

ANNUAL PROGRAMME OF RESEARCH WORK

KHARIF - 2017



**SOIL SALINITY RESEARCH INSTITUTE,
PINDI BHATTIAN**

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ANNUAL RESEARCH PROGRAMME OF WORK KHARIF-2017

TITLE 01:	RESPONSE OF SUNFLOWER TO BORON APPLICATION IN SALINE SODIC SOIL
OBJECTIVE	Boron has ability to improve sunflower yield due to improved K/Na ratio under salt stress condition. The experiment has been planned to determine the optimum level of boron for yield improvement of sunflower in saline-sodic soil.
RESEARCHER	Dr. Muhammad Sarfraz, Amar Iqbal Saqib and Dr. Muhammad Anwar Zaka
DURATION	2017-2019
LOCATION	Research Farm, SSRI, Pindi Bhattian
TREATMENTS	T ₁ : Control (without B application) T ₂ : B application @ 1.0 kg ha ⁻¹ T ₃ : B application @ 1.5 kg ha ⁻¹ T ₄ : B application @ 2.0 kg ha ⁻¹ T ₅ : B application @ 2.5 kg ha ⁻¹ T ₆ : B application @ 3.0 kg ha ⁻¹
METHODOLOGY	A moderately saline –sodic field will be selected. Soil samples will be collected and analysed for pH _s , EC _e , SAR, O.M. available P, extractable K and available B. Field will be prepared and leveled. Sunflower crop will be sown on ridges in watter condition keeping ridge to ridge distance 75 cm and plant to plant distance 23 cm. Recommended dose of fertilizer will be 125-75-60 NPK kg ha ⁻¹ . Whole P, K , B and 1/2 N will be applied at the time of sowing and remaining 1/2 N will be applied at flowering stage. Source of B will be Boric acid. Tested variety will be FH -331. Experimental Design will be RCBD. Plot size will be 6m x 4 m. Replications will be three. Crop will be harvested at maturity. Data on plant height, Head Diameter, Total biomass, Achene yield will be recorded. Seed will be analysed for N P K and B contents. Post-harvest soil samples will be analysed for pH _s , EC _e , SAR, O.M. available P, extractable K and available B.
PREVIOUS YEAR RESULTS	New Experiment

TITLE 02:	GROWTH PERFORMANCE OF HIGH DENSITY GUAVA ORCHARD WITH MODIFIED RHIZOSPHERE IN SALT AFFECTED SOILS
OBJECTIVE	To determine salinity / sodicity tolerance and performance of high density guava plantation under modified rhizosphere techniques.
RESEARCHERS	Amar IqbalSaqib , Dr. M. Anwar Zaka
DURATION	2017-2027
LOCATION	SSRI, Research Farm.
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	<p>A. Planting Geometry</p> <ol style="list-style-type: none"> 1. 6 x 6 meter 2. 6 x 3 meter 3. 3 x 3 meter <p>B. Treatments</p> <p>T₁ = Pits refilling with excavated soil T₂ = Pits refilling with 100% silt</p>

	<p>T₃ = Pits refilling with 50% excavated soil + 50% silt T₄ = T₃+FYM 1:20 T₅ = T₁ + Gypsum @ 100% of soil GR. T₆ = T₁ + Gypsum @ 5 x 100% of soil GR.</p>
METHODOLOGY	<p>A saline sodic field will be selected after initial soil analysis .Field will be prepared and leveled. Experiment will be laid out in split plot having five replications. Planting geometry will be kept in main plots and amendments in sub-plots. The pits will be made having size 1x1x1 meter mechanically and filled according to treatments. The pits will be irrigated and after thirty days guava plants will be transplanted having uniform size. Fertilizer will be applied according the recommendation of the Horticulture department. All agronomic and protection measures will be followed according to the required situation. Data regarding plant height, stem diameter, plant canopy, No. of fruits and mortality % will be recorded. Design will be split plot with five replications.</p> <p>Plant analysis: Leaves will be collected from each treatment and analyzed for Na and K after one year.</p> <p>Soil analysis: Soil samples will be analyzed for pH_s, EC_e, SAR after one year.</p>
PREVIOUS RESULTS	New experiment

TITLE 03:	SEED PRIMING AND AMENDMENTS APPLICATION TO IMPROVE PEARL MILLET YIELD IN SALINE SODIC SOILS
OBJECTIVE	To evaluate the combined effect of seed priming and amendments application for yield improvement of pearl millet in saline sodic soils
RESEARCHERS	Manzoor Hussain, M.Q.Nawaz and Dr. M. Anwar Zaka
DURATION	2017-2019
LOCATION	Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	<p>A) Amendments</p> <ol style="list-style-type: none"> 1) Control (No amendment) 2) Poultry manure @ 20 t ha⁻¹ 3) H₂SO₄ equivalent to 25 % GR of soil <p>B) Priming Agents</p> <ol style="list-style-type: none"> 1) CaCl₂ (2%) 2) Single super phosphate (1%) 3) MgSO₄ (2%) 4) Potassium dihydrogen phosphate (2%) 5) Potassium Chloride (2%)
METHODOLOGY	<p>A salt affected field will be selected, leveled and well prepared sowing of pearl millet. Seed will be primed for 8 hours. Crop will sow by maintaining P x P distance 10 cm and R x R distance of 30 cm. Recommended dose of fertilizer (80-60-60 NPK kg ha⁻¹) will be applied. All P will be applied at sowing and N will be applied in two splits. Experiment will be laid out in split plot design with three replications. Amendments will be kept in main plots and priming agents will be kept in sub-plot. Sub-plot size will be 4 m x 6 m. All other agronomic & plant protection measures will be adopted uniformly. Data of yield and yield component will be recorded. Soil samples will be collected and analyzed for pH_s, EC_e and SAR before sowing and after the harvest of crop.</p>

PREVIOUS RESULTS	New Experiment
TITLE 04:	COMPARISON OF DIFFERENT SOWING METHODS FOR IMPROVING YIELD AND WATER USE EFFICIENCY UNDER BRACKISH WATER IRRIGATION.
OBJECTIVE	To compare the efficacy of different sowing methods for yield and water use efficiency improvement using brackish water in Rice-Wheat rotation.
RESEARCHERS	M. Rizwan and Dr. M. Anwar Zaka
DURATION	2017-2020
LOCATION	Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	Sowing Methods: <ul style="list-style-type: none"> • Broadcast sowing (Flat) • Drill sowing (Flat) • Ridge Sowing • Bed sowing
METHODOLOGY	A normal field will be selected and prepared for sowing of rice (Shaheen basmati) by direct seeding according to treatment plan. Irrigations will be applied using cut throat flume. Bed width will be 2 feet. Recommended dose of fertilizer (150-85-60 NPK kg ha ⁻¹) will be applied. No. of irrigations for whole season will be recorded to calculate the delta of water and ultimately water use efficiency will be evaluated. Data of yield and yield components will be recorded. Soil samples before start of study and after harvest of each crop will be collected and analyzed for pH _s , EC _e , SAR, HC and BD. Design will be RCBD with three repeats having plot size 15m x 10m.
PREVIOUS RESULTS	New Experiment

ONGOING RESEARCH EXPERIMENTS

TITLE 05:	FERTILIZER REQUIREMENT OF DIRECT SEEDED COARSE RICE IN SALINE SODIC SOIL			
OBJECTIVE	To determine optimum rate of NPK for better yield and nutrient uptake of direct seeded coarse rice in saline sodic soil.			
DURATION	2016-2018			
RESEARCHERS	Dr. M. Sarfraz			
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian			
NATURE OF EXPERIMENT	Field Experiment			
TREATMENTS	Treatments	N(kg ha⁻¹)	P₂O₅(kg ha⁻¹)	K₂O (kg ha⁻¹)
	T ₁	0	0	0
	T ₂	0	86	60
	T ₃	87	86	60
	T ₄	174	86	60
	T ₅	261	86	60
	T ₆	174	0	60

	T ₇	174	43	60
	T ₈	174	129	60
	T ₉	174	86	0
	T ₁₀	174	86	30
	T ₁₁	174	86	90
METHODOLOGY	Saline sodic field will be selected, prepared and leveled. Composite soil samples will be collected and analyzed for salinity/sodicity. Experiment will be laid out in RCBD with three replications having plot size 6 x 4 m ² . Treatments will be applied according to treatment plan. Sowing of direct seeded rice will be done with hand drill in watter condition. . Test variety will be KSK-133. Whole P ₂ O ₅ and K ₂ O and 1/3 N will be applied at the time of sowing to rice crop. Remaining N will be applied 20 and 40 days after sowing. Zinc sulphate (33%) @ 12.5 kg ha ⁻¹ will be applied 15 days after sowing. Crop will be harvested at maturity. Paddy and Straw yield data will be recorded. Paddy and straw samples will be analyzed for NPK concentration and their uptake. Soil samples will be collected after harvesting of rice and analysed for EC _e , pH _s , SAR, O.M., available P and extractable K.			
PREVIOUS RESULTS	Kharif 2016			

Pre-sowing Soil Analysis

pH _s	= 8.54
EC _e	= 5.18 (dS m ⁻¹)
SAR	=33.58 (mmol L ⁻¹) ^{1/2}
O.M	= 0.39
Available P	= 7.40 mg kg ⁻¹
Extractable K	= 106.0 mg kg ⁻¹

Effect of different fertilizer rates on paddy yield and 1000 paddy weight of direct seeded coarse rice

Treatments NPK (kg ha ⁻¹)	Paddy yield (t. ha ⁻¹)	1000 paddy weight (g)
T ₁ (0-0-0)	1.41 H	16.90 I
T ₂ (0-86-60)	1.94 G	17.80 H
T ₃ (87-86-60)	2.35 EF	24.60 F
T ₄ (174-86-60)	2.97 BC	28.20 C
T ₅ (261-86-60)	3.26 AB	28.90 AB
T ₆ (174-0-60)	1.88 G	17.20 I
T ₇ (174-43-60)	2.16 FG	22.50 G
T ₈ (174-129-60)	3.47 A	29.40 A
T ₉ (174-86-0)	2.56 DE	26.00 E
T ₁₀ (174-86-30)	2.82 CD	27.30 D
T ₁₁ (174-86-90)	3.14 B	28.60 BC
LSD	0.3264	0.5328

Effect of different rates of fertilizer application on NPK contents of paddy in direct seeded coarse rice

Treatments NPK (kg ha ⁻¹)	Total (N %)	Total (P %)	Total (K %)
T ₁ (0-0-0)	1.38 J	0.18 D	0.24 F
T ₂ (0-86-60)	1.94 G	0.20 CD	0.28 E
T ₃ (87-86-60)	2.05 FE	0.23 ABC	0.34 CD
T ₄ (174-86-60)	2.16 BCD	0.26 AB	0.37B
T ₅ (261-86-60)	2.22 AB	0.27 A	0.38 A
T ₆ (174-0-60)	1.72 H	0.20CD	0.26 E
T ₇ (174-43-60)	1.98 FG	0.22 BCD	0.32 D
T ₈ (174-129-60)	2.28 A	0.27 A	0.39 AB
T ₉ (174-86-0)	2.08 DE	0.24 ABC	0.36 AB
T ₁₀ (174-86-30)	2.12 CDE	0.26 AB	0.36 BC
T ₁₁ (174-86-90)	2.22 BC	0.26 AB	0.39 AB
LSD	0.0912	0.0428	0.0275

Post Harvest Soil Analysis

Treatments NPK (kg ha ⁻¹)	pH _s	EC dS m ⁻¹	SAR (mmol ⁻¹) ^{1/2}	O.M. %	Available P mg kg ⁻¹	Extractable K mg kg ⁻¹
T ₁ (0-0-0)	8.53	5.12	31.16	0.36	6.20	102.0
T ₂ (0-86-60)	8.53	5.11	30.03	0.41	8.20	114.0
T ₃ (87-86-60)	8.52	5.09	29.84	0.43	8.40	112.0
T ₄ (174-86-60)	8.52	5.07	29.47	0.47	8.42	110.0
T ₅ (261-86-60)	8.51	5.06	29.12	0.51	8.60	107.0
T ₆ (174-0-60)	8.51	5.05	29.02	0.45	5.80	116.0
T ₇ (174-43-60)	8.51	5.03	28.90	0.41	7.20	114.0
T ₈ (174-129-60)	8.50	5.02	28.79	0.47	8.80	110.0
T ₉ (174-86-0)	8.50	5.02	28.57	0.45	8.40	98.6
T ₁₀ (174-86-30)	8.49	5.02	28.51	0.47	8.42	108.0
T ₁₁ (174-86-90)	8.49	5.01	28.41	0.49	8.60	118.0

TITLE 06:	FERTILIZER REQUIREMENT OF DIRECT SEEDED FINE RICE IN SALINE SODIC SOIL
OBJECTIVE	To determine optimum rate of NPK for better yield and nutrient uptake of direct seeded fine rice in saline sodic soil.
DURATION	2016-2018
RESEARCHERS	Dr. M. Sarfraz
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment

TREATMENTS	Treatments	N(kg ha⁻¹)	P₂O₅(kg ha⁻¹)	K₂O (kg ha⁻¹)
	T ₁	0	0	0
	T ₂	0	86	60
	T ₃	75	86	60
	T ₄	150	86	60
	T ₅	225	86	60
	T ₆	150	0	60
	T ₇	150	43	60
	T ₈	150	129	60
	T ₉	150	86	0
	T ₁₀	150	86	30
	T ₁₁	150	86	90
METHODOLOGY	Saline sodic field will be selected, prepared and leveled. Composite soil samples will be collected and analyzed for salinity/sodicity. Experiment will be laid out in RCBD with three replications having plot size 6 x 4 m ² . Treatments will be applied according to treatment plan. Sowing of direct seeded rice will be done with hand drill in wattar condition. . Test variety will be Shaheen Basmati. Whole P ₂ O ₅ and K ₂ O and 1/3 N will be applied at the time of sowing to rice crop. Remaining N will be applied 20 and 40 days after sowing. Zinc sulphate (33%) @ 12.5 kg ha ⁻¹ will be applied 15 days after sowing. Crop will be harvested at maturity. Paddy and Straw yield data will be recorded. Paddy and straw samples will be analyzed for NPK concentration and their uptake. Soil samples will be collected after harvesting of rice and analysed for EC _e , pH _s , SAR, O.M., available P and extractable K.			
PREVIOUS RESULTS	Kharif 2016			

Pre-sowing Soil Analysis

pH _s	= 8.53
EC _e	= 5.16 (dS m ⁻¹)
SAR	= 32.02 (mmol L ⁻¹) ^{1/2}
O.M	= 0.45%
Available P	= 8.53 mg kg ⁻¹
Extractable K	= 110.0 mg kg ⁻¹

Effect of different fertilizer application rates on paddy yield and 1000 paddy weight of direct seeded fine rice

TreatmentsNPK (kg ha ⁻¹)	Paddy yield (t. ha ⁻¹)	1000 paddy weight (g)
T ₁ (0-0-0)	1.27 I	16.50 G
T ₂ (0-86-60)	1.89 GH	17.20 G
T ₃ (75-86-60)	2.28 EF	21.40 E
T ₄ (150-86-60)	2.87 BC	24.10 C
T ₅ (225-86-60)	3.10 A	28.10 A
T ₆ (150-0-60)	1.72 H	16.90 G
T ₇ (150-43-60)	2.06 FG	19.35 F

T ₈ (150-129-60)	2.98 AB	26.40 B
T ₉ (150-86-0)	2.42 DE	22.80 D
T ₁₀ (150-86-30)	2.66 CD	23.50 CD
T ₁₁ (150-86-90)	2.89 BC	25.60 B
LSD	0.3210	0.9723

Effect of different rates of fertilizer application on NPK contents of paddy in direct seeded fine rice

Treatments NPK (kg ha ⁻¹)	Total (N %)	Total (P %)	Total (K %)
T ₁ (0-0-0)	1.32 E	0.14 G	0.20 I
T ₂ (0-86-60)	1.74 D	0.18 EF	0.26 GH
T ₃ (75-86-60)	1.98 C	0.22 CD	0.31 F
T ₄ (150-86-60)	2.20 AB	0.27 AB	0.39 CD
T ₅ (225-86-60)	2.26 A	0.29 A	0.49 A
T ₆ (150-0-60)	1.68 D	0.16 FG	0.24 HI
T ₇ (150-43-60)	1.91 C	0.20 DE	0.29 FG
T ₈ (150-129-60)	2.24 A	0.27 AB	0.46 AB
T ₉ (150-86-0)	2.06 BC	0.23 CD	0.33 EF
T ₁₀ (150-86-30)	2.18 AB	0.25 BC	0.36 DE
T ₁₁ (150-86-90)	2.24 A	0.27 AB	0.42 BC
LSD	0.1634	0.0377	0.0468

Post-Harvest Soil Analysis

Treatments NPK (kg ha ⁻¹)	pH _s	EC dS m ⁻¹	SAR (mmol ⁻¹) ^{1/2}	O.M. %	Available P mg kg ⁻¹	Extractable K mg kg ⁻¹
T ₁ (0-0-0)	8.53	5.14	31.03	0.42	7.60	106.0
T ₂ (0-86-60)	8.53	5.14	30.56	0.46	8.60	118.0
T ₃ (75-86-60)	8.52	5.13	30.24	0.48	8.80	118.0
T ₄ (150-86-60)	8.52	5.12	29.97	0.51	8.80	116.0
T ₅ (225-86-60)	8.52	5.12	29.67	0.53	8.92	116.0
T ₆ (150-0-60)	8.52	5.10	29.51	0.44	7.20	120.0
T ₇ (150-43-60)	8.52	5.09	29.42	0.47	8.40	118.0
T ₈ (150-129-60)	8.52	5.02	28.93	0.58	9.60	114.0
T ₉ (150-86-0)	8.51	5.01	28.68	0.52	9.20	102.0
T ₁₀ (150-86-30)	8.51	5.00	28.57	0.54	9.00	116.0
T ₁₁ (150-86-90)	8.51	4.99	28.42	0.56	9.00	118.0

TITLE 07:	EFFECT OF SEED PRIMING AND FOLIAR APPLICATION OF SALICYLIC ACID ON NUTRIENT UPTAKE OF DIRECT SEEDED RICE IN SALINE SODIC SOIL
OBJECTIVE	To study the effect of seed priming and foliar application of salicylic acid on nutrient uptake of direct seeded rice in saline sodic condition.
DURATION	2016-2018

RESEARCHERS	Dr. M. Sarfraz
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T ₁ Control (without Salicylic acid application) T ₂ Seed priming of rice with 0.5 mM Salicylic acid T ₃ Seed priming of rice with 1.0 mM Salicylic acid T ₄ Seed priming of rice with 2.0 mM Salicylic acid T ₅ Seed priming and foliar application of rice with 0.5 mM salicylic acid T ₆ Seed priming and foliar application of rice with 1.0 mM salicylic acid T ₇ Seed priming and foliar application of rice with 2.0 mM salicylic acid
METHODOLOGY	Saline sodic field will be selected, prepared and leveled. Composite soil samples will be collected and analyzed for salinity/sodicity. Experiment will be laid out in RCBD with three replications having plot size 6 x 4 m ² . Different treatments of salicylic acid will be applied according to treatment plan. For seed priming 500 g seed of rice will be soaked in 1000 mL solution of salicylic acid of different concentration for 12 hours. Seed will be dried to its original moisture level under shade before sowing. Three foliar applications of salicylic acid will be done starting from booting stage with 10 days interval. Sowing of direct seeded rice will be done with hand drill in watter condition. Test variety will be Shaheen Basmati. Seed rate will be 50 kg ha ⁻¹ . Recommended dose of NPK will be 150-86-60 N, P ₂ O ₅ and K ₂ O. Whole P ₂ O ₅ ,K ₂ O and 1/3 N will be applied at the time of sowing to rice crop. Remaining N will be applied 20 and 40 days after sowing. Zinc sulphate (33%) @ 12.5 kg ha ⁻¹ will be applied 15 days after sowing. Crop will be harvested at maturity. Paddy and Straw yield data will be recorded. Paddy and straw samples will be analyzed for NPK concentration and their uptake. Soil samples will be collected after harvesting of rice and analysed for EC _e , pHs, SAR, O.M., available P and extractable K.
PREVIOUS RESULTS	Kharif 2016

Pre-sowing Soil Analysis

pH _s	= 8.53
EC _e	= 5.20 (dS m ⁻¹)
SAR	= 31.40 (mmol L ⁻¹) ^{1/2}
O.M	= 0.44%
Available P	= 7.53 mg kg ⁻¹
Extractable K	= 102.0 mg kg ⁻¹

Effect of different treatments of salicylic acid on paddy yield, straw yield and 1000 paddy weight of rice

Treatments	Paddy yield (t. ha⁻¹)	Straw yield (t. ha⁻¹)	1000 paddy wt (g)
T ₁ Control (without SA application)	2.85 D	2.97 E	23.10 D
T ₂ Seed priming of wheat with 0.5 mM SA	2.91 CD	3.04 E	23.14 D
T ₃ Seed priming of wheat with 1.0 mM SA	3.08 BC	3.18 DE	23.72 CD
T ₄ Seed priming of wheat with 2.0 mM SA	3.18 B	3.35 CD	24.10 C
T ₅ Seed priming and foliar application of wheat with 0.5 mM SA	3.20 B	3.51 BC	25.60 B
T ₆ Seed priming and foliar application of wheat with 1.0 mM SA	3.42 A	3.72 AB	27.10 A
T ₇ Seed priming and foliar application of wheat with 2.0 mM SA	3.46 A	3.78 A	27.16 A
LSD	0.2238	0.2341	0.7130

Effect of different treatments of Salicylic Acid on NPK contents of Paddy

Treatments	Total (N %)	Total (P %)	Total (K %)
T ₁ = Control (without Salicylic Acid)	2.05 D	0.22 B	0.36 C
T ₂ = Seed priming of rice with 0.5mM Salicylic Acid	2.07 CD	0.22 B	0.36 C
T ₃ =seed priming of rice with 1mM Salicylic Acid	2.10 CD	0.24 AB	0.36 C
T ₄ =seed priming of Rice with 2mM Salicylic Acid	2.14 BC	0.24 AB	0.38 BC
T ₅ =seed priming +Foliar application of rice with 0.5mM Salicylic Acid	2.18 BC	0.26 AB	0.38 BC
T ₆ =seed priming+ Foliar application of rice with 1mM Salicylic Acid	2.26 A	0.28 A	0.42 AB
T ₇ =seed priming+ Foliar application of rice with 2mM Salicylic Acid	2.28 A	0.28 A	0.44 A
LSD	0.0747	0.0482	0.0482

Effect of different treatments of Salicylic Acid on NPK contents of rice straw

Treatments	Total (N %)	Total (P %)	Total (K %)
T ₁ = Control (without Salicylic Acid)	0.47 C	0.08 B	1.16 C
T ₂ = Seed priming of rice with 0.5mM Salicylic Acid	0.48 C	0.08 B	1.16 C
T ₃ =seed priming of rice with 1mM Salicylic Acid	0.52 BC	0.10 AB	1.18 BC
T ₄ =seed priming of Rice with 2mM Salicylic Acid	0.56 AB	0.10 AB	1.18 BC
T ₅ =seed priming +Foliar application of rice with 0.5mM Salicylic Acid	0.58 A	0.10 AB	1.19 ABC
T ₆ =seed priming+ Foliar application of rice with 1mM Salicylic Acid	0.61 A	0.12 A	1.21 AB
T ₇ =seed priming+ Foliar application of rice with 2mM Salicylic Acid	0.61 A	0.12 A	1.22 A
LSD	0.0654	0.0368	0.0375

Post-Harvest Soil Analysis

Treatments NPK (kg ha⁻¹)	pH_s	EC_e dS m⁻¹	SAR (mmol⁻¹)^{1/2}	O.M %	Available P mg kg⁻¹	Extractable K mg kg⁻¹
T₁ Control (without Salicylic acid application)	8.53	5.15	30.92	0.52	8.80	108.60
T₂ Seed priming of wheat with 0.5 mM SA	8.53	5.14	30.78	0.54	8.80	108.40
T₃ Seed priming of wheat with 1.0 mM SA	8.52	5.13	30.76	0.54	8.68	108.10
T₄ Seed priming of wheat with 2.0 mM SA	8.52	5.12	30.63	0.54	8.64	107.60
T₅ Seed priming and foliar application of wheat with 0.5 mM SA	8.52	5.12	30.60	0.54	8.60	107.20
T₆ Seed priming and foliar application of wheat with 1.0 mM SA	8.52	5.11	30.50	0.56	8.58	105.10
T₇ Seed priming and foliar application of wheat with 2.0 mM SA	8.51	5.11	30.48	0.56	8.58	104.70

TITLE 08:	ENHANCING THE SOLUBILITY OF GYPSUM WITH H₂SO₄
OBJECTIVE	To find out the best combination of sulfuric acid and gypsum for reclamation of saline sodic soil in rice wheat cropping rotation
RESEARCHERS	Amar IqbalSaqib and Dr. Khalil Ahmed
DURATION	2015-2018
LOCATION	Agri. Research Farm, SSRI, PindiBhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T ₁ Control T ₂ Gypsum @ 100 % of GR T ₃ Gypsum @ 100 % of GR + 10 kg H ₂ SO ₄ acre ⁻¹ T ₄ Gypsum @ 100 % of GR + 50 kg H ₂ SO ₄ acre ⁻¹ T ₅ Gypsum @ 100 % of GR + 100 kg H ₂ SO ₄ acre ⁻¹
METHODOLOGY	A salt affected field will be selected, prepared and leveled. Composite soil samples will be collected and analyzed for salinity/sodicity and GR. Experiment will be laid out in RCBD with three replications having plot size 6 x 4 m ² . Gypsum and sulfuric acid will be applied in the respective treatment plots followed by leaching. Crop rotation used will be rice-wheat. Recommended dose of fertilizers 150-85-60 N,P ₂ O ₅ ,K ₂ O kg ha ⁻¹ for rice (Shaheen Basmati) will be applied. Soil samples will be collected after harvesting of each crop. Straw and paddy yield data will be recorded at maturity. Soil samples will be analyzed for pH _s , EC _e and SAR.
PREVIOUS RESULTS	2016

Initial Soil Analysis

pH _s	= 8.85
EC _e (dS m ⁻¹)	=4.85
SAR (mmol L ⁻¹) ^{1/2}	= 43.82
GR (t.acre ⁻¹)	= 3.96

Yield data (Rice2016)

Treatments	Paddy yield	Straw Yield
		(t. ha ⁻¹)
T ₁ Control	1.42C	3.29C
T ₂ Gypsum @ 100 % of GR	2.79B	6.45B
T ₃ Gypsum @ 100 % of GR + 10 kg H ₂ SO ₄ acre ⁻¹	2.82B	6.43B
T ₄ Gypsum @ 100% of GR + 50 kg H ₂ SO ₄ acre ⁻¹	3.39A	7.69A
T ₅ Gypsum @ 100% of GR + 100 kg H ₂ SO ₄ acre ⁻¹	3.46A	7.87A
LSD	0.3483	0.7968

SOIL ANALYSIS BEFORE RICE 2016

Treatments	pH _s	EC _e dS m ⁻¹	SAR (mmol ⁻¹) ^{1/2}
Control	8.83	4.87	43.44
Gypsum @ 100% GR	8.71	4.50	34.00
T ₃ - Gypsum @ 100 % of GR +	8.72	4.48	33.55
T ₄ - Gypsum @ 100% of GR + 50 kgH ₂ SO ₄	8.68	4.39	30.33
T ₅ - Gypsum @ 100% of GR + 100 kgH ₂ SO ₄	8.67	4.46	30.53

SOIL ANALYSIS AFTER RICE HARVEST 2016

Treatments	pH _s	EC _e (dS m ⁻¹)	SAR (mmol L ⁻¹) ^{1/2}
T ₁ Control	8.85	4.90	43.69
T ₂ Gypsum @ 100 % of GR	8.65	3.87	24.55
T ₃ Gypsum @ 100 % of GR + 10 kgH ₂ SO ₄ acre ⁻¹	8.65	3.88	24.41
T ₄ Gypsum @ 100% of GR + 50 kgH ₂ SO ₄ acre ⁻¹	8.56	3.58	21.43
T ₅ Gypsum @ 100% of GR + 100 kgH ₂ SO ₄ acre ⁻¹	8.53	3.61	20.55

TITLE 09:	USE OF HYACINTH COMPOST IN SALT AFFECTED SOILS
OBJECTIVE	To determine the effectiveness of hyacinth compost as an ameliorant for reclamation of saline sodic soil and crop production
RESEARCHERS	A.R. Jami, Amar IqbalSaqib, Dr. Khalil Ahmed and Dr. Ehsan-ul-Haq
DURATION	2015-2018
LOCATION	Agri. Research Farm, SSRI, PindiBhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T ₁ Control T ₂ Gypsum @ 100% of GR T ₃ Gypsum @ 50 % of GR T ₄ Hyacinth compost @ 15t. ha ⁻¹ T ₅ Gypsum @ 50 % of GR+ hyacinth compost @ 5 t. ha ⁻¹ T ₆ Gypsum @ 50 % of GR+ hyacinth compost @ 10 t. ha ⁻¹ T ₇ Gypsum @ 50 % of GR+ hyacinth compost @ 15 t. ha ⁻¹
METHODOLOGY	A salt affected field will be selected, prepared and leveled. Composite soil

	samples will be collected and analyzed for salinity/sodicity and GR. Experiment will be laid out in RCBD with three replications having plot size 6 x 4 m ² . Gypsum will be applied one month before rice transplantation in the respective treatment plots followed by leaching and hyacinth compost fifteen days before transplantation. Crop rotation used will be rice-wheat. Compost will be made by burying the water hyacinth plants in a pit up to four weeks. Recommended dose of fertilizers 150-85-60 N,P ₂ O ₅ ,K ₂ O kg ha ⁻¹ for rice (Shaheen Basmati) will be applied. Soil samples will be collected after harvesting of each crop. Straw and paddy yield data will be recorded at maturity. Soil samples will be analyzed for pH _s , EC _e and SAR.
PREVIOUS RESULTS	2016

Initial Soil Analysis

$$\text{pH}_s = 8.91$$

$$\text{EC}_e (\text{dS m}^{-1}) = 5.02$$

$$\text{SAR} (\text{mmol L}^{-1})^{1/2} = 44.24$$

$$\text{GR} (\text{t.acre}^{-1}) = 4.12$$

$$\text{BD} (\text{Mg m}^{-3}) = 1.43$$

$$\text{HC} (\text{cm hr}^{-1}) = 0.28$$

Yield data (Rice2016)

Treatments	Paddy	Straw
	t ha ⁻¹	
T ₁ Control	1.24D	3.10D
T ₂ Gypsum @ 100% of GR	2.92A	6.72A
T ₃ Gypsum @ 50 % of GR	2.32C	5.34C
T ₄ Hyacinth compost @ 15 t. ha ⁻¹	2.35C	5.55C
T ₅ Gypsum @ 50 % of GR + hyacinth compost @ 5 t. ha ⁻¹	2.54BC	5.93BC
T ₆ Gypsum @ 50 % of GR + hyacinth compost @ 10 t. ha ⁻¹	2.80AB	6.50AB
T ₇ Gypsum @ 50 % of GR + hyacinth compost @ 15 t. ha ⁻¹	3.03A	6.97A
LSD	0.2824	0.6613

Soil analysis before rice 2016

Treatments	pH _s	EC _e (dS m ⁻¹)	SAR (mmol L ⁻¹) ^{1/2}	BD (Mg m ⁻³)	HC (cm hr ⁻¹)
Control	8.93	4.98	44.24	1.66	0.34
Gypsum @ 100% GR	8.72	4.69	32.12	1.62	0.46
T ₃ - Gypsum @ 50 % of GR	8.82	4.77	35.42	1.63	0.39
T ₄ -Hyacinth compost @ 15 t. ha ⁻¹	8.86	4.82	36.54	1.60	0.40
T ₅ - Gypsum @ 50 % of GR +	8.78	4.76	35.06	1.61	0.43
T ₆ - Gypsum @ 50 % of GR +	8.79	4.70	34.28	1.59	0.44
T ₇ - Gypsum @ 50 % of GR +	8.74	4.67	33.78	1.59	0.45

Soil analysis after rice 2016

Treatments	pH _s	EC _e (dS m ⁻¹)	SAR (mmol L ⁻¹) ^{1/2}	BD (Mg m ⁻³)	HC (cm hr ⁻¹)
T ₁ Control	8.93	5.02	44.29	1.66	0.34
T ₂ Gypsum @ 100% of GR	8.63	3.68	25.66	1.60	0.47
T ₃ Gypsum @ 50 % of GR	8.74	3.80	31.51	1.62	0.42

T ₄ Hyacinth compost @ 15 t. ha ⁻¹	8.77	4.06	32.27	1.60	0.40
T ₅ Gypsum @ 50 % of GR + hyacinth compost @ 5 t. ha ⁻¹	8.71	3.76	28.53	1.60	0.43
T ₆ Gypsum @ 50 % of GR + hyacinth compost @ 10 t. ha ⁻¹	8.67	3.65	26.71	1.59	0.45
T ₇ Gypsum @ 50 % of GR + hyacinth compost @ 15 t. ha ⁻¹	8.62	3.53	25.37	1.59	0.48

TITLE 10:	REHABILITATION OF SALINE SODIC SOILS THROUGH CULTIVATION OF SALT TOLERANT GRASSES
OBJECTIVE	To investigate the performance of various perennial salt tolerant grasses under salt affected soils conditions and their impact in improving soil health
RESEARCHER	Amar IqbalSaqib
DURATION	2017-2020
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T ₁ =Para Grass T ₂ =Mot Grass T ₃ =Rhodes Grass T ₄ = Kallar Grass
METHODOLOGY	A salt affected field will be selected, prepared and leveled. Composite soil samples will be collected and analyzed for salinity/sodicity and GR. Experiment will be laid out in RCBD with three replications. Tufts of grasses will be planted in February-March according to treatment plane. Fertilizer P ₂ O ₅ and K ₂ O will be applied @ 40 kg ha ⁻¹ at final land preparation while N will be applied @ 30 kg ha ⁻¹ at 20 days after transplanting whereas 15 kg N ha ⁻¹ will be applied after every harvest (three months). Fresh and dry weight, NO. of cuttings, will be recorded after three months. Soil samples will be analyzed for pH _s , EC _e , and SAR after every year.
PREVIOUS YEAR RESULTS	Field has been selected and prepared ,collection of grasses is in progress

TITLE 11:	RESPONSE OF TAMARIND SEEDLINGS UNDER DIFFERENT LEVELS OF SALINITY AND SODICITY		
OBJECTIVE	Performance of tamarind seedlings will be tested on different salinity and sodicity levels in pots and then performance will be evaluated under field conditions		
RESEARCHER	Amar IqbalSaqib and Abdul Rehman Jami		
DURATION	2017-2020		
LOCATION	Campus, SSRI, Pindi Bhattian		
NATURE OF EXPERIMENT	Pot Experiment		
TREATMENTS	Treatments	EC_e(dSm⁻¹)	SAR (mmol L⁻¹)^{1/2}
	T ₁	<4	<13
	T ₂	6	25
	T ₃	6	35
	T ₄	6	45
	T ₅	8	25

	T ₆	8	35
	T ₇	8	45
	T ₈	10	25
	T ₉	10	35
	T ₁₀	10	45
METHODOLOGY	A normal soil will be selected and the desired salinity/sodicity levels will be developed using salts NaCl, Na ₂ SO ₄ , CaCl ₂ and MgSO ₄ . After establishing, desired levels of EC _e and SAR, the soil will be filled in the glazed pots as per treatment plan. One seedling of tamarind will be transplanted (February-March) in each pot. Experiment will be laid out in CRD with three replications. After one year (April-May) data regarding plant height, stem diameter, No. of leaves, No. of branches and mortality % will be recorded and leaves will be analyzed for Ca, Mg, Na and K. Soil samples will be analyzed for pH _s , EC _e , SAR at the start and completion of the study.		
PREVIOUS RESULTS	Salinity has been developed according to treatments in pots and plants will be transplanted in this month.		

TITLE 12:	RESPONSE OF MAIZE-WHEAT ROTATION UNDER BRACKISH WATER MANAGEMENT STRATEGIES
OBJECTIVE	To assess the effect of brackish tube well water for getting high yield under maize-wheat rotation in normal soils
RESEARCHER	Dr. Khalil Ahmed and Dr. Muhammad Anwar Zaka
DURATION	2015-2019
LOCATION	Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T ₁ Canal water T ₂ Tube well water T ₃ Gypsum application on the basis of RSC of tube well water T ₄ Tube well water + PGPR T ₅ Tube well water + Gypsum application on the basis of RSC of tube well water + PGPR
METHODOLOGY	After the harvest of wheat crop, post-harvest soil sampling will be done and maize crop will be sown on a normal field while gypsum on RSC basis will be applied on annual basis. PGPR will be coated to maize seed for 3-4 hours before sowing. Fertilizers @ 125-90-60 NPK kg ha ⁻¹ will be applied to all treatments. Grain yield will be recorded at maturity. Soil samples will be collected and analyzed for pH _s , EC _e , SAR, BD and HC before the start of the experiment and after harvest of each crop. The design will be RCB with three repeats.
PREVIOUS RESULTS	2016

Initial Soil Analysis

pH _s	= 8.04
EC _e	= 2.81 dS m ⁻¹
SAR	= 11.99 (mmol L ⁻¹) ^{1/2}
Hydraulic conductivity	= 0.87 cm hr ⁻¹
Bulk density	= 1.40 Mg m ⁻³

Analysis of tube well water

EC _{iw}	= 1.37 dS m ⁻¹
SAR _{iw}	= 8.40 (mmol L ⁻¹) ^{1/2}
RSC _{iw}	= 7.85 me L ⁻¹

Previous results maize (2016)

Treatments	Plant height (cm)	Grain yield (t. ha ⁻¹)
T ₁ Canal water	194.00 A	2.20 A
T ₂ Tube well water	182.00 B	2.00 B
T ₃ Gypsum application on the basis of RSC of tube well water	187.33 AB	2.19 A
T ₄ Tube well water + PGPR	185.00 B	2.04 B
T ₅ Tube well water + PGPR + Gypsum application on the basis of RSC of tube well water	189.00 AB	2.22 A
LSD	8.7033	0.1381

Soil analyses before sowing of maize 2016

Treatments	pH _s	EC _e (dS m ⁻¹)	SAR (mmol L ⁻¹) ^{1/2}	HC (cm hr ⁻¹)	BD (Mg m ⁻³)
T ₁ Canal water	8.02	1.07	10.04	0.89	1.34
T ₂ Tube well water	8.28	1.69	13.45	0.87	1.42
T ₃ Gypsum application on the basis of RSC of tube well water	8.07	1.41	10.13	0.90	1.38
T ₄ Tube well water + PGPR	8.15	1.59	11.16	0.88	1.35
T ₅ Tube well water + PGPR + Gypsum application on the basis of RSC of tube well water	8.07	1.26	10.21	0.90	1.36

Soil analyses after maize harvest 2016

Treatments	pH _s	EC _e (dS m ⁻¹)	SAR (mmol L ⁻¹) ^{1/2}	HC (cm hr ⁻¹)	BD (Mg m ⁻³)
T ₁ Canal water	8.02	1.06	10.00	0.90	1.34
T ₂ Tube well water	8.30	1.72	13.47	0.85	1.42
T ₃ Gypsum application on the basis of RSC of tube well water	8.02	1.39	10.00	0.91	1.36
T ₄ Tube well water + PGPR	8.10	1.58	11.15	0.86	1.37
T ₅ Tube well water + PGPR + Gypsum application on the basis of RSC of tube well water	8.00	1.25	10.18	0.91	1.35

TITLE 13:	LONG TERM EFFECT OF HIGH RSC WATER ON PHYSICAL PROPERTIES OF SOIL UNDER RICE-MUSTARD ROTATION
OBJECTIVE	To study the deleterious effects of high RSC water on physical properties of soil under rice-mustard rotation
DURATION	2013-18
RESEARCHER	Dr. Khalil Ahmed and Dr. Muhammad Anwar Zaka
LOCATION	Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T ₁ Tube well water T ₂ Gypsum application on the basis of RSC of tube well water T ₃ H ₂ SO ₄ application on the basis of RSC of tube well water T ₄ Green Manuring with Guar T ₅ FYM @ 10 t ha ⁻¹
METHODOLOGY	A moderately salt affected field will be selected, prepared and leveled. Composite soil samples will be collected and analyzed for pH _s , EC _e and SAR. Experiment will be laid out in RCBD with four replications. Gypsum will be applied in the respective treatment plots followed by leaching. Crop rotation used will be rice–mustard. Recommended dose of fertilizers @ 150-85-60 NPK kg ha ⁻¹ will be applied to rice crop. Yield data of will be recorded at maturity. Soil samples will be collected after harvesting of each crop. These samples will be analyzed for EC _e , pH _s , SAR, HC and BD.
PREVIOUS RESULTS	2016

Initial Soil Analysis

pH _s	= 8.82
EC _e	= 4.71 dS m ⁻¹
SAR	= 26.82 (mmol L ⁻¹) ^{1/2}
Hydraulic conductivity	= 0.67 cm hr ⁻¹
Bulk density	= 1.37 Mg m ⁻³

Analysis of tube well water

EC _{iw}	1.37 dS m ⁻¹
SAR	8.40 (mmol L ⁻¹) ^{1/2}
RSC _{iw}	7.85 me L ⁻¹

Yield data of Rice (2016)

Treatments	Paddy Yield (t. ha ⁻¹)	Straw Yield (t. ha ⁻¹)
T ₁ Tube well water	2.81 C	4.10 C
T ₂ Gypsum application on the basis of RSC of tube well water	3.53 A	7.51 A
T ₃ H ₂ SO ₄ application on the basis of RSC of tube well water	3.50 A	7.53 A
T ₄ Green Manuring with Guar	3.17 B	6.83 B
T ₅ FYM @ 10 t. ha ⁻¹	3.30 B	7.00 AB
LSD	0.1778	0.5532

Soil analysis before rice 2016

Treatments	pH _s	EC _e (dS m ⁻¹)	SAR (mmol L ⁻¹) ^{1/2}	HC (cm hr ⁻¹)	BD (Mg m ⁻³)
T ₁ Tube well water	8.79	4.57	25.00	0.68	1.34
T ₂ Gypsum application on the basis of RSC of tube well water	8.61	3.90	17.00	0.74	1.29
T ₃ H ₂ SO ₄ application on the basis of RSC of tube well water	8.62	3.92	17.10	0.72	1.29
T ₄ Green Manuring with Guar	8.73	4.00	19.32	0.70	1.30
T ₅ FYM @ 10 t. ha ⁻¹	8.73	3.94	18.15	0.70	1.30

Soil analysis after rice harvest 2016

Treatments	pH _s	EC _e (dS m ⁻¹)	SAR (mmol L ⁻¹) ^{1/2}	HC (cm hr ⁻¹)	BD (Mg m ⁻³)
T ₁ Tube well water	8.80	4.59	25.10	0.67	1.35
T ₂ Gypsum application on the basis of RSC of tube well water	8.60	3.50	17.00	0.75	1.27
T ₃ H ₂ SO ₄ application on the basis of RSC of tube well water	8.60	3.90	17.70	0.72	1.28
T ₄ Green Manuring with Guar	8.70	3.93	19.16	0.71	1.29
T ₅ FYM @ 10 t. ha ⁻¹	8.73	4.00	18.10	0.70	1.28

TITLE 14:	INTEGRATED USE OF SULPHUR AND ORGANIC AMENDMENT FOR RECLAMATION OF SALINE SODIC SOIL IN WHEAT-PEARL MILLET ROTATION
OBJECTIVE	To monitor the effectiveness of combined use of sulphur and organic source for reclamation of saline sodic soil under wheat-pearl millet rotation.
RESEARCHER	Dr. Khalil Ahmed and Dr. Muhammad Anwar Zaka
DURATION	2016-2019
LOCATION	Research Farm, SSRI Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	<ol style="list-style-type: none"> 1. Control 2. Sulphur on the basis of 50% GR 3. Sulphur on the basis of 100% GR 4. Press mud @ 20 t ha⁻¹ 5. Sulphur on the basis of 50% GR + Press mud @ 10 t ha⁻¹ 6. Sulphur on the basis of 25% GR + Press mud @ 15 t ha⁻¹
METHODOLOGY	After the harvest of wheat crop, post-harvest soil sampling will be done and pearl millet crop will be sown in same layout. The design will be RCB

	with three repeats. Fertilizers @ 80-60-60 NPK kg ha ⁻¹ will be applied and all other agronomic practices will be followed uniformly to all the treatments. Grain yield will be recorded at maturity. Soil samples will be collected and analyzed for pH _s , EC _e , SAR, BD and HC before the start of the experiment and after harvest of the crop.
PREVIOUS RESULTS	First Year

Initial Soil Analysis

pH _s	= 8.97
EC _e	= 4.52 dS m ⁻¹
SAR	= 40.70 (mmol L ⁻¹) ^{1/2}
Hydraulic conductivity	= 0.54 cm hr ⁻¹
Bulk density	= 1.38 Mg m ⁻³
GR	= 2.50 (t. acre ⁻¹)

TITLE 15:	LONG TERM EFFECT OF DIFFERENT ORGANIC MANURES AND GYPSUM ON PHYSICAL PROPERTIES OF SALINE SODIC SOIL IN WHEAT-RICE ROTATION
OBJECTIVE	To monitor the effectiveness of different amendments on downward movement of salts and rehabilitation of soil health with passage of time
RESEARCHER	Dr. Khalil Ahmed and Dr. Muhammad Anwar Zaka
DURATION	2016-2025
LOCATION	Research Farm, SSRI Pindi Bhattian
NATURE OF EXPERIMENT	Field
TREATMENTS	<ol style="list-style-type: none"> 1. Control 2. Gypsum @ 100% GR 3. Poultry manure @ 20 t. ha⁻¹ 4. FYM @ 20 t. ha⁻¹ 5. Rice straw @ 20 t. ha⁻¹ 6. Press mud @ 20 t. ha⁻¹
METHODOLOGY	After the harvest of wheat crop, post-harvest soil sampling will be done and rice crop will be sown in same layout. The design will be RCB with three repeats. Fertilizers @ 125-90-60 NPK kg ha ⁻¹ will be applied and all other agronomic practices will be followed uniformly to all the treatments. Grain yield will be recorded at maturity. Soil samples will be collected and analyzed for pH _s , EC _e , SAR, BD and HC before the start of the experiment and after harvest of the crop. Composite soil samples will be collected from 0-15, 15-30, 30-60 and 60-90 cm after every three years and analyzed for EC _e , pH _s , SAR, HC and BD.
PREVIOUS RESULTS	First Year

Initial Soil Analysis

pH _s	= 9.91
EC _e	= 10.95 dS m ⁻¹
SAR	= 89.14 (mmol L ⁻¹) ^{1/2}
Hydraulic conductivity	= 0.16 cm hr ⁻¹
Bulk density	= 1.69 Mg m ⁻³
GR (t. acre)	= 4.40

TITLE 16:	STRATEGIES FOR UTILIZATION OF BRACKISH WATER FOR STRAWBERRY-MUNG ROTATION
OBJECTIVE	To manage the deleterious effects of brackish water (BW) for sustainable production of strawberry (<i>Fragariaananassa</i>) and Mung Bean (<i>Vignaradiata</i>) rotation.
RESEARCHERS	GhulamQadir, Imtiaz Ahmad Warraich, Muhammad AslamAvais and M. A. Zaka
DURATION	2016-2019
LOCATION	SSRI campus, Pindi Bhattian
NATURE OF EXPERIMENT	Field experiment
TREATMENTS	T ₁ : Control [Brackish Water (B W)] T ₂ : Poultry manure @ 5 t. ha ⁻¹ T ₃ : Poultry manure @ 10 t. ha ⁻¹ T ₄ : H ₂ SO ₄ equivalent to 25% GR on the basis of RSC of water T ₅ : H ₂ SO ₄ equivalent to 50% GR on the basis of RSC of water
METHODOLGY	A normal field was selected and poultry manure was applied before transplanted of strawberry. H ₂ SO ₄ will be applied with each irrigation. Mung Bean (<i>Vigna radiata</i>) yield and yield parameters (Grain Yield, Biomass, No. of Pods, No. of branches etc.) will be recorded. Soil samples will be analyzed for pH _s , EC _e and SAR at the initiation of the experiment and after harvest of the crop. The crop will be sown in lines during the month of July-August. Fertilizer @ 25-60-30 N P ₂ O ₅ K ₂ O kg ha ⁻¹ will be applied, (Whole P K + 1/2 N at sowing & remaining 1/2 N at flowering stage). Distance between plant to plant 15 cm and row to row 30 cm will be maintained. Statistical design will be RCB. Irrigation will be applied 3 to 4 times, (1 st irrigation after 3 to 4 weeks after germination, 2 nd at flowering, 3 rd at pod formation and then at grain formation).
PREVIOUS RESULTS	First Year

Initial Soil Analysis:

pH _s	= 8.19
EC _e	= 2.50 (dS m ⁻¹)
SAR	= 19.89 (mmol L ⁻¹) ^{1/2}

Irrigation Water Analysis:

EC _{iw}	= 1.23 (dS m ⁻¹)
SAR	= 6.01 (mmol L ⁻¹) ^{1/2}
RSC	= 4.85 (me L ⁻¹)

Poultry Manure Analysis (%)

Total N	Total P	Total K
1.59	1.0	0.53

TITLE 17:	DISSEMINATION OF TECHNOLOGIES FOR SAFE UTILIZATION OF BRACKISH WATER
OBJECTIVE	To assess quality of tube well water installed by farmers at Chiniot road Pindi Bhattian for its safe usage.
RESEARCHERS	GhulamQadir, Imtiaz Ahmad Warraich, Muhammad AslamAvais and M. A. Zaka
DURATION	2016-2025
LOCATION	Farmer Tube Well, Chiniot Road, Pindi Bhattian
NATURE OF EXPERIMENT	Field experiment
Methodology	Farmers tube wells Chiniot road Pindi Bhattian will be selected for determining quality of water with respect to EC_{iw} , SAR and RSC. Water samples of thirty eight tube wells will be collected and analyzed. The farmers will be advised to avoid ill effects of of brackish water.
PREVIOUS RESULTS	2016-17

Total No. of Water Samples = 38		
Fit = 8 (21.05%)		
Unfit = 21 (55.26%)		
Marginally Fit = 9 (23.68%)		
Unfit Due To		
EC	RSC	EC + RSC
4	4	13
Marginally Fit Due To		
EC	RSC	EC + RSC
1	8	-

Sr. No.	Name of Farmer	EC_{iw} dS m ⁻¹	SAR (mmol L ⁻¹)	RSC me L ⁻¹	Quality
1	Muhammad Hussain, Macho Nikka	1.20	4.38	2.00	M. Fit
2	Muhammad Hussain, Macho Nikka	1.17	4.48	2.30	M. Fit
3	Malik Manzoor, JotianWala	2.01	10.12	4.10	unfit
4	Malik Manzoor, JotianWala	1.57	6.74	1.15	unfit
5	Malik Manzoor, JotianWala	1.92	9.46	3.90	unfit
6	Malik ManzoorHussain, JotianWala	1.73	7.92	2.65	unfit
7	Govt. Primary School, Ghabrika	1.19	8.81	3.80	unfit
8	Govt. Primary School, Ghabrika	2.44	13.22	3.90	unfit
9	RanaIrshad, Ghabrika	1.58	7.47	3.40	unfit
10	RanaFarooq, Ghabrika	0.78	1.47	1.35	M. Fit
11	RanaFarooq, Ghabrika	1.12	2.17	Nil	Fit
12	Farhat Abbas, JotianWala	1.60	7.19	2.75	unfit
13	RaiUlfatHussain, Ghabrika	1.89	8.36	1.90	unfit
4	RaiUlfatHussain, Ghabrika	0.78	2.91	2.35	M. Fit
15	RaiUlfatHussain, Ghabrika	1.91	9.51	2.10	unfit

16	RanaNaeem, Ghabrika	1.82	8.85	3.80	unfit
17	RanaNaeem, Ghabrika	1.56	7.60	2.55	unfit
18	RanaNaeem, Ghabrika	1.50	9.25	3.75	unfit
19	Muhammad Zafar, Ghabrika	1.29	5.99	2.60	unfit
20	AbrarMunir, MandalKhuh	1.40	4.17	1.25	M. Fit
21	Naseem Abbas, MandalKhuh	0.98	1.63	Nil	Fit
22	Jazman, KhanniKhui	1.01	5.96	3.00	unfit
23	RaiWaseem, ThathaLadai	0.75	2.37	0.60	Fit
24	Zafar Ali, ThathaLadaiMauzaBadari	0.53	0.92	Nil	Fit
25	Zafar Ali, ThathaLadaiMauzaBadari	1.05	2.55	0.40	Fit
26	Zafar Ali, ThathaLadaiMauzaBadari	1.00	3.16	1.50	M. Fit
27	Zafar Ali, ThathaLadaiMauzaBadari	1.08	3.51	1.30	
28	Zafar Ali, ThathaLadaiMauzaBadari	1.07	3.08	1.70	
29	ShahbazHussain, KotBadar Din	1.80	11.94	4.30	unfit
30	Muhammad Nawaz, KotBadar Din	1.68	9.70	1.70	unfit
31	Sarfraz, KotBadar Din	2.27	16.81	6.70	unfit
32	AftabHussain, Bhajne	2.25	14.47	5.10	unfit
33	Shabbeer, 12 Da Chakka	2.36	23.0	8.45	unfit
34	Majboor, Khan Chak 42	2.57	13.78	4.05	unfit
35	Muhammad Amjad, AddaBurjian	1.14	5.23	1.20	Fit
36	Haq Nawaz, Sahuke	0.69	3.62	1.95	M. Fit
37	MumtazHussain, Mirza Bhattian	0.83	2.45	0.80	Fit
38	NasirHussain, Mirza Bhattian	0.70	0.70	Nil	

TITLE 18:	EFFECTIVENESS OF DIFFERENT MANAGEMENT STRATEGIES FOR HIGH RSC IRRIGATION WATER
OBJECTIVE	To manage the deleterious effects of brackish water (BW) for sustainable production of wheat-rice in a normal soil
RESEARCHERS	GhulamQadir, Imtiaz Ahmad Warraich, Muhammad AslamAvais and M. A. Zaka
DURATION	2015-2019
LOCATION	Rakh Farm, SSRI, PindiBhattian
NATURE OF EXPERIMENT	Field experiment
TREATMENTS	T ₁ : Control [Brackish Water (B W)] T ₂ : Continuous treated water with sulfuric acid on the basis of RSC of water T ₃ : Two irrigations with H ₂ SO ₄ on RSC basis +Two Irrigations without H ₂ SO ₄ T ₄ : Alternate irrigations with H ₂ SO ₄ on RSC basis T ₅ : One irrigation with H ₂ SO ₄ on RSC basis after two irrigations without H ₂ SO ₄
METHODOLGY	A normal field will be selected and commercial H ₂ SO ₄ on RSC basis will be applied as per treatment plan. Rice nursery (Shaheen Basmati) will be transplanted. Fertilizer @ 150-85-60 NPK kg ha ⁻¹ will be applied to all treatments. Paddy and straw yield data will be recorded. Pre sowing and post harvest soil samples will be analyzed for pH _s , EC _e and SAR. Experiment will be laid out according to Randomized Complete Block Design.
PREVIOUS RESULTS	2016

Initial Soil Analysis:

pH _s	= 8.20
EC _e	= 3.89 (dS m ⁻¹)
SAR	= 14.53 (mmol L ⁻¹) ^{1/2}

Irrigation Water Analysis:

EC _{iw}	= 1.33 (dS m ⁻¹)
SAR	= 8.83 (mmol L ⁻¹) ^{1/2}
RSC	= 7.90 (me L ⁻¹)

Soil Analysis before rice 2016:

Treatments	pH _s	EC _e (dS m ⁻¹)	SAR (mmol L ⁻¹) ^{1/2}
T ₁ : Control [Brackish Water (B W)]	8.24	3.88	14.00
T ₂ : Continuous treated water with sulfuric acid on the basis of RSC of water	8.10	3.73	12.90
T ₃ : Two irrigations with H ₂ SO ₄ on RSC basis + Two Irrigations without H ₂ SO ₄	8.14	3.80	13.50
T ₄ : Alternate irrigations with H ₂ SO ₄ on RSC basis	8.15	3.79	13.40
T ₅ : One irrigation with H ₂ SO ₄ on RSC basis after two irrigations without H ₂ SO ₄	8.18	3.83	13.70

Paddy and Straw Yield 2016

Treatments	Paddy	Straw
	(t. ha ⁻¹)	
T ₁ : Control [Brackish Water (B W)]	2.65 C	6.25 C
T ₂ : Continuous treated water with sulfuric acid on the basis of RSC of water	3.40 A	8.21 A
T ₃ : Two irrigations with H ₂ SO ₄ on RSC basis + Two Irrigations without H ₂ SO ₄	3.01 B	7.17 B
T ₄ : Alternate irrigations with H ₂ SO ₄ on RSC basis	3.14 B	7.12 B
T ₅ : One irrigation with H ₂ SO ₄ on RSC basis after two irrigations without H ₂ SO ₄	3.11 B	6.92 B
LSD	0.2414	0.4014

Soil Analysis after rice 2016:

Treatments	pH _s	EC _e (dS m ⁻¹)	SAR (mmol L ⁻¹) ^{1/2}
T ₁ : Control [Brackish Water (B W)]	8.29	3.94	14.22
T ₂ : Continuous treated water with sulfuric acid on the basis of RSC of water	8.08	2.86	10.55
T ₃ : Two irrigations with H ₂ SO ₄ on RSC basis + Two Irrigations without H ₂ SO ₄	8.12	3.44	12.04
T ₄ : Alternate irrigations with H ₂ SO ₄ on RSC basis	8.13	3.60	11.22
T ₅ : One irrigation with H ₂ SO ₄ on RSC basis after two irrigations without H ₂ SO ₄	8.14	3.18	10.57

TITLE 19:	TEMPORAL CHANGES IN THE QUALITY OF IRRIGATION WATER UNDER CLIMATE CHANGING SCENARIO
OBJECTIVE	To study changes in quality of irrigation water in relation to climatic factors (Temperature and Rainfall)
RESEARCHERS	GhulamQadir, Imtiaz Ahmad Warraich, Muhammad AslamAvais and M. A. Zaka
DURATION	2015-2030

METHODOLOGY	A long term experiment will be carried out to monitor temporal changes in the quality of irrigation water with respect to EC_{iw} , SAR and RSC. The temperature and rainfall data will be recorded while the four tube wells water samples will be analyzed fortnightly.
PREVIOUS RESULTS	September 2015 to August 2016 Rainfall = 498 mm rainfall recorded

 EC_{iw} (dS m⁻¹)

Sr. No.	Date	TW 1	TW 2	TW 3	TW 4	Rainfall	Temp. (°C) Minimum	Temp. (°C) Maximum
		(1 Campus)	(2 Campus)	(1 Rakh Farm)	(2 Rakh Farm)	mm		
1	September, 2015	0.83	1.23	1.36	1.38	75	18.0	35.5
2	October, 2015	0.76	1.21	1.40	1.37	9	15.5	32.0
3	November, 2015	0.72	1.16	1.27	1.28	-	7.5	24.0
4	December, 2015	0.71	1.14	1.30	1.28	-	7.0	19.0
5	January, 2016	0.72	1.13	1.26	1.25	79	3.5	18.5
6	February, 2016	0.68	1.14	1.34	1.33	-	4.5	25.5
7	March, 2016	0.75	1.19	1.33	1.36	93	12.0	25.0
8	April, 2016	0.77	1.20	1.34	1.36	29	16.5	34.5
9	May, 2016	0.80	1.24	1.36	1.33	20	18.0	39.0
10	June, 2016	0.80	1.18	1.43	1.32	49	28.3	40.0
11	July, 2016	0.76	1.17	1.42	1.28	230	26.1	34.9
12	August, 2016	0.81	1.26	1.43	1.32	144	25.4	35.4

- Maximum EC_{iw} (0.83 dS m⁻¹), was observed in September, 2015 at maximum temperature 35.50 Centigrade while minimum EC_{iw} (0.68 dS m⁻¹), was observed in February, 2016 at minimum temperature 4.5 Centigrade for Tube Well NO. 1.
- Maximum EC_{iw} (1.26 dS m⁻¹), was observed in August, 2016 at maximum temperature 35.40 Centigrade while minimum EC_{iw} (1.13), was observed in January, 2016 at minimum temperature 3.5 Centigrade for Tube Well NO. 2.
- Maximum EC_{iw} was observed in June (1.43 dS m⁻¹) & August (1.43 dS m⁻¹), 2016 at maximum temperature 40 & 35.40 Centigrade respectively while minimum EC_{iw} (1.26 dS m⁻¹), was observed in January, 2016 at minimum temperature 3.5 Centigrade for Tube Well NO. 3.
- Maximum EC_{iw} (1.38 dS m⁻¹), was observed in September, 2015 at maximum temperature 35.40 Centigrade while minimum EC_{iw} (1.25 dS m⁻¹), was observed in January, 2016 at minimum temperature 3.5 Centigrade for Tube Well NO. 4.

SAR (mmol L⁻¹)^{1/2}

Sr. No	Date	TW 1 (1 Campus)	TW 2 (2 Campus)	TW 3 (1 Rakh Farm)	TW 4 (2 Rakh Farm)	Rainfall mm	Temperature (°C) Minimum	Temperature (°C) Maximum
1	September, 2015	4.81	6.17	8.64	8.02	75	18.0	35.5
2	October, 2015	3.84	6.10	8.29	7.86	9	15.5	32.0
3	November, 2015	3.48	5.10	8.04	7.54	-	7.5	24.0
4	December, 2015	2.84	6.10	7.89	7.39	-	7.0	19.0
5	January, 2016	3.09	5.29	8.05	6.62	79	3.5	18.5
6	February, 2016	2.71	5.24	8.41	7.29	-	4.5	25.5
7	March, 2016	3.66	5.69	8.39	7.53	93	12.0	25.0
8	April, 2016	3.10	5.72	8.04	7.92	29	16.5	34.5
9	May, 2016	4.02	6.19	8.31	7.87	20	18.0	39.0
10	June, 2016	3.53	5.54	8.52	7.23	49	28.3	40.0

11	July, 2016	3.12	5.08	8.65	7.02	230	26.1	34.9
12	August, 2016	3.48	6.01	8.57	7.63	144	25.4	35.4

- Maximum SAR ($4.81(\text{mmol L}^{-1})^{1/2}$), was observed in September, 2015 at maximum temperature 35.50 Centigrade while minimum SAR ($2.71(\text{mmol L}^{-1})^{1/2}$), was observed in February, 2016 at minimum temperature 4.5 Centigrade for Tube Well NO. 1.
- Maximum SAR ($6.19(\text{mmol L}^{-1})^{1/2}$), was observed in May, 2016 at maximum temperature 39.0 Centigrade while minimum SAR ($5.24(\text{mmol L}^{-1})^{1/2}$), was observed in February, 2016 at minimum temperature 4.5 Centigrade for Tube Well NO. 2.
- Maximum SAR ($8.65(\text{mmol L}^{-1})^{1/2}$), was observed in July, 2016 at maximum temperature 34.90 Centigrade while minimum SAR ($7.89(\text{mmol L}^{-1})^{1/2}$), was observed in December, 2015 at minimum temperature 7.0 Centigrade for Tube Well NO. 3.
- Maximum SAR ($8.02(\text{mmol L}^{-1})^{1/2}$), was observed in September, 2015 at maximum temperature 35.50 Centigrade while minimum SAR ($6.62(\text{mmol L}^{-1})^{1/2}$), was observed in January 2016 at minimum temperature 7.0 Centigrade for Tube Well NO. 4.

RSC (me L^{-1})

Sr. No.	Date	TW 1 (1 Campus)	TW 2 (2 Campus)	TW 3 (1 Rakh Farm)	TW 4 (2 Rakh Farm)	Rainfall mm	Temperature ($^{\circ}\text{C}$) Minimum	Temperature ($^{\circ}\text{C}$) Maximum
1	September, 2015	3.42	4.37	7.62	6.60	75	18.0	35.5
2	October, 2015	3.43	4.70	7.92	7.10	9	15.5	32.0
3	November, 2015	3.47	3.27	7.17	6.60	-	7.50	24.0
4	December, 2015	2.47	4.57	7.12	7.10	-	7.00	19.0
5	January, 2016	2.80	4.15	7.59	6.50	79	3.50	18.5
6	February, 2016	2.75	4.39	7.70	6.72	-	4.50	25.5
7	March, 2016	3.30	4.22	7.56	6.85	93	12.0	25.0
8	April, 2016	2.95	4.30	7.65	6.87	29	16.5	34.5
9	May, 2016	3.70	4.72	8.10	7.15	20	18.0	39.0
10	June, 2016	2.80	4.55	8.73	6.68	49	28.3	40.0
11	July, 2016	2.48	4.42	8.20	6.75	230	26.1	34.9
12	August, 2016	3.15	4.30	8.22	6.77	144	25.4	35.4

- Maximum RSC (3.70 me L^{-1}), was observed in May, 2016 at maximum temperature 39.0 Centigrade while minimum RSC (2.47 me L^{-1}), was observed in December, 2015 at minimum temperature 7.0 Centigrade for Tube Well NO. 1.
- Maximum RSC (4.72 me L^{-1}), was observed in May, 2016 at maximum temperature 39.0 Centigrade while minimum RSC (4.15 me L^{-1}), was observed in January, 2016 at minimum temperature 3.50 Centigrade for Tube Well NO. 2.
- Maximum RSC (8.73 me L^{-1}), was observed in June, 2016 at maximum temperature 40.0 Centigrade while minimum RSC (7.12 me L^{-1}), was observed in December, 2015 at minimum temperature 7.0 Centigrade for Tube Well NO. 3.
- Maximum RSC (7.15 me L^{-1}), was observed in May, 2016 at maximum temperature 39.0 Centigrade while minimum RSC (6.50 me L^{-1}), was observed in January, 2016 at minimum temperature 3.50 Centigrade for Tube Well NO. 4.

TITLE 20:	Comparative study of ratoonability of different sugarcane clones / varieties in salt affected soils
OBJECTIVE	To investigate the yield performance of ratoon sugarcane crop in salt affected soil
RESEARCHERS	Manzoor Hussain , M. Q. Nawaz and M. Anwar Zaka
DURATION	2014-17
LOCATION	Research Farm, SSRI, PindiBhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	New Clones/Varieties 1) HSF-240 2) CPF-246 3) CPF-247 4) CPF-248 5) S-2003-us-127 6) S-2003-us-633 7) S-2003-us-704 8) S-2006-SP-93 9) S-2006-us-272 10) S-2006-us-658
METHODOLOGY	Trial was sown using RCB Design with three replications in a salt affected field on dated 23-10-14. Plot size of 4.5 m x 6 m was maintained. Seed rate 75000 DBS ha ⁻¹ was used. Fertilizer 170-112-112 NPK kg ha ⁻¹ was applied. Row to Row distance of 75 cm was maintained. The crop was harvested on dated 15-02-2016 and will be left for testing the performance of ratoon crop. All other agronomic & plant protection measures will be adopted uniformly. Data of yield and yield components will be recorded. Soil samples will be collected and analyzed for pH _s , EC _e and SAR.

Cane Yield

Treatments	Yield (t ha⁻¹)
HSF-240	63.97 A
CPF-246	47.76 G
CPF-247	57.74 D
CPF-248	60.40 C
S-2003-us-127	58.91 CD
S-2003-us-633	49.33 FG
CPF-249 (S-2003-us-704)	62.20 B
S-2006-SP-93	54.71 E
S-2006-us-272	50.52 F
S-2006-us-658	53.14 E
LSD	1.6230

Initial soil analysis

pH_s = 8.92
EC_e = 5.64 dSm⁻¹
SAR = 27.46 (mmol L⁻¹)^{1/2}

Post-harvest soil analysis

Treatments	pH_s	EC_e dSm⁻¹	SAR (mmol L⁻¹)^{1/2}
HSF-240	8.87	5.46	25.30
CPF-246	8.82	5.58	25.43
CPF-247	8.84	5.62	26.42

CPF-248	8.88	5.55	25.53
S-2003-us-127	8.87	5.54	26.41
S-2003-us-633	8.82	5.58	25.60
S-2003-us-704	8.80	5.57	25.65
S-2006-SP-93	8.80	5.52	25.20
S-2006-us-272	8.82	5.56	24.92
S-2006-us-658	8.84	5.58	26.60

TITLE 21:	YIELD IMPROVEMENT OF DIRECT SOWN RICE ON RAISED BEDS USING PRIMING TECHNIQUES IN SALT AFFECTED SOILS
OBJECTIVE	To evaluate the yield performance of direct seeded rice (dibbling) on raised beds using different seed priming agents in salt affected soils
RESEARCHERS	M.Q. Nawaz, Manzoor Hussain and Dr. M. Anwar Zaka
DURATION	2015-2018
LOCATION	Research Farm, SSRI, PindiBhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	Priming Agents 1) Potassium dihydrogen phosphate (2%) 2) Zinc Sulphate (2%) 3) Single super phosphate (1%) 4) MgSO ₄ (2%) 5) Single super phosphate + Urea (1%) each
METHODOLOGY	A salt affected field will be selected, leveled and well prepared for making beds of 90 cm apart. The rice variety (KSK-133) will be sown by dibbling maintaining PxP and RxR distance of 30 cm. Three seeds will be sown per hill. All P& K will be applied at sowing and N will be applied in two splits (half at sowing and other half at tillering). Experiment will be laid out in RCBD with three replications. Plot size will be 3.6 m x 4.5 m. All other agronomic & plant protection measures will be adopted uniformly. Data of yield and yield component will be recorded. Soil samples will be collected and analyzed for pH _s , EC _e and SAR before sowing and after the harvest of crop.
PREVIOUS RESULTS	2016

Paddy Yield (t ha⁻¹)

Treatment	Paddy Yield t ha ⁻¹
KH ₂ PO ₄	4.61 CD
ZnSO ₄	4.53 D
SSP	5.23 A
MgSO ₄	4.83 BC
SSP+Urea	4.92 B
LSD	0.2576

Initial soil analysis

pH_s = 8.80

EC_e = 5.46 dSm⁻¹

SAR = 36.57 (mmol L⁻¹)^{1/2}

Post-harvest soil analysis

Treatments	pH _s	EC _e ⁻¹ (dS m ⁻¹)	SAR ^{-1 1/2} (m mol L ⁻¹)
Potassium dihydrogen phosphate (2%)	8.73	5.41	34.42
Zinc Sulphate (2%)	8.69	5.38	33.50
Single super phosphate (1%)	8.63	5.32	33.36
MgSO ₄ (2%)	8.65	5.34	33.30
Single super phosphate + Urea (1%) each	8.68	5.36	33.48

TITLE 22:	MANAGEMENT OF SALINE SODIC WATER BY USING DIFFERENT AMMENDMENTS AND SOWING TECHNIQUES
OBJECTIVE	To assess the role of different organic and inorganic amendments by using different sowing techniques to mitigate the harmful effects of high RSC water on yield of direct seeded rice and wheat crop.
RESEARCHERS	M.Q. Nawaz, Manzoor Hussain , A.I. Saqib and M.A. Zaka
DURATION	2013-2018
LOCATION	Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	A) Sowing Techniques 1) Ridge sowing 2) Broadcast sowing B) Soil Amendments 1) Gypsum on the basis of RSC of water 2) Press mud @ 10 t ha ⁻¹ 3) Press mud @ 20 t ha ⁻¹ 4) Biogas slurry @ 10 t ha ⁻¹ 5) Biogas slurry @ 20 t ha ⁻¹
METHODOLOGY	A normal field will be selected, leveled and prepared for sowing of rice (Super Bas.). Rice seed @ 50 kg ha ⁻¹ will be used. Experiment will be laid out in split plot design with three replications. Sub-plot size will be kept 6 m x 4 m. Recommended dose of fertilizer 150-86-60 NPK kg ha ⁻¹ will be applied. Organic and inorganic amendments will be applied one month before sowing of rice as per treatment plan. Sowing techniques will be kept in main plots and soil amendments in sub-plots. All other agronomic & plant protection measures will be adopted uniformly. Data regarding yield & yield components will be recorded. Soil samples will be collected and analyzed for pH _s , EC _e and SAR.
PREVIOUS RESULTS	2016

Paddy yield (t ha⁻¹)

Treatments	Ridge Sowing	Broadcast	Mean
Gypsum on the basis of RSC of Water	2.68 de	2.49 e	2.58 C
Press-mud @ 10 t ha ⁻¹	2.73 de	2.55 de	2.64 C
Press-mud @ 20 t ha ⁻¹	3.06 bc	2.77 cd	2.91 B
Biogas slurry @ 10 t ha ⁻¹	3.09 ab	2.79 bcd	2.94 B
Biogas slurry @ 20 t ha ⁻¹	3.33 a	3.07 ab	3.20 A
Mean	2.98 A	2.73 B	

LSD for sowing techniques = 0.2272

LSD for soil amendments = 0.1854

LSD for interaction = 0.2622

Amendments Analyses (%)

Amendments	Total N	Total P	Total K
Press-mud	1.25	0.90	0.60
Bio-slurry	1.50	1.35	0.40

Initial soil analysis

pH_s = 8.10
 EC_e = 2.88 dS m⁻¹
 SAR = 12.90 (mmol L⁻¹)^{1/2}

Tub-well water analysis

SAR = 8.06 (mmol L⁻¹)^{1/2}
 EC_{iw} = 1.44 dS m⁻¹
 RSC = 8.40 me L⁻¹

Post-harvest soil analysis

Sr.	Treatments	Ridge sowing			Broadcast sowing		
		pH _s	EC _e (dS m ⁻¹)	SAR ^{-1 1/2} (mmol L ⁻¹)	pH _s	EC _e (dS m ⁻¹)	SAR ^{-1 1/2} (mmol L ⁻¹)
1	Gypsum on the basis of RSC of Water	8.18	3.44	14.63	8.18	3.42	13.59
2	Press-mud @ 10 t ha ⁻¹	8.12	3.48	14.65	8.11	3.56	14.52
3	Press-mud @ 20 t ha ⁻¹	8.14	3.45	14.53	8.14	3.46	14.48
4	Biogas slurry @ 10 t ha ⁻¹	8.14	3.46	14.55	8.12	3.45	14.56
5	Biogas slurry @ 20 t ha ⁻¹	8.14	3.41	14.35	8.14	3.45	14.53

TITLE 23:	UTILIZATION OF SALT AFFECTED LAND USING PIT PLANTING TECHNIQUE FOR SUGERCANE
OBJECTIVE	To develop the technology for sugarcane production in salt affected soils
RESEARCHERS	Manzoor Hussain, M.Q. Nawaz and Dr. M. Anwar Zaka
DURATION	2014-17
LOCATION	Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	Treatments 1) Pits without amendment 2) Pits with Gypsum @ 50 % GR 3) Pits with Gypsum @ 100 % GR 4) Pits with FYM @ 20 t ha ⁻¹ 5) Pits with Gypsum @ 50 % + FYM @ 10 t ha ⁻¹
METHODOLOGY	Salt affected field will be selected, leveled and well prepared for planting of sugarcane crop. Trial will be laid out in RCBD with three replications. Plot size will be kept as 4.5 m X 6 m. Pits of 60 cm diameter and 90 cm depth will be dug with Tractor mounted auger. Pits will be filled according to the treatments. Pit to Pit distance will be kept 50 cm and Row to Row distance 75cm will be maintained. All other agronomic & plant protection measures will be adopted uniformly. Data of yield & yield components will be recorded. Soil samples will be collected and analyzed for pH _s , EC _e , SAR and GR.
PREVIOUS RESULTS	

Cane Yield

Treatments	Cane Yield (t ha ⁻¹)
Pits without amendment	48.73 C
Pits with Gypsum @ 50 % GR	58.07 B
Pits with Gypsum @ 100 % GR	67.08 A
Pits with FYM @ 20 t ha ⁻¹	53.89 BC
Pits with Gypsum @ 50 % + FYM @ 10 t ha ⁻¹	61.25 AB
LSD	7.8329

Initial soil analysis

pH _s	= 8.96
EC _e	= 10.55 dSm ⁻¹
SAR	= 41.37 (mmol L ⁻¹) ^{1/2}
GR	= 3.25 t acre ⁻¹

Post-harvest soil analysis

Treatments	pH _s	EC _e ⁻¹ (dS m ⁻¹)	SAR ^{-1/2} (mmol L ⁻¹)
Pits without amendment	8.92	10.43	39.45
Pits with Gypsum @ 50 % GR	8.50	8.62	37.91
Pits with Gypsum @ 100 % GR	8.46	6.88	35.00
Pits with FYM @ 20 t ha ⁻¹	8.51	7.85	38.75
Pits with Gypsum @ 50 % + FYM @ 10 t ha ⁻¹	8.47	7.27	36.65

TITLE 24:	PERFORMANCE OF NEW SUGARCANE CLONES/VARIETIES IN SALT AFFECTED SOILS
OBJECTIVE	To check the yield performance of new clones/varieties of sugarcane crop in salt affected soil
RESEARCHERS	M. Q. Nawaz and Manzoor Hussain and Dr. M. Anwar Zaka
DURATION	2014-17
LOCATION	Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	New Clones/Varieties 1) HSF-240 2) CPF-246 3) CPF-247 4) CPF-248 5) S-2003-us-127 6) S-2003-us-633 7) S-2003-us-704 8) S-2006-SP-93 9) S-2006-us-272 10) S-2006-us-658
METHODOLOGY	A salt affected field will be selected leveled and prepared for sowing of sugarcane crop. Trial will be laid in RCB design having three replications with plot size of 4.5 m x 6 m. Seed rate 75000 DBS ha ⁻¹ will be used. Fertilizer 170-112-112 NPK kg ha ⁻¹ will be applied. Row to Row distance of 75 cm will be maintained. All other agronomic & plant protection measures will be adopted uniformly. Data of yield and yield components will be recorded. Soil samples will be collected and analyzed for pH _s , EC _e and SAR.
PREVIOUS RESULTS	2016

Initial soil analysispH_s = 9.01EC_e = 5.69 dSm⁻¹SAR = 27.51 (mmol L⁻¹)^{1/2}**Post harvest soil analysis**

S.No.	Treatments	pHs	ECedSm ⁻¹	SAR(m mol L ⁻¹) ^{1/2}
1	S-2003-us-704	8.96	5.51	25.35
2	CPF-248	8.91	5.63	25.48
3	S-2003-us-127	8.93	5.67	26.47
4	S-2006-us-272	8.95	5.61	25.58
5	S-2003-us-633	8.96	5.59	26.46
6	HSF-240	8.92	5.63	25.65
7	S-2006-SP-93	9.00	5.62	25.60
8	S-2006-us-658	8.88	5.57	25.25
9	CPF-247	8.90	5.61	24.97
10	CPF-246	8.94	5.63	26.65

Cane Yield

Treatments	Yield (t ha ⁻¹)
S-2003-us-704	56.34 BC
CPF-248	50.99 CD
S-2003-us-127	59.33 AB
S-2006-us-272	42.49 EF
S-2003-us-633	45.44 DEF
HSF-240	49.35 CDE
S-2006-SP-93	65.36 A
S-2006-us-658	39.57 F
CPF-247	55.59 BC
CPF-246	61.95 AB
LSD	7.7496

TITLE 25:	Effect of different irrigation frequencies on direct seeded rice in salt affected soil
OBJECTIVE	To find out the delta of water and irrigation frequencies for direct seeded rice in salt affected soils.
RESEARCHERS	M. Rizwan and Dr. M. Anwar Zaka
DURATION	2016-2020
LOCATION	Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	Irrigation Frequencies <ul style="list-style-type: none"> • 4 days • 6 days • 8 days

	• 10 days
METHODOLOGY	A salt affected field will be selected and prepared for sowing of rice (Shaheen basmati) by direct seeding. Irrigations will be applied according to treatment plan using cut throat flume. Recommended dose of fertilizer (150-85-60 N,P ₂ O ₅ ,K ₂ O kg ha ⁻¹) will be applied. Data of yield and yield components will be recorded. Soil samples before start of study and after harvest of each crop will be collected and analyzed for pH _s , EC _e , SAR, HC and BD. Design will be RCBD with three repeats having plot size 8m x 6m.
PREVIOUS RESULTS	Kharif 2016

Soil analyses before start of study

Parameter	Soil Depth (0-15) cm	Soil Depth (15-30) cm
pH _s	8.80	9.01
EC _e (dS m ⁻¹)	4.33	3.46
SAR (mmol L ⁻¹) ^{1/2}	30.15	30.77
BD (Mg m ⁻³)	1.53	----
HC (cm hr ⁻¹)	0.48	----

Effect of Irrigation Frequencies on Paddy and Straw Yield (t ha⁻¹)

Irrigation Frequency	Paddy Yield (t ha ⁻¹)	Straw yield (t ha ⁻¹)	No. of Irrigations Applied	Delta of water (Inches)	Water use Efficiency (kg ha ⁻¹ mm ⁻¹)
4 Days	2.82 BC	5.32 B	24	87	1.28
6 Days	2.88 B	5.54 AB	16	63	1.80
8 Days	3.18 A	5.87 A	12	51	2.45
10 Days	2.60 C	5.17 B	09	42	2.44
LSD	0.2280	0.4038			

Note: Rainfall (15 inches) occurred during kharif-2016 is included in delta of water.

Soil analysis after harvest of rice crop

Irrigation Frequency	pH _s	EC _e (dS m ⁻¹)	SAR (mmol L ⁻¹) ^{1/2}
4 Days	8.77	4.01	29.50
6 Days	8.78	4.06	29.43
8 Days	8.78	4.09	29.22
10 Days	8.79	4.23	29.65

TITLE 26:	MAINTENANCE OF GERM PLASM/ GENEPOOL TOLERANT TO SALINITY
OBJECTIVE	To preserve the genetic stock/gene pool for future breeding programme
RESEARCHERS	Muhammad Khalid Bhatti and Ghulam Shabbir
DURATION	A regular feature
LOCATION	SSRI,Pindi Bhattian
TREATMENTS	Rice lines /cultivars

	<p>Fine</p> <p>Shaheen Bas</p> <p>PB-95</p> <p>Super Bas</p> <p>Bas-370</p> <p>Bas-385</p> <p>Bas-2000</p> <p>SRI-13</p> <p>SRI-7</p> <p>SRI-8</p> <p>SRI-12</p>	<p>Coarse</p> <p>Ks-282</p> <p>IR-6</p> <p>NAIB-6</p> <p>IR-9</p> <p>Nurty 2016 4 lines</p> <p>Ksk-133</p> <p>Ksk-434</p>	<p>Coarse (exotic)</p> <p>IRRI =22 lines</p>
METHODOLOGY	<p>These varieties/genotypes will be grown in normal soil. A plot size of 5m x 3m will be maintained. Fertilizer NPK will be applied @ 150-86-60 kg ha⁻¹. The seed of each variety/line will be harvested and preserved for next season. The data for yield and yield components will be recorded. Off type plants will be roughed out. Pre and post harvest Soil analysis will be carried out for pHs, EC_e and SAR</p>		
PREVIOUS YEARS	<p>The nursery of forty genotypes was raised and transplanted and seed of these lines was preserved after harvesting for next coming season</p>		

TITLE 27:	<p>DEVELOPING HIGH YIELDING FINE GRAIN RICE LINES FOR SALINITY TOLERANCE</p> <p>Experiments:</p> <p>7.a (2017): Screening of 20 rice germplasm lines collected from national and international research institutes against salinity.</p> <p>7.b (2018): Hybridization among salt tolerant and high yielding lines selected from 2017 trial.</p> <p>7.c (2019): Evaluation of F₁ population against salinity.</p> <p>7. d (2020): Selection of salt tolerant combinations from F₂ segregating population.</p> <p>7. e (2021): Selection of high yielding and extra long grain rice combinations from F₃ population grown under salinity conditions.</p>		
OBJECTIVE	<p>To find out salt tolerant rice lines for growing on moderately salt affected soil.</p>		
RESEARCHER	<p>Mr. Muhammad Khalid Bhatti and Mr.Ghulam Shabbir</p>		
DURATION	<p>Continuous</p>		
LOCATION	<p>SSRI, Pindi Bhattian</p>		
NATURE OF EXPERIMENT	<p>Lysimeter Experiment</p>		
TREATMENTS	<p>Twenty rice varieties/ lines collected from national and international institutes.</p> <p>Salinity Levels: 3</p> <p>1.EC_e < 4dS m⁻¹ SAR < 13.2 (mmolL⁻¹)^{1/2}</p> <p>2.EC 5.5dS m⁻¹ SAR 25 (mmolL⁻¹)^{1/2}</p> <p>3.EC_e 7.0 dS m⁻¹ SAR 35 (mmolL⁻¹)^{1/2}</p>		

METHODOLOGY	Soil sampling will be done to monitor the desired salinity levels for experiment initiation. Salinity/ sodicity will be developed using quadratic equation. Seedlings from each line rice nursery will be transplanted in various salinity levels using CR Design with 3 replications. All recommended agronomic practices will be followed. At maturity, data of yield and yield components will be recorded and statistically analyzed. At panicle initiation stage plants will be sampled and analyzed for Na and K contents and K/Na ratio.
PREVIOUS RESULTS	New Experiment

TITLE 28:	SCREENING OF RICE GERMPLASM IN SALT AFFECTED SOIL
OBJECTIVE	To find out the salt tolerance potential of rice lines for further use in breeding programme.
RESEARCHERS	Muhammad Khalid Bhatti and Ghulam Shabbir
DURATION	Continuous nature
LOCATION	SSRI,Pindi Bhattian
TREATMENTS	Varities /lines collected from different locations.
METHODOLOGY	The experiment will be conducted to screen out various rice lines against salinity/sodicity. The trial will be conducted in salinity blocks by artificially developed salinity levels of EC_e 5, 6 and 7 $dS m^{-1}$ along with sodicity levels of SAR 30($mmol L^{-1}$) ^{1/2} developed by adding salts i.e. NaCl, Na ₂ SO ₄ , CaCl ₂ and MgSO ₄ by using quadratic equation. By using CRBD layout, 7 advanced lines/varieties were tested by transplanting each variety in a single row of 150 cm length.. Recommended dose of fertilizer (150-86-60 NPK $kg ha^{-1}$) will be applied to each experimental unit. Data of Yield and Yield components will be recorded. At panicle initiation stage plants will be sampled and analyzed for Na and K contents and for K / Na ratio.
PREVIOUS RESULTS	2016

Initial Soil Analyses of salinity blocks

Sr. No.	Lines /Varieties	$EC_e - 2.5$	$EC_e - 5.0$	$EC_e - 6.00$	$EC_e - 7.00$
		($dS m^{-1}$) SAR-10.00 ($mmolL^{-1}$) ^{1/2}	($dS m^{-1}$) SAR-30.00 ($mmolL^{-1}$) ^{1/2}	($dS m^{-1}$) SAR-30.00 ($mmolL^{-1}$) ^{1/2}	($dS m^{-1}$) SAR-30.00 ($mmolL^{-1}$) ^{1/2}
Yield (t. h⁻¹)					
1	PB-95	3.94 AB	3.18 A	2.16 A	1.08 A
2	SRI-12	3.69 DE	2.85 C	1.95 BC	0.86 BC
3	T-05	3.41 E	2.64 C	1.81 CD	0.77 BCD
4	1121	4.06 AB	1.94 D	1.66 E	0.62 D
5	SRI-13	3.64 CD	2.96 B	1.91 ABC	0.84 AB
6	Basmati-515	4.18 A	2.05 D	1.68 DE	0.65 CD
7	Shaheen Basmati	3.91 BC	3.06 AB	2.08 AB	0.91 AB
	LSD	0.2406	0.1590	0.1912	0.2129

Soil Analyses of salinity blocks after harvest of rice

EC _e – 2.26 (dS m ⁻¹)	EC _e -4.98 (dS m ⁻¹)	EC _e -5.88 (dS m ⁻¹)	EC _e -6.76 (dS m ⁻¹)
SAR-9.88 (mmolL ⁻¹) ^{1/2}	SAR-27.68 (mmolL ⁻¹) ^{1/2}	SAR-29.26 (mmolL ⁻¹) ^{1/2}	SAR-29.58 (mmolL ⁻¹) ^{1/2}

TITLE 29:	YIELD EVALUATION TRIAL FOR ADVANCE RICE LINES/VARIETIES IN SALT AFFECTED SOIL.
OBJECTIVE	To find out high yielding rice lines in the rice growing area.
RESEARCH WORKERS	Muhammad Khalid Bhatti and Ghulam Shabbir
DURATION	Continuous Nature
TREATMENTS	Lines / varieties-8
LOCATION	SSRI, Pindi Bhattian and Hafizabad
METHODOLOGY	The nursery will be raised in normal soil and will be transplanted in moderately salt affected soil. The recommended dose of NPK(150-86-60) kg/ha ⁻¹ fertilizer will be applied. The experiment will be laid according to RCBD having net plot size of 3m x 5m. The recommended cultural practices will be carried out till maturity. At maturity yield data will be recorded.
PREVIOUS RESULT	2016

Sr. No.	Varieties/lines	Paddy Yield (t. ha ⁻¹)
1	PB-95	3.29 A
2	T-05	2.85 C
3	SRI-12	2.65 C
4	SRI-13	2.89 B
5	Basmati-515	1.74 D
6	Shaheen Basmati	3.19 A
7	Super Basmati	1.57 E
LSD		0.0875

Initial soil analysespH_s 8.73EC_e 4.68 - 5.66 dS m⁻¹SAR 32.25 - 37.65 (mmol L⁻¹)^{1/2}**Post-harvest soil analyses**pH_s 8.71EC_e 4.59 - 5.31 dS m⁻¹SAR 30.36 - 34.36 (mmol L⁻¹)^{1/2}

TITLE 30:	NATIONAL UNIFORM RICE YIELD TRIAL
OBJECTIVE	To find out high yielding salt tolerant rice variety/line
RESEARCHERS	Muhammad Khalid Bhatti and Ghulam Shabbir
DURATION	A regular feature
LOCATION	SSRI Pindi Bhattian
TREATMENTS	No of entries- supplied by the Rice Coordinator NARC, Islamabad

METHODOLOGY	The trial will be laid out in RCBD with three replications 3m x 5m plot size. Trial will be transplanted in moderately salt affected soil. Recommended agronomic practices will be followed till maturity. Data on yield and yield components will be recorded.
PREVIOUS RESULTS	2016

Sr. No.	Genotype	Plant Height (cm)	No. of tillers/plant	No. of grain per panicles	1000 grain weight (g)	Paddy Yield (tha ⁻¹)	Maturity days	Days to 50% flowering
1	FR16001	56	14	52	29.74	2.432	102	62
2	FR16002	49	15	63	30.69	2.741	101	61
3	FR16003	61	16	56	25.07	2.221	105	65
4	FR16004	63	12	61	25.94	2.113	104	64
5	FR16005	65	15	65	26.09	2.321	103	63
6	FR16006	61	13	59	30.07	2.531	102	62
7	FR16007	60	15	57	29.36	2.642	100	60
8	FR16008	59	17	62	31.79	2.921	104	64
9	FR16009	63	14	56	27.39	2.431	105	65
10	CR16010	65	13	59	22.07	2.831	99	59
11	CR16011	62	15	56	21.39	2.941	98	58
12	CR16012	59	13	52	27.33	2.314	97	57
13	CR16013	54	12	51	27.25	2.431	95	55
14	CR16014	58	14	54	24.6	2.171	98	58
15	CR16015	56	13	53	25.9	2.223	97	57
16	CR16016	58	11	55	26.91	2.341	98	58
17	CR16017	59	12	52	25.34	2.341	99	59
18	CR16018	61	11	57	25.77	2.341	98	58
19	CR16019	58	12	51	24.82	2.412	97	57
20	CR16020	56	14	49	27.72	2.413	96	56
21	CR16021	58	10	54	24.82	1.931	99	59
22	CR16022	60	13	51	27.02	2.341	97	57
23	CR16023	59	15	53	28.29	2.313	98	59
24	CR16024	57	14	49	27.61	2.132	99	59

Initial soil analyses

pH_s = 8.60
 EC_e = 5.55 dS m⁻¹
 SAR = 31.35 (mmol L⁻¹)^{1/2}

Post harvest soil analyses

pH_s = 8.57
 EC_e = 5.53 dS m⁻¹
 SAR = 31.33 (mmol L⁻¹)^{1/2}

TITLE 31:	MAINTENANCE OF SALT TOLERANT RICE VARIETY SHAHEEN BASMATI
OBJECTIVE	To make the variety Shaheen basmati true to its genotypes
RESEARCHER	Mr. Muhammad Khalid Bhatti and Mr. GhulamShabbir
DURATION	2017

LOCATION	SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Continuous nature
TREATMENTS	Shaheen basmati,PB-95,SRI-13,
METHODOLOGY	The experiment will be laid out for perpetuation of approved variety Shaheen Basmati to maintain to true to type form in order to avoid degeneration through mechanical mixing and mutation. Thirty panicles of selected plants from Pre-basic seed of salt tolerant approved variety Shaheen Basmati will be grown plant to row progenies. Ten uniform progeny lines will be selected to grow individual progeny blocks. Five most uniform progeny blocks will also be selected and bulked to produce pure seed for further use during next season.
PREVIOUS RESULTS	Three kg BNS and Ten kg pre-basic seed of Shaheen Basmati was produced.