits and biomass of rooted cuttings.
Salient finding	The study leads to the conclusion that *Terminalia* spp. is difficult to root with mature stem cuttings. Among the two species, *T. arjuna* had better rooting potential than *T. catappa* and IBA is found to be effective than NAA. Cuttings should be taken in spring and planted in phyto -environmentally controlled conditions under mist chamber. One year old leafless cuttings about 15±2.5 cm length and 1 -2 cm in diameter having 4 ... from selected trees must be treated with 2000 mg L^{-1} concentration of IBA for 24 hours before planting. The rooting medium should be composed of 1:1:1 of FYM, sand and soil mixture. Care should be taken to keep intermittent mist 'on' for 10 s and 'off' for 10 min. and also spray the *Bavistin* on cuttings to prevent fungal attack during rooting. If these conditions are strictly followed, it will be possible to achieve 80% and 60% rooting in cuttings of *T. arjuna* and *T. catappa*, respectively.

Thesis Title	**Effect of Site Quality on Biomass, Productivity And, Storage And Sequestration of Carbon In Sal (*Shorea robusta*) In Tropical Deciduous Forest of Chhattisgarh**
Objectives	1. To quantify the physicochemical properties of soil in Sal forest and its relationship with vegetation properties. 2. To quantify the effect of site quality on structure and regeneration pattern of Sal forest. 3. To quantify the effect of site quality on biomass and net primary productivity in Sal forest. 4. To quantify the effect of site quality on storage and sequestration of carbon in Sal forest.
Salient finding	1. The forest was characterized with 33.5-46.8 m^2 ha^{-1} trees and 0.31-0.35 m^2 ha^{-1} sapling basal cover. *Shorea robusta* was recognized as dominant tree species. 2. Species richness and diversity for tree, sapling and seedling layer decreased with decreasing quality of sites and follows in order of site I> site II> site III > site IV, respectively. Concentration of dominance was followed in similar trends except beta diversity. 3. Total standing crop of vegetation averaged 280.29 t ha^{-1} with 273.8 t ha^{-1} in the tree layer, 0.48 t ha^{-1} in the herb layer, 2.58 t ha^{-1} the litter layer and 3.33 t ha^{-1} fine roots. 4. The total C in trees varied from 79.86 t C ha^{-1} to 163.63 t C ha^{-1}. Quantity of C in above ground and below ground portions in trees on different sites was between 72.32 – 143.36 t C $ha^{-1}$and 7.54 – 20.27 t C ha^{-1}, respectively. 5. In present study the site quality I characterized by highest N, P and K, OC and OM % in both surface and lower layer compared to the remaining three sites and followed in the order: site I > site II > site III > site IV, respectively.

Trees In Study Area **Forest Floor Biomass** **Litter Fall Biomass** **Fine Root Biomass**

MAPs & NTFP

Activities 2017-18 & Proposed Programme 2018-19
Level III Meeting Dated 8th May 2018
Inauguration of New building of CoE Dated 7th March 2018 by HCM




Collection, evaluation and Characterization of Chirongi Germplasm through vegetative Cutting

- Scion from 05 identified genotypes of Chirongi collected from from district Kanker, Dantewada, Bastar and Narayanpur then grafted in one year old Chirongi Root stocks at SG CARS, Jagdalpur.
- Success of graft observed 92 % and mortality after grafting was 8 % only.
- In-situ identification and survey of diversity work is going on contineously.
- Flowering time, fruiting and maturity was recorded during survey.
- Market price of ripe chironji seeds with pulp in local market was recorded Rs. 200-220 per kg.

Different genotypes of Chirongi, Grafted under the project during 2017-18

Establishment of Herbal garden

- The herbal garden is established in 7 acre of land comprising of species of aromatic, medicinal & NTFP plants. Funds for regular maintenance of this garden will be required in future also.
- Germplasm of Kalmegh, Aloe vera, Ashwagandha, sarpgandha and Kenwach are maintained in this garden.
- Farmers, students, scientist, dignitaries visits this garden time to time.

Development of Agronomical Practices of Kewanch (*Mucuna pruriens*)

- The agronomical trials were conducted both at Bhatapara (3.5 acre) and Herbal Garden, Raipur (0.5 acres).
- Sowing time : 5-9 July 2018.
- Seed rate : 10 kg / ha
- Spacing : 100 x 75 cm
- Mannures and fertilizer : 8 q /ha FYM + 25,20,35 NPK kg /ha
- Average Productivity over the locations: 11.56 q /ha
- Sale rate : Rs. 60 to 100 per kg

Development of Aloe vera based Value added Products

Aloe vera soap

Aloe vera gel

Aloe vera hand wash

Aloe vera shampoo

Aloe vera body lotion

CG COST supported Project:

Collection, conservation & evaluation of Charota germplasm

- Total 438 germplasm were collected from various locations of Chhattisgarh and were evaluated for higher yield during 2016-17 and selected 98 entries 2017-18.
- The promising lines will again be evaluated during 2018-19.

Activities of CSS_MIDH_Spices and Aromatic Plants Project, sponsored by DASD, GOI, Calicut

Production of QPM			
Crop	**Target**	**Achievement**	**Locations**
Ginger (t)	12.371	11.16	Surguja, Bastar, Bilaspur, Korba, Bhatapara, Mahasamund, Rajnandgaon, Raipur
Turmeric (t)	21.151	15.35	
Chilli (q)	2.435	1.18	
Seed spices (t)	17.708	17.47	
Aromatic Plants (ha)	4 ha	2 ha	
Front Line Demonstration			
Ginger	1.95ha	1.0 ha	Surguja, Bastar, Rajnandgaon, Raipur
Turmeric	3.39 ha	2.3 ha	
Seed Spices	3.05 ha	1.48	
Chilli	1.75 ha	.8 ha	
Aromatic Plants	7.0 ha	02 ha	

Glimpses of FLD on Aromatic Plants and spices




Lemongrass at Gariyaband at CARS, Bilaspu **Turmuric Coriender at CARS, Kawardha** **Ginger at Korea**

Agro-meteorology

Title- Training of technical and supporting staff engaged in Agromet. Observatories established in fourteen locations.

Objectives:

1.To upgrade the knowledge level of agromet. Observatory personnels (Nodal Officers and Meteorological Observer) of all the centre's where Observatory installation is already over or under the process of installation.

Title- Delineation of different tehsils of Chhattisgarh on the basis of Rainfall.

Objectives:

1.Delineation of rainfall analysis in different tehsils of Chhattisgarh

Tehsil wise Annual and seasonal variability of rainfall

	Highest Varia bility	**Lowest Variability**
Annual Rainfall	Antagarh tehsil (43.8 %) followed by Mahasamund tehsil (42.6%)	Koylibeda (12.64%) followed by Kathghora (14.04%)
SWM	Kurud (145.3%) followed by Dongargarh (131.5%)	Koylibeda and Chote donger (12.8 %).
NEM	Dongargarh value (196.4 %) followed by Champa (189.2 %)	Kondagaon district (47.5 %).

Tehsil wise trend analysis of annual and south west monsoon rainfall

Criteria	Increasing Trend	Decreasing Trend
Annual Rainfall	Berla (2.4), Bhatapara (2.1), Durg (2.7), Kasdol (1.9), Kota (1.9), Mahasamund (3.5), Mainpur (2.8), Pamgarh (2.1), Patan (1.8), Raigarh (2.3), Saja (2.5), Sarangarh (1.7), Srivrinarayan (2.1), Bijapur (2.4), Sukma (3.0), Kusami (2.7)	Antagarh (-1.5), Bodla (-1.9), Dongarhgarh (-3.9), Lailunga (-1.8), Malkharod (-1.8), Ambikapur (-2.0), Bagicha (-4.2), Surjpur (-2.7)
South West Monsoon	Berla (2.2), Bhatapara (2.2), Durg (2.7), Kasdol (1.9), Kota (1.9), Magarload (1.5), Mahasamund (3.8), Maipur (2.4), Pali (1.6), Pamgarh (2.4), Raigarh (2.3), Rajnandgaon (2.0), Saja (2.3), Saranggarh (1.9), Srivrinarayan (2.1), Tilda (2.1), Bairamgarh (1.3), Sukma (2.2), Kusami (2.9)	Antagarh (-1.4), Bodla (-2.4), Dongarhgarh (-3.8) Lailunga (-1.5), Malkharod (-1.5), Narayanpur (-2.2), Ambikapur (-1.6), Surjpur (-2.6)

Meteorological Drought probabilities for different Tehsils of Chhattisgarh

S. No.	Drought Category	% of Probability	Tehsils
01	No Drought	60% 100%	Mahasamund, Jaijaipur, Koyelibeda, Malkharod, Tamnar
02	Moderate	0 % 26 %	Jaijaipur, Koylibeda, Malkharod, Tamnar, Chotedonger, Kontagaon and Usur Bhagbahara
03	Severe	0 to 6% 12% to 15%	Most of the tehsils Champa and Antagarh

District Level Contingent Plans (DLCP)

- We have updated the District level Contingent Plans for all the 27 districts in the year 2017 under the Nodal Agency CRIDA, Hyderabad in 2012
- DLCP are available on DAC and FW website www.agricoop.nic.in and IGKV website www.igau.edu.in
- DLCP contains integrated information on agriculture and allied sectors i.e., horticulture, livestock, poultry, fisheries.
- Technological solutions for all the major weather related aberrations including extreme events viz., droughts, floods, heat wave, cold wave, untimely and high intensity rainfall, frost, and hailstorms.
- Pest and disease outbreaks are aimed to be utilised by district authorities.
- Contingent planning and other real time advisories are available on CRIDA website www.cropweatheroutlook.in

Title	Result
Intercropping studies in potato	The additive series of potato - maize and Potato -cabbage at 1:1 and 1:2 indicated that the most economical combination is potato -maize at 1:1 wi th 4.97 (B:C ratio) Fallowed by the sole potato with 3.61(B:C ratio).
Effect of plant growth regulators on tuber yield of potato	Among the ten treatment combination potato yield was recorded maximum with the application of with 200 ppm IBA application (34.34 t/ha).
Develop site specific NPK requirements	The N:P:K effect were studied under omission plot technique including absolute control plot and it was observed that the omission of each nutrient significantly influence the potato yield and it may be optimized upto 225 kg nitrogen, 150 kg Phosphorus and 150 kg potash for variety K Pukhraj (2.8 B:C ratio).

Department of Soil and Water Engineering

Adhoc Research Scheme Completed

- ❑ Evaluation and adoption of water harvesting technology for Chhattisgarh region of Madhya Pradesh.
- ❑ Study of hydrological behavior of micro watersheds and development of integrated watershed models.
- ❑ Hydrological water balance modelling of rainfed watersheds for improved water management.
- ❑ Hydrological modelling for effective management of small watersheds of Chhattisgarh.
- ❑ Hydrological Modelling of a Watershed using Remote Sensing, Geographical Information System and AVSWAT.

Adhoc Research Scheme Continue

- ❑ Measurement to Management (M2M): Improved Water Use Efficiency and Agricultural Productivity through Experimental Sensor Network.

AICRP on Irrigation Water Management: Raipur and Bilaspur centre of IGKV, Raipur

Number of University Funded Projects including Mega Project: 5

On going projects

1. All India Coordinated Research Project on "Irrigation Water Management" Raipur and Bilaspur Centre of IGKV, Raipur (Funded by ICAR, New Delhi).
2. Adhoc Project on "Measurement to Management (M2M): Improved Water Use Efficiency and Agricultural Productivity through Experimental Sensor Network" (Funded by ITRA, Media Lab Asia, Ministry of Information Technology, Govt. of India, New Delhi)
3. Mega Project on "Development of land use plan for Chhattisgarh" (Funded by IGKV, Raipur).
4. Delineation of farming situations of agro climatic zones of Chhattisgarh State based on digital satellite soil mapping.
5. Demonstration of Water harvesting based Integrated Farming System model at Mungeli.
6. Fabrication and development of different hydroponic system for horticulture crop under protected **structures at Raipur.**

Project 1: Cadastral Level Land Use Plan for Effective Management of Water Resources. (2013-2016)

Objectives

1. To characterize various basin parameters using hydrological, geomorphological, soil resources and satellite data in the environment of GIS.
2. To identify and prioritize the critical sub-watersheds and Hydrologic Response Units (HRUs) on the basis of estimated runoff, sediment yield and nutrient losses using SWAT and VMODFLOW models.

To develop effective water resource management plan on cadastral level. AICRP on IWM IGKVV, Raipur Centre

Salient Findings

1. Cadastral level land use plan was developed based on the suitable farming situation, soil health, topography and current land use pattern.
2. Total 60 ha comprising of 250 farm fields of current fallow under *Matasi* farming situation and total 40 ha comprising of 112 farm fields of current fallow under *Dorsa* farming situation can be brought under cultivation due to its good soil health.
3. Total 55 farm families will be benefited by the additional cropped land.
4. Water resource plan was developed based on the surface and ground water availability.
5. 11,250 cum of water can be stored and recharged by the WHS and can support 20 ha of additional cropped area.

Project 2: Studies on aquifer parameters and effect of climate change on groundwater availability in the Kharun watershed.

Objectives

1. To analyze the multiple years meteorological data of *Kharun* Watershed on Monthly and SMW wise.
2. To assess the groundwater availability during different seasons using long term groundwater fluctuation data.

Salient Findings

- Gurur station shows that there is decreasing trend in rainfall and mean temperature both. we can clearly see that depth of rainfall is decreased in the year of 2016 and Rainfall pattern has also changed.
- Dhamtari station shows that decreasing trend in rainfall and mean temperature both but is first five year graph there is increasing trend and in the year of 2016 the depth of rainfall is reduced but greater than the year 2002.
- Patan station shows that there is decreasing trend in rainfall but temperature is nearly constant. Here depth of rainfall is also reduced in the year of 2016 but greater than the year 2001 and 2008.
- In Raipur we can see that there is drastic change in rainfall. Mean temperature is reducing but maximum temperature is increasing.
- Pindrawan station also shows a decreasing trend is rainfall but mean temperature trend is also decreasing. In the year 2000, 2008, 2011rainfall is low but in the year 2016 depth of rainfall is increased.

Project 3: Groundwater recharge planning for Balod, Bemetara, Dhamtari, Bilaspur, Rajnandgaon, Kawardha, Raigarh and Raipur districts using remote sensing and GIS. (2013-2017)

Balod, Bemetara, Dhamtari – 2012-13,

Bilaspur-2013-14

Rajnandgaon and Kawardha-2014-15,

Raigarh -2015-16

Raipur – 2016-17

Objectives

- To prepare various thematic maps of the study area.
- To identify the location of groundwater recharge structures.
- To prepare groundwater recharge plan on the basis of suitable groundwater recharge structures.