ANNUAL PROGRAMME OF RESEARCH WORK

RABI 2016-17

SOIL SALINITY RESEARCH INSTITUTE

PINDI BHATTIAN

New Experiments

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<tr><td>TITLE : 01</td><td>RESPONSE OF SAPODILLA SEEDLINGS TO DIFFERENT LEVELS OF SALINITY AND SODICITY</td></tr>
<tr><td>OBJECTIVE</td><td>• To determine salinity / sodicity tolerance of sapodilla.
• Performance of sapodilla will be tested on different salinity and sodicity levels in pots and then performance will be evaluated under field conditions</td></tr>
<tr><td>RESEARCHERS</td><td>A.R. Jami, Dr. Khalil Ahmed, Amar Iqbal Saqib and Dr. Ehsan-ul-Haq</td></tr>
<tr><td>DURATION</td><td>2016-2019</td></tr>
<tr><td>LOCATION</td><td>SSRI, Campus</td></tr>
<tr><td>NATURE OF EXPERIMENT</td><td>Pot Experiment</td></tr>
<tr><td>TREATMENTS</td><td>
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<tr><th>Treatments</th><th>EC_e (dSm^{-1})</th><th>SAR $(mmol\ L^{-1})^{1/2}$</th></tr>
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<tr><td>T_2</td><td>8</td><td>20</td></tr>
<tr><td>T_3</td><td>8</td><td>25</td></tr>
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<tr><td>METHODOLOGY</td><td>A normal soil will be selected and the desired salinity/sodicity levels will be developed using salts NaCl, Na_2SO_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 sapodilla will be transplanted (September-October) 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.
<u>Soil analysis:</u> Soil samples will be analyzed for pH_s, EC_e, SAR at the start and completion of the study.</td></tr>
<tr><td>PREVIOUS RESULTS</td><td>First year
Plants have been transplanted in pots</td></tr>
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TITLE: 02	**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 Iqbal Saqib, Dr. Khalil Ahmed, Abdul Rehman Jami and Dr. Ehsan-ul- Haq
DURATION	2016-2020
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T1 = Para Grass (*Brachiaria mutica*) T2 = Mot Grass (*Penniestum benthium*) T3 = Rhodes Grass (*Chloris gayana*) T4 = Lemon Grass (*Cymbopogon flexuosus*)
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_2O_5 and K_2O 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. Leaves will be analyzed for Ca, Mg, Na and K after every cutting. **Soil analyses** Soil samples will be analyzed for pH_s, EC_e, and SAR after every year.
PREVIOUS RESULTS	New experiment

TITLE: 03	**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	Dr. Khalil Ahmed, Amar Iqbal Saqib, Abdul Rehman Jami and Dr. Ehsan-ul- Haq
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_2SO_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 analysis:** Soil samples will be analyzed for pH_s, EC_e, SAR at the start and completion of the study.		
PREVIOUS RESULTS	New experiment		

TITLE: 04	**Alleviation of Temperature Stress in Wheat with Foliar Application of Organic and Inorganic Chemicals in Salt Affected Soil under Climate Changing Scenario**
OBJECTIVE	Wheat yield is affected adversely due to high temperature at grain filling stage in late sown wheat. The experiment is planned to alleviate temperature stress through foliar application of organic and inorganic chemicals in saline sodic soil under climate changing scenario.
DURATION	2016-2022
RESEARCHERS	Asifa Naz, Dr. M. Sarfraz and Dr. Ehsan-ul-Haq
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment

TREATMENTS	T_1 Control (Without Foliar application) T_2 Foliar Application of salicylic acid (0.1%) 2 sprays starting from booting stage at 10 days interval T_3 Foliar Application of thiourea (0.05%) 2 sprays starting from booting stage at 10 days interval T_4 Foliar Application of Oxalic acid (0.02%) 2 sprays starting from booting stage at 10 days interval T_5 Foliar Application of KNO_3 (1%) 2 sprays starting from booting stage at 10 days interval T_6 Foliar Application of $CaCl_2$ (1%) 2 sprays starting from booting stage at 10 days interval
METHODOLOGY	A moderately salt affected field will be selected. Soil samples will be collected and analyzed for pH_s, EC_e, SAR, OM and available P and extractable K. Field will be leveled and prepared. Wheat will be sown in wattar condition. Test variety Faisalabad 2008 will be sown on 15 December. NPK will be applied @ 120-110-70 NPK kg ha^{-1}. Foliar sprays of organic and inorganic chemicals will be done according to treatment plan. Crop will be harvested at maturity. Grain and straw yield data will be recorded. Plant samples (Grain & straw) will be analyzed for NPK contents and their uptake by wheat. After the harvest of wheat, soil samples will be collected and analyzed for pH_s, EC_e, SAR, OM, available P and K. Design RCBD Replications Three Plot Size 6m x 4m
PREVIOUS RESULTS	New experiment

TITLE: 05	**Yield Enhancement by Improving Phosphorus Use Efficiency in Saline Sodic Soils**
OBJECTIVE	To determine the response of humic acid and sulfur for yield improvement and phosphorus use efficiency of wheat in saline sodic soil.
DURATION	2016-2019
RESEARCHERS	Asifa Naz, Dr. M. Sarfraz and Dr. Ehsan-ul-Haq
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment

TREATMENTS	T_1 Control (without P_2O_5 application) T_2 Recommended dose of P_2O_5 (110 kg ha^{-1}) T_3 Recommended dose of P_2O_5 + Humic acid @ 25 kg/ha T_4 Recommended dose of P_2O_5 + Humic acid @ 25 kg/ha + Sulfur @ 10 kg/ha T_5 Recommended dose of P_2O_5 + 500 kg FYM ha^{-1} T_6 50% Recommended dose of P_2O_5 T_7 50% Recommended dose of P_2O_5 + Humic acid @ 25kg/ha T_8 50% Recommended dose of P_2O_5 + Humic acid @ 25 kg/ha + Sulfur @ 10 kg/ha T_9 50% Recommended dose of P_2O_5 + 500 kg FYM ha^{-1} Note: Sulfur and humic acid will be broadcasted by mixing with seed or TSP.
METHODOLOGY	A moderately salt affected field will be selected. Soil samples will be collected and analyzed for pH_s, EC_e, SAR, OM and available P and extractable K. Field will be leveled and prepared. Wheat will be sown in wattar condition. Test variety will be Faislabad 2008. NPK will be applied @ 120-110-70 NPK kg ha^{-1}. P, K, humic acid, S and 1/3 N will be applied at the time of sowing while remaining N will be applied at 1st and 2nd irrigation. TSP will be mixed with FYM and incubate for 15 days before its application. Crop will be harvested at maturity. Grain and straw yield data will be recorded. Plant samples (Grain & straw) will be analyzed for NPK contents and their uptake by wheat. After the harvest of wheat, soil samples will be collected and analyzed for pH_s, EC_e, SAR, OM, available P and K. Design RCBD Replications Three Plot Size 6m x 4m
PREVIOUS RESULTS	New experiment

TITLE: 06	**Enhancement of Wheat Yield by Improving Nitrogen Use Efficiency in Saline Sodic Soil**
OBJECTIVE	To improve wheat yield and Nitrogen use efficiency by using slow release urea in saline sodic soil
DURATION	2016-2019
RESEARCHERS	Asifa Naz, Dr. M. Sarfraz and Dr. Ehsan-ul-Haq
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment

TREATMENTS	T_1 Control (Without Nitrogen) T_2 Recommended dose of N from urea T_3 Recommended dose of N from slow release urea T_4 75% recommended dose of N from slow release urea T_5 50% recommended dose of N from slow release urea
METHODOLOGY	A moderately salt affected field will be selected. Soil samples will be collected and analyzed for pH_s, EC_e, SAR, OM and available P and extractable K. Field will be leveled and prepared. Wheat will be sown in wattar condition. Test variety will be Galaxy 2013. NPK will be applied @ 120-110-70 NPK kg ha^{-1}. Phosphorus and potassium and 1/3 N will be applied at the time of sowing while remaining nitrogen will be applied at 1st and 2nd irrigation. Crop will be harvested at maturity. Grain and straw yield data will be recorded. Plant samples (Grain & straw) will be analyzed for NPK contents and their uptake by wheat. After the harvest of wheat, soil samples will be collected and analyzed for pH_s, EC_e, SAR, OM, available P and K. Design RCBD Replications Three Plot Size 6m x 4m
PREVIOUS RESULTS	New experiment

TITLE: 07	**Zinc Requirement of Canola in Saline Sodic Soil**
OBJECTIVE	Zinc has ability to increase crop yield by improving K/Na and Ca/Na ratios. The experiment is planned to determine optimum zinc requirement of Canola in saline sodic soil.
DURATION	2016-2019
RESEARCHERS	Asifa Naz, Dr. M. Sarfraz and Dr. Ehsan-ul-Haq
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T1 Control (Without Zn) T2 Zinc @ 2.5 kg ha^{-1} soil T3 Zinc @ 5.0 kg ha^{-1} soil T4 Zinc @ 7.5 kg ha^{-1} soil T5 Zinc @ 10 kg ha^{-1} soil T6 Foliar spray of zinc (0.2%) 2 sprays at 10 days interval starting from booting stage T7 Foliar spray of zinc (0.3%) 2 sprays at 10 days interval starting from booting stage

METHODOLOGY	A moderately salt affected field will be selected, prepared and leveled. Soil samples will be collected before sowing of canola to monitor salinity/sodicity status of soil. Test variety will be Punjab canola. The recommended dose of NPK for canola will be 80-60-60 kg ha^{-1}. Phosphorus, potassium and ½ N will be applied at the time of sowing while remaining ½ N and Zinc will be applied at 1st irrigation. Foliar spray of zinc will be done according to treatment plan. The crop will be harvested at maturity. Grain & Straw yield data will be recorded. Grain & Straw sample will be analyzed for NPK & Zn content and finally Zn use efficiency will be calculated. Design RCBD Replications 3 Plot size $6 \times 4\ m^2$
PREVIOUS RESULTS	New experiment

TITLE: 08	**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 and mung rotation.
RESEARCHERS	Ghulam Qadir, M. Sarfraz, M. A. Zaka and Ehsan Ul Haq
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_2SO_4 equivalent to 25% GR on the basis of RSC of water T_5: H_2SO_4 equivalent to 50% GR on the basis of RSC of water
METHODOLGY	A normal field will be selected and poultry manure will be applied 15 days before sowing of strawberry crop only. H_2SO_4 will be applied with each irrigation. Fruit yield 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 on ridges during the month of October. Fertilizer 53-45-75 N P_2O_5 K_2O kg ha^{-1} (All P_2O_5 K_2O+1/2 N at sowing & remaining ½ at flowering stage), Planting system will be Ridge system, Plant to Plant distance will be 20 cm and row to row distance will be 75 cm. Design RCBD
PREVIOUS RESULTS	New Experiment

Strawberry Yield Potential			
EC_{iw} mmhos/cm			
100%	90%	75%	50%
0.7	0.9	1.2	1.7
Ayers and Westcot, 1976			

Strawberry Yield Potential			
EC_e mmhos/cm			
100%	90%	75%	50%
1.0	1.3	1.8	2.5
Ayers and Westcot, 1976			

TITLE: 09	**DISSEMINATION OF TECHNOLOGIES FOR UTILIZATION OF BRACKISH WATER AT CHINNIOT ROAD PINDI BHATTIAN**
OBJECTIVE	To asses quality of tube well water installed by farmers at Chinniot road Pindi Bhattian for its safe usage.
RESEARCHERS	Ghulam Qadir, M. Sarfraz, M. A. Zaka and Ehsan Ul Haq
DURATION	2016-2025
LOCATION	Farmer Field, Chinniot Road Pindi Bhattian
NATURE OF EXPERIMENT	Field experiment
Treatments and Methodology	Farmers at Chinniot road Pindi Bhattian will be selected for determining quality of brackish water with respect to EC_{iw}, SAR and RSC of tube well water after every two months. Farmers will be advised and recommendations will be provided to reduce ill effects of brackish water. Minimum thirty number of water samples will be analyzed.
PREVIOUS RESULTS	New Experiment

TITLE: 10	Integrated use of S 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	Tasawar Abbas, Dr. Muhammad Anwar Zaka and Dr. Ehsan-ul-Haq Ch.
DURATION	2016-2019
LOCATION	Research Farm, SSRI Pindi Bhattian
NATURE OF EXPERIMENT	Field
TREATMENTS	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	Saline sodic field will be selected, prepared and leveled. Sulphur will be applied one month before sowing of wheat followed by irrigation. Amendments will be incorporated in the respective treatments one month before sowing of wheat. All other agronomic practices will be followed uniformly to all the treatments. Fertilizers will be applied @ 120-110-70 $NP_2O_5K_2O$ kg ha^{-1}. Soil samples will be collected before sowing and after harvesting of each crop and analyzed for pH_s, EC_e, SAR, BD and HC. At maturity, crop yield data will be collected and analyzed statistically.
PREVIOUS RESULTS	New experiment

TITLE: 11	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	Tasawar Abbas, Dr. Muhammad Anwar Zaka and Dr. Ehsan-ul-Haq Ch.
DURATION	2016-2025
LOCATION	Research Farm, SSRI Pindi Bhattian
NATURE OF EXPERIMENT	Field
TREATMENTS	1. Control 2. Gypsum @ 100% GR 3. Poultry manure @ 20 t. ha^{-1} 4. FYM @ 20 t. ha^{-1} 5. Municipal solid waste compost @ 20 t. ha^{-1} 6. Press mud @ 20 t. ha^{-1}
METHODOLOGY	Saline sodic field will be selected, prepared and leveled. Composite soil samples will be collected from 0-15, 15-30, 30-60 and 60-90 cm depth before application of amendments and analyzed for EC_e, pH_s, SAR, HC, IR and BD. Organic materials and gypsum will be applied one month before sowing of wheat. All agronomic practices will be applied uniformly to grow wheat crop. Fertilizers will be applied @ 120-110-70 Kg ha^{-1} $N\text{-}P_2O_5\text{-}K_2O$ in all the treatments. At maturity, crop yield data will be recorded and analyzed statistically. Soil samples will be collected before sowing and after harvesting of each crop and analyzed for EC_e, pH_s, SAR, HC and BD. Composite soil samples will be collected from 0-15, 15-30, 30-60 and 60-90 cm after every three years and analyzed for ECe, pHs, SAR, HC, BD and IR.
PREVIOUS RESULTS	New experiment

TITLE: 12	**Performance of Bio-drainage plants for the utilization of saline water logged soils**
OBJECTIVE	1. To study the performance of three bio drainage plants in water logged soils of farmers field. 2. Utilization of water logged soils to generate income from barren land.
RESEARCHERS	M. Rizwan and Ehsan-ul-Haq
DURATION	2016-25
LOCATION	Out-reach trial
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	**Bio-Drain Plants** 1. Eucalyptus 2. Willow tree 3. Acacia ampliceps
METHODOLOGY	Water logged field of farmer will be selected to check the performance of three bio-drainage plants. One foot deep furrow will be prepared. Pits of size 3 X 3 X 3 feet will be prepared at the shoulders of furrows and filled by Soil + Silt (1:1). Six month old saplings will be transplanted. Plant to plant and row to row distance will be 1.5m X 1.5m, 2.5m X 2.5m and 2m X 2m for eucalyptus, willow tree and Acacia ampliceps. Three Piezometers will be installed to monitor water table depth of three bio-drainage plants and one piezometer will be installed on barren field. Height and diameter of trees will be recorded. Soil chemical and physical properties EC_e, pH_s, SAR, HC and BD will be monitored for soil depth 0-6, 6-12, 12-24, 24-36, 36-48, 48-60, 60-72 inches.
PREVIOUS RESULTS	New Experiment

TITLE: 13	**EVALUATION OF WHEAT GENOTYPES FOR SALT TOLERANCE UNDER ARTIFICIAL CONSTRUCTED SALINITY BLOCKS**
OBJECTIVE	Identification of genotypes with better performance under different levels of salt stress.
RESEARCHER	Mr. Muhammad Ali Sher and Mr. Ghulam Shabbir
DURATION	2016-17
LOCATION	SSRI, Campus Pindi Bhattian
NATURE EXPERIMENT	Salinity Blocks
TREATMENTS	8 Wheat germplasm lines collected from national and provincial institutes across Pakistan.

	Salt affected Soil: 5 levels 1. Normal: Control: EC_e< 04 d Sm^{-1} and SAR <15 (mmol L^{-1})$^{1/2}$ 2. Salinity sodicity: EC_e ≈08 d Sm^{-1} and SAR≈30 (mmol L^{-1})$^{1/2}$ 3. Salinity sodicity: EC_e ≈12 d Sm^{-1} and SAR≈30 (mmol L^{-1})$^{1/2}$
METHODOLOGY	Soil sampling will be done to develop suitable salt medium for screening till crop maturity. Seed of 8 genotypes will be sown in various saline-sodicity levels in CR Design (factorial) in 2 replications under artificially constructed salinity blocks. All kind of recommended agronomic practices will be followed. Data will be recorded for yield and yield components of both stressed and normal plants.Post-harvest soil analysis will also be done.
PREVIOUS RESULTS	New Experiment

TITLE: 14	**ESTIMATION OF GENETIC DIVERSITY AMONG WHEAT GENOTYPES**
OBJECTIVE	Assessment of genetic diversity is necessary as it helps to tackle the threats of environmental fluctuations and for the effective exploitation of genetic resources.
RESEARCHER	Mr. Muhammad Ali Sher and Mr. Ghulam Shabbir
DURATION	2016- 2018 (4 years)
LOCATION	Agri. Research Farm, SSRI, PindiBhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	30 wheat germplasm lines will be used Salt affected Soil: 2 levels 1. Normal: Control: EC_e< 04 d Sm^{-1} and SAR <15 (mmol L^{-1})$^{1/2}$ 2. Salinity sodicity: EC_e≈8.00 d Sm^{-1} and SAR≈30 (mmol L^{-1})$^{1/2}$
METHODOLOGY	Soil sampling of salt affected farm area will be done to select suitable saline-sodic soil for screening. Seed of 20 germplasm lines will be sown in field according to RCB Design in 2 replications. Plant to plant and row to row distance will be maintained at 22.5 cm. Plant protection measures will be taken time to time according to crop situation. Field will be irrigated according to crop requirement. At maturity and harvesting, data of yield and yield components traits will be recorded. Post-harvest soil analysis will also be done.
PREVIOUS RESULTS	New Experiment

ON-GOING EXPERIMENTS

ITLE: 15	**ENHANCING THE SOLUBILITY OF GYPSUM WITH H_2SO_4**
OBJECTIVE	To find out the best combination of sulfuric acid and gypsum for reclamation of saline sodic soil in rice wheat cropping rotation
RESEARCHERS	A.R. Jami, Amar Iqbal Saqib, Dr. Khalil Ahmed and Dr. Ehsan-ul-Haq
DURATION	2015-2018
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T_1- Control T_2- Gypsum @ 100 % of GR T_3 - Gypsum @ 100 % of GR + 10 Kg H_2SO_4 $acre^{-1}$ T_4 - Gypsum @ 100 % of GR + 50 Kg H_2SO_4 $acre^{-1}$ T_5 - Gypsum @ 100 % of GR + 100 Kg H_2SO_4 $acre^{-1}$
METHODOLOGY	After rice harvest, 2015 wheat crop (Faisalabad 2008) will be sown in Rabi (2016-17) season in same layout. Recommended dose of fertilizers 120-110-70 N,P_2O_5,K_2O kg ha^{-1} will be applied. Agronomic practices and plant protection measures will be applied uniformly. Plant height, No. of tillers, 1000 grain weight, straw and grain yield data will be recorded at maturity. Soil samples will be collected after harvesting of wheat crop. **Soil analyses** Soil samples will be analyzed for pH_s, EC_e and SAR.
PREVIOUS RESULTS	2015-16

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 (Wheat 2015-16)

Treatments	Grain yield	Straw Yield
	($t\ ha^{-1}$)	
T1 - Control	0.85 C	1.10 C
T2 - Gypsum @ 100 % of GR	2.60 B	3.25 B
T3 - Gypsum @ 100 % of GR + 10 kg H_2SO_4 $acre^{-1}$	2.61 B	3.28 B
T4 - Gypsum @ 100% of GR + 50 kg H_2SO_4 $acre^{-1}$	2.85 A	3.64 A
T5 - Gypsum @ 100% of GR + 100 kg H_2SO_4 $acre^{-1}$	2.82 A	3.60 A
LSD	0.1918	0.3056

Soil analysis after wheat 2015-16

Treatments	pH_s	EC_e (dS m^{-1})	SAR (mmol $L^{-1})^{1/2}$	Ca+Mg (me L^{-1})
T1 - Control	8.83	4.87	43.44	3.00
T2 - Gypsum @ 100 % of GR	8.71	4.50	34.00	3.90
T3 - Gypsum @ 100 % of GR + 10 kg H_2SO_4 $acre^{-1}$	8.72	4.48	33.55	4.00
T4 - Gypsum @ 100% of GR + 50 kg H_2SO_4 $acre^{-1}$	8.68	4.39	30.33	4.50
T5 - Gypsum @ 100% of GR + 100 kg H_2SO_4 $acre^{-1}$	8.67	4.46	30.53	4.60

TITLE: 16	**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 Iqbal Saqib, Dr. Khalil Ahmed and Dr. Ehsan-ul-Haq
DURATION	2015-2018
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T1 - Control T2 - Gypsum @ 100% of GR T3 - Gypsum @ 50 % of GR T4 - Hyacinth compost @ 15t. ha^{-1} T5 - Gypsum @ 50 % of GR+ hyacinth compost @ 5 t. ha^{-1} T6- Gypsum @ 50 % of GR+ hyacinth compost @ 10 ha^{-1} T7- Gypsum @ 50 % of GR+ hyacinth compost @ 15 t. ha^{-1}
METHODOLOGY	After rice harvest, 2015 wheat crop (Faisalabad 2008) will be sown in Rabi (2016-17) season in same layout. Recommended dose of fertilizers 120-110-70 N,P_2O_5,K_2O kg ha^{-1} will be applied. Agronomic practices and plant protection measures will be applied uniformly. Plant height, No. of tillers, 1000 grain weight, straw and grain yield data will be recorded at maturity. Soil samples will be collected after harvesting of wheat crop. **Soil analyses** Soil samples will be analyzed for pH_s, EC_e and SAR.
PREVIOUS RESULTS	2015-16

Initial Soil Analysis

pH_s	8.91
EC_e (dS m^{-1})	5.02
SAR (mmol L^{-1})$^{1/2}$	44.24
GR (t.$acre^{-1}$)	4.12
BD (Mg m^{-3})	1.66
HC (cm hr^{-1})	0.35

Chemical analysis of hyacinth compost

N%	P%	K%	Moisture%
1.25	0.40	0.70	16

Yield data (Wheat 2015-16)

Treatments	Grain Yield	Straw Yield
	(t ha^{-1})	
T1 - Control	0.77 D	1.16 D
T2 - Gypsum @ 100% of GR	2.64 A	3.29 A
T3 - Gypsum @ 50 % of GR	1.89 C	2.10 C
T4 -Hyacinth compost @ 15 t. ha^{-1}	2.10 BC	2.60 B
T5 - Gypsum @ 50 % of GR + hyacinth compost @ 5 t. ha^{-1}	2.24 B	2.78 B
T6 - Gypsum @ 50 % of GR + hyacinth compost @ 10 t. ha^{-1}	2.51 A	3.18 A
T7 - Gypsum @ 50 % of GR + hyacinth compost @ 15 t. ha^{-1}	2.59 A	3.27 A
LSD	0.2151	0.2410

Soil analysis after wheat 2015-16

Treatments	pH_s	EC_e (dS m^{-1})	SAR (mmol L^{-1})$^{1/2}$	BD (Mg m^{-3})	HC (cm hr^{-1})
T1 - Control	8.93	4.98	44.24	1.66	0.34
T2 - Gypsum @ 100% of GR	8.72	4.69	32.12	1.62	0.46
T3 - Gypsum @ 50 % of GR	8.82	4.77	35.42	1.63	0.39
T4 -Hyacinth compost @ 15 t. ha^{-1}	8.86	4.82	36.54	1.60	0.40
T5 - Gypsum @ 50 % of GR + hyacinth compost @ 5 t. ha^{-1}	8.78	4.76	35.06	1.61	0.43
T6 - Gypsum @ 50 % of GR + hyacinth compost @ 10 t. ha^{-1}	8.79	4.70	34.28	1.59	0.44
T7 - Gypsum @ 50 % of GR + hyacinth compost @ 15 t. ha^{-1}	8.74	4.67	33.78	1.59	0.45

TITLE: 17	**EFFECT OF SEED PRIMING AND FOLIAR APPLICATION OF SALICYLIC ACID ON NUTRIENT UPTAKE OF WHEAT IN SALINE SODIC SOIL**
OBJECTIVE	Salicylic acid reduces the uptake of sodium and promotes uptake of NPK when applied to wheat in salt stress condition. The experiment is planned to study the effect of seed priming and foliar application of salicylic acid on nutrient uptake of wheat in saline sodic condition.
RESEARCHERS	Dr. M. Sarfraz and Dr. Ehsan-ul-haq
DURATION	2015-2018
LOCATION	Research Farm, SSRI, Pindi Bhattian.
NATURE OF EXPERIMENT	Field experiment
TREATMENTS	T_1 = Control (Without Salicylic acid application) T_2 = Seed priming of wheat with 0.5 mM Salicylic acid T_3 = Seed priming of wheat with 1.0 mM Salicylic acid T_4 = Seed priming of wheat with 2.0 mM Salicylic acid T_5 = Seed priming and foliar application of wheat with 0.5 mM Salicylic acid T_6= Seed priming and foliar application of wheat with 1.0 mM Salicylic acid T_7= Seed priming and foliar application of wheat with 2.0 mM Salicylic acid
METHODOLOGY	A moderately saline sodic field will be selected. Soil samples will be collected and analyzed for pH_s, EC_e, SAR,OM and available P and extractable K. Field will be leveled and prepared. Different treatments of salicylic acid will be applied according to treatment plan. For seed priming 500 g seed of wheat 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. Three foliar applications of salicylic acid will be done at booting stage at 10 days interval. Test variety will be Galaxy. NPK will be applied @ 120-110-70 NPK kg ha^{-1}. Crop will be harvested at maturity. Grain and straw yield data will be recorded. Plant samples (Grain & straw) will be analyzed for NPK contents and their uptake by wheat. After the harvest of wheat, soil samples will be collected and analyzed for pH_s, EC_e, SAR, OM, available P and K. Design RCBD Replications Three Plot Size 6m x 4m
Previous Results	2015-16

Pre Sowing Soil Analysis:

pH_s= 8.68 EC_e= 5.71(dS m^{-1}) SAR = 26.50 (mmol L^{-1})$^{1/2}$ O.M = 0.42%

Available P = 8.66 mg kg^{-1} Extractable K = 105.60 mg kg^{-1}

Effect of different treatments of salicylic acid on grain and straw yield of wheat (2015-16):

Treatments	**Grain Yield (t. ha^{-1})**	**Straw yield (t. ha^{-1})**
T_1 Control (Recommended dose of NPK)	2.28 C	2.39 D
T_2 Seed priming with 0.5 mM Salicylic acid	2.31 C	2.45 DE
T_3 Seed priming with 1.0 mM Salicylic acid	2.46 BC	2.65 CD
T_4 Seed priming with 2.0 mM Salicylic acid	2.54 B	2.69 C
T_5 Seed priming and Foliar application with 0.5 mM Salicylic acid	2.59 B	2.75 BC
T_6 Seed priming and Foliar application with 1.0 mM Salicylic acid	2.82 A	2.94 AB
T_7 Seed priming and Foliar application with 2.0 mM Salicylic acid	2.84 A	2.98 A
LSD	0.2213	0.2083

Post harvest soil analysis wheat (2015-16):

Treatments	**pH_S**	**EC (dS m^{-1})**	**SAR (mmol L^{-1})$^{1/2}$**	**O.M. (%)**	**Available P (mg kg^{-1})**	**Extractable K (mg kg^{-1})**
T_1= Control (NPK fertilizer only)	8.68	5.67	25.87	0.52	10.00	109.26
T_2 = Seed priming of wheat with 0.5 mM Salicylic acid	8.68	5.65	25.31	0.52	10.80	109.26
T_3 = Seed priming of wheat with 1.0 mM Salicylic acid	8.67	5.65	25.14	0.55	10.13	111.10

T_4 = Seed priming of wheat with 2.0 mM Salicylic acid	8.67	5.64	24.70	0.55	10.20	111.10
T_5 = Seed priming and foliar application of wheat with 0.5 mM Salicylic acid	8.66	5.62	24.56	0.55	10.33	111.80
T_6 = Seed priming and foliar application of wheat with 1.0 mM Salicylic acid	865	5.61	24.42	0.55	10.46	112.20
T_7 = Seed priming and foliar application of wheat with 2.0 mM Salicylic acid	8.60	5.60	24.28	0.55	10.46	112.20

TITLE: 18	**INVESTIGATION OF SALT TOLERANCE OF CAMELINA UNDER SALINE SODIC CONDITIONS**		
OBJECTIVE	To investigate salt tolerance potential of newly inroduced oil seed crop-Camelina under saline-sodic soil conditions		
RESEARCHERS	Dr. M. Sarfraz and Dr. Ehsan-ul-haq		
DURATION	2015-2018		
LOCATION	Research Farm, SSRI, Pindi Bhattian.		
NATURE OF EXPERIMENT	Pot experiment		
TREATMENTS	Treatments	Soil EC_e(dS m^{-1})	Soil SAR (mmol L^{-1})$^{1/2}$
	T_1	<4	<15
	T_2	4	20
	T_3	8	20
	T_4	12	20
	T_5	4	30
	T_6	8	30
	T_7	12	30
	T_8	4	40
	T_9	8	40
	T_{10}	12	40

METHODOLOGY	A normal soil will be selected and analyzed for $EC_e$and pH, SAR and soil texture. The desired combinations of EC and SAR will be developed artificially using NaCl, Na_2SO_4, $CaCl_2$ and $MgSO_4$. Quadratic equation will be used to calculate different amounts of sodium, calcium and magnesium salts for the development of desired levels of EC and SAR. After establishing desired values of EC_e and SAR, the soil will be filled in glazed pots. The pots will be filled with 10 kg soil per pot. Experimental design will be CRD with 3 replications. Ten seed of camelina will be sown in each pot and three plants per pot will be kept after seed establishment. Recommended dose of fertilizers will be 75-60-50 kg ha^{-1}. Plant will be grown to maturity. Biomass and grain yield component data will be recorded. Plant samples will be analyzed for N, P, K, Na, Ca and Mg.
PREVIOUS RESULTS	2015-2016

Pre-sowing Soil Analysis (2015-16):

pH_s = 8.14 EC_e (dS m^{-1}) = 2.34 SAR (mmol $L^{-1})^{1/2}$ = 6.79 Saturation percentage (%) = 28.64 O.M. (%) = 0.44 Available P (mg kg^{-1}) = 8.13 Extractable K (mg kg^{-1}) =105.96

Effect of different combinations of salinity/sodicity on total biomass per pot of Camelina

Treatments	**EC (dS m^{-1})**	**SAR (mmol$L^{-1})^{1/2}$**	**Total Biomass (g)**	**% decrease over control**
T_1	<4	<13.2	11.40 A	-
T_2	4	20	9.84 B	13.68
T_3	8	20	8.53 C	25.17
T_4	12	20	6.60 DE	42.10
T_5	4	30	7.37 D	35.35
T_6	8	30	6.12 E	46.31
T_7	12	30	4.95 F	56.57
T_8	4	40	3.87 G	66.05
T_9	8	40	3.40 GH	70.17
T_{10}	12	40	2.87 H	74.82
LSD			0.8660	-

Effect of different combinations of salinity/sodicity on grain yield per pot of Camelina:

Treatments	EC ($dS\ m^{-1}$)	SAR ($mmolL^{-1})^{1/2}$	Grain yield (g)	% decrease over control
T_1	<4	<13.2	4.48 A	-
T_2	4	20	3.84 B	14.28
T_3	8	20	3.21 C	28.34
T_4	12	20	2.42 DE	45.98
T_5	4	30	2.70 D	39.73
T_6	8	30	2.26 E	49.55
T_7	12	30	2.09 E	53.34
T_8	4	40	1.43 F	68.08
T_9	8	40	1.26 F	71.87
T_{10}	12	40	1.08 F	75.89
LSD			0.4235	-

Effect of different combinations of salinity/sodicity on plant height of Camelina

Treatments	EC ($dS\ m^{-1}$)	SAR ($mmolL^{-1})^{1/2}$	Plant height (cm)	Percent decrease over control
T_1	<4	<13.2	65.0 A	-
T_2	4	20	62.0 A	4.61
T_3	8	20	55.0 B	15.38
T_4	12	20	50.0 C	23.07
T_5	4	30	47.0CD	27.69
T_6	8	30	45.0 DE	44.44
T_7	12	30	42.0 E	35.38
T_8	4	40	34.0 F	47.69
T_9	8	40	31.0 FG	52.30
T_{10}	12	40	29.0 G	55.38
LSD			4.6017	-

Effect of different combinations of salinity/sodicity on plant height of Camelina

Treatments	EC ($dS\ m^{-1}$)	SAR $(mmolL^{-1})^{1/2}$	Plant height (cm)	Percent decrease over control
T_1	<4	<13.2	65.0 A	-
T_2	4	20	62.0 A	4.61
T_3	8	20	55.0 B	15.38
T_4	12	20	50.0 C	23.07
T_5	4	30	47.0CD	27.69
T_6	8	30	45.0 DE	44.44
T_7	12	30	42.0 E	35.38
T_8	4	40	34.0 F	47.69
T_9	8	40	31.0 FG	52.30
T_{10}	12	40	29.0 G	55.38
LSD			4.6017	-

Effect of different combinations of salinity/sodicity on No. of branches/plant of Camelina

Treatments	EC ($dS\ m^{-1}$)	SAR $(mmolL^{-1})^{1/2}$	No. of branches/plant	Percent decrease over control
T_1	<4	<13.2	12.0 A	-
T_2	4	20	10.0 B	16.66
T_3	8	20	9.33 BC	22.25
T_4	12	20	9.00 BC	25.00
T_5	4	30	8.67 BC	27.75
T_6	8	30	8.00 CD	33.33
T_7	12	30	7.00 DE	41.66
T_8	4	40	6.00 EF	50.00
T_9	8	40	5.00 FG	58.33
T_{10}	12	40	4.00 G	66.66
LSD			1.4913	-

Post harvest Soil analysis of Camelina (2015-16)

Treatments	EC_e (dS m^{-1})	SAR (mmol $L^{-1})^{1/2}$	pH_s	EC_e (dS m^{-1})	SAR (mmol $L^{-1})^{1/2}$
T_1	<4	<13.2	8.12	2.25	6.18
T_2	4	20	8.28	3.92	18.46
T_3	8	20	8.32	7.90	18.59
T_4	12	20	8.33	11.47	18.61
T_5	4	30	8.35	3.89	27.89
T_6	8	30	8.44	7.89	28.67
T_7	12	30	8.45	11.18	28.70
T_8	4	40	8.46	3.81	38.22
T_9	8	40	8.52	7.81	38.64
T_{10}	12	40	8.61	11.56	37.81

TITLE: 19	**Management of high RSC irrigation water for successful production of wheat grass**
OBJECTIVE	To manage the deleterious effects of brackish water (BW) for sustainable production of wheat grass in a normal soil
RESEARCHERS	Ghulam Qadir, M. Sarfraz, M. A. Zaka and Ehsan Ul Haq
DURATION	2015-2018
LOCATION	Rakh Farm, SSRI, PindiBhattian
NATURE OF EXPERIMENT	Field experiment
TREATMENTS	T_1: Control [Brackish Water (B W)] T_2: Gypsum @ 100% GR on the basis of RSC of water T_3: Gypsum @ 50% GR on the basis of RSC of water T_4: H_2SO_4 @ 100% GR on RSC basis T_5: H_2SO_4 @ 50% GR on RSC basis T_6: Compost @ 10 t. ha^{-1}
METHODOLGY	A normal field be selected and gypsum will be applied one month before sowing while H_2SO_4 (H_2SO_4 = 94 kg /Acre/3 inches irrigation) will be with each irrigation on RSC basis as per treatment plan. Fertilizer @ 120-110-70 N P_2O_5 K_2O kg ha^{-1} will be applied to all treatments. Plant biomass yield will be recorded. Soil samples will be analyzed for pH_s, EC_e and SAR at the start of the experiment and after harvest of the crop.
PREVIOUS RESULTS	2015-16

Initial Soil Analysis:	Irrigation Water Analysis:
pH_s = 8.42 EC_e = 3.90 (dS m^{-1}) SAR = 17.58 (mmol $L^{-1})^{1/2}$	EC_{iw} = 1.33 (dS m^{-1}) SAR = 8.83 (mmol $L^{-1})^{1/2}$ RSC = 7.90 (me L^{-1})

Wheat Grass Yield 2015-16

Treatments	Fresh Biomass (t. ha^{-1})
T_1: Control [Brackish Water (B W)]	4.81 E
T_2: Gypsum @ 100% GR on the basis of RSC of water	9.87 A
T_3: Gypsum @ 50% GR on the basis of RSC of water	7.27 CD
T_4: H_2SO_4 @ 100% GR on RSC basis	9.29 AB
T_5: H_2SO_4 @ 50% GR on RSC basis	8.04 BC
T_6: Compost @ 10 t. ha^{-1}	5.64 DE
LSD	1.8218

Post Harvest Soil Analysis:

Treatments	pH_s	EC_e (dS m^{-1})	SAR (mmol $L^{-1})^{1/2}$
T_1: Control [Brackish Water (B W)]	8.44	3.88	17.00
T_2: Gypsum @ 100% GR on the basis of RSC of water	8.36	2.78	13.60
T_3: Gypsum @ 50% GR on the basis of RSC of water	8.40	2.86	14.89
T_4: H_2SO_4 @ 100% GR on RSC basis	8.35	2.80	14.00
T_5: H_2SO_4 @ 50% GR on RSC basis	8.37	2.85	14.00
T_6: Compost @ 10 t. ha^{-1}	8.39	2.87	14.50

TITLE: 20	**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	Ghulam Qadir, M. Sarfraz, M. A. Zaka and Ehsan Ul Haq
DURATION	2015-2019
LOCATION	Rakh Farm, SSRI, Pindi Bhattian
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_2SO_4 on RSC basis + Two Irrigations without H_2SO_4 T_4: Alternate irrigations with H_2SO_4 on RSC basis T_5: One irrigation with H_2SO_4 on RSC basis after two irrigations without H_2SO_4

METHODOLGY	A normal field will be selected and H_2SO_4 (H_2SO_4 = 94 kg /Acre/3 inches irrigation) on RSC basis will be applied as per treatment plan. Wheat crop (Faisalabad-2008) will be sown. Fertilizer @ 120-110-70 N P_2O_5 K_2O kg ha^{-1} will be applied to all treatments. Grain and straw yield data 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. Design RCBD
PREVIOUS RESULTS	2015-16

Initial Soil Analysis:	Irrigation Water Analysis:
pH_s = 8.20 EC_e = 3.89 (dS m^{-1}) SAR = 14.53 (mmol $L^{-1})^{1/2}$	EC_{iw} = 1.33 (dS m^{-1}) SAR = 8.83 (mmol $L^{-1})^{1/2}$ RSC = 7.90 (me L^{-1})

Wheat Yield 2015-16

Treatments	**Grain**	**Straw**
	(t. ha^{-1})	
T_1: Control [Brackish Water (B W)]	2.50 B	3.00 B
T_2: Continuous treated water with sulfuric acid on the basis of RSC of water	3.33 A	4.03 A
T_3: Two irrigations with H_2SO_4 on RSC basis + Two Irrigations without H_2SO_4	3.00 AB	3.45 AB
T_4: Alternate irrigations with H_2SO_4 on RSC basis	3.10 AB	3.67 AB
T_5: One irrigation with H_2SO_4 on RSC basis after two irrigations without H_2SO_4	2.66 AB	3.23 B
LSD	0.6706	0.7466

Post Harvest Soil Analysis:

Treatments	**pH_s**	**EC_e** (dS m^{-1})	**SAR** (mmol $L^{-1})^{1/2}$
T_1: Control [Brackish Water (B W)]	8.20	3.88	14.00
T_2: Continuous treated water with sulfuric acid on the basis of RSC of water	8.10	3.13	12.90
T_3: Two irrigations with H_2SO_4 on RSC basis + Two Irrigations without H_2SO_4	8.14	3.20	13.50
T_4: Alternate irrigations with H_2SO_4 on RSC basis	8.15	3.29	13.40
T_5: One irrigation with H_2SO_4 on RSC basis after two irrigations without H_2SO_4	8.18	3.13	13.70

TITLE: 21	**Temporal changes in the quality of irrigation water under climate changing scenario**
OBJECTIVE	To study changes in quality of irrigation water in relation to climate
RESEARCHERS	Ghulam Qadir, M. Sarfraz, M. A. Zaka and Ehsan Ul Haq
DURATION	2015-2030
METHODOLGY	A longterm experiment will be carried out to monitor temporal changes in the quality of irrigation water w. r. to fitness criteria $EC_{iw,}$ SAR and RSC. The temperature will be recorded while the four number of tube wells will be analyzed fortnightly.
PREVIOUS RESULTS	Since the start of experiment

EC_{iw} (dS m^{-1})

S. NO.	Date	TW 1	TW 2	TW 3	TW 4	Temperature (^{0}C) Minimum	Temperature (^{0}C) Maximum
		Code (1 Campus)	Code (2 Campus)	Code (1 Rakh Farm)	Code (2 Rakh Farm)		
1	September, 2015	0.83	1.23	1.36	1.38	18.0	35.5
2	October, 2015	0.76	1.21	1.41	1.37	15.5	32.0
3	November, 2015	0.72	1.16	1.28	1.28	7.5	24.0
4	December, 2015	0.71	1.29	1.30	1.28	7.0	19.0
5	January, 2016	0.73	1.15	1.31	1.34	3.5	18.5
6	February, 2016	0.69	1.14	1.35	1.33	4.5	25.5
7	March, 2016	0.76	1.20	1.37	1.36	12.0	25.0
8	April, 2016	0.78	1.21	1.36	1.36	16.5	34.5
9	May, 2016	0.80	1.29	1.38	1.33	18.0	39.0
10	June, 2016	0.80	1.19	1.44	1.31	28.3	40.0
11	July, 2016	0.76	1.17	1.42	1.27	26.1	32.5
12	August, 2016	0.81	1.26	1.48	1.31	25.4	35.4
13	September, 2016	0.84	1.30	1.48	1.31	23.4	41.0

SAR (mmol L^{-1})$^{1/2}$

S. NO.	Date	TW 1 (1 Campus)	TW 2 (2 Campus)	TW 3 (1 Rakh Farm)	TW 4 (2 Rakh Farm)	Temperature (^{0}C) Minimum	Temperature (^{0}C) Maximum
1	September, 2015	4.81	6.17	8.64	8.02	18.0	35.5
2	October, 2015	3.84	6.10	9.29	7.88	15.5	32.0
3	November, 2015	3.48	5.11	8.04	7.54	7.5	24.0
4	December, 2015	2.84	6.55	7.90	7.39	7.0	19.0
5	January, 2016	3.09	5.70	8.05	7.33	3.5	18.5
6	February, 2016	2.71	5.24	8.42	7.29	4.5	25.5
7	March, 2016	3.67	5.70	8.39	7.53	12.0	25.0
8	April, 2016	3.10	5.73	8.04	7.92	16.5	34.5
9	May, 2016	4.03	6.53	8.31	7.88	18.0	39.0
10	June, 2016	3.54	5.82	8.53	7.23	28.3	40.0
11	July, 2016	3.12	5.08	8.65	7.02	26.1	32.5
12	August, 2016	3.48	6.02	8.52	7.63	25.4	35.4
13	September, 2016	3.58	6.10	9.08	7.45	23.4	41.0

RSC (me L^{-1})

S. NO.	Date	TW 1 (1 Campus)	TW 1 (2 Campus)	TW 2 (1 Rakh Farm)	TW 3 (2 Rakh Farm)	Temperature (^{0}C) Minimum	Temperature (^{0}C) Maximum
1	September, 2015	3.43	4.38	7.6	6.6	18.0	35.5
2	October, 2015	3.43	4.80	7.9	7.09	15.5	32.0
3	November, 2015	3.48	3.28	7.08	6.3	7.5	24.0
4	December, 2015	2.48	4.58	7.43	7.15	7.0	19.0
5	January, 2016	2.80	4.24	7.59	6.6	3.5	18.5
6	February, 2016	2.75	4.39	7.70	6.7	4.5	25.5
7	March, 2016	3.30	4.23	7.56	6.85	12.0	25.0
8	April, 2016	2.95	4.30	7.65	6.88	16.5	34.5
9	May, 2016	3.70	4.73	8.10	7.15	18.0	39.0
10	June, 2016	2.80	4.59	8.74	6.69	28.3	40.0
11	July, 2016	2.99	4.43	8.20	6.75	26.1	32.5
12	August, 2016	3.15	4.30	8.23	6.78	25.4	35.4
13	September, 2016	3.15	4.50	8.10	6.55	23.4	41.0

TITLE : 22	**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	Tasawar Abbas, M. A. Zaka and Ehsan Ul Haq
DURATION	2015-2019
LOCATION	Research Farm, SSRI, Pindi Bhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	T_1 Canal Irrigation 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 Maize crop, post harvest soil sampling will be done and wheat crop be sown on a normal field while gypsum on RSC basis would be applied on annual basis. PGPR will be applied to the respective treatments. Fertilizers @ 120-110-70 $NP_2O_5K_2O$ 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 the crop. The design will be RCBD with three repeats.
PREVIOUS RESULTS	2015-16

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}

Grain yield of wheat (2015-16)

Treatments	**Grain Yield (t. ha^{-1})**
T_1:Canal water	3.43 A
T_2: Tube well water	3.02 B
T_3:Gypsum application on the basis of RSC of tube well water	3.2 AB
T_4: Tube well water + PGPR	3.03 B
T_5:Tube well water + PGPR + Gypsum application on the basis of RSC of tube well water	3.33 A
LSD	0.298

Soil analyses after wheat harvest 2015-16

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

TITLE : 23	**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	Tasawar Abbas, M. A. Zaka and Ehsan Ul Haq
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_2SO_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 @ 70-70-60 $NP_2O_5K_2O$ kg ha^{-1} will be applied to grow the raya crop. Yield data of raya 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	2015-16

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 Raya (2015-16)

Treatments	Raya grain Yield (t. ha^{-1})
T_1: Tube well water	0.61 C
T_2:Gypsum application on the basis of RSC of tube well water	0.90 A
T_3:H_2SO_4 application on the basis of RSC of tube well water	0.88 A
T_4:Green Manuring with Guar	0.76 B
T_5:FYM @ 10 t. ha^{-1}	0.81 B
LSD	0.0512

Soil analysis before sowing of raya 2015-16

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	4.58	25.25	0.66	1.33
T_2: Gypsum application on the basis of RSC of tube well water	8.62	3.91	18.70	0.70	1.29
T_3: H_2SO_4 application on the basis of RSC of tube well water	8.63	3.93	18.00	0.72	1.30
T_4: Green Manuring with Guar	8.73	3.95	21.82	0.70	1.30
T_5: FYM @ 10 t. ha^{-1}	8.72	4.05	20.57	0.71	1.27

Soil analysis after Raya harvest 2015-16

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_2SO_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	4.0	19.32	0.70	1.30
T_5: FYM @ 10 t. ha^{-1}	8.73	3.94	18.15	0.74	1.30

TITLE: 24	**RESPONSE OF WHEAT VARIETIES TO CLIMATE CHANGE UNDER DIFFERENT SOWING DATES IN SALT AFFECTED SOIL**
OBJECTIVE	To study the performance of wheat varieties in changing climate with different sowing dates in salt affected soils.
RESEACHER	M.Q.Nawaz, G.M.Wains and M.Sarfraz
LOCATION	Research Farm SSRI, Pindi Bhattian
DURATION	2015-20
NATURE OF EXPERIMENT	Field Experiment

TREATMENTS	**A) Varieties** 1). Faisalabad-2008 2). Glaxy-2013 **B) Sowing Dates** 1. 10 November 2. 20 November 3. 30 November 4. 10 December
	The trial will be laid out in salt affected soil using split plot design having three replications. Sowing dates will be kept in main plots and varieties in sub-plots. Sub-plot size will be 3 m x 5m. Recommended dose of fertilizer (120-110-70 NPK kg ha^{-1}) will be applied. All P, K and half nitrogen will be applied at sowing and the remaining half will be applied at tillering. Data regarding fresh and dry weight of the plants will be recorded for calculating the CGR, LAI, LA. Grain yield and yield components data will be recorded at maturity. Soil samples will be analyzed pH_s and SAR. Rainfall data will be recorded throughout the crop season.
PREVIOUS RESULTS	**2015-16**

Wheat Grain yield $t.ha^{-1}$ 2015-16

Treatments	**FSD-08**	**Galaxy-13**	**Mean**
10 November	2.26 bcd	1.84 d	2.06 BC
20 November	3.22 a	2.87 ab	3.05 A
30 November	2.82 abc	2.24 bcd	2.53 B
10 December	2.23 cd	1.76 d	2.00 C
Mean	2.6 A	2.18 B	

LSD For varieties = 0.2825 LSD for Sowing dates = 0.4815 LSD for Interaction = 0.6810

Data of Crop Growth Rate (g/m^2/day)

Treatment	FSD-08	Galaxy-13	Mean
10 November	21.30 de	19.34 f	20.32 c
20 November	29.27 a	27.61 b	28.44 a
30 November	27.07 b	24.77 c	25.92 b
10 December	22.68 d	19.89 ef	21.28 c
Mean	25.08A	22.90 B	

LSD for varieties = 0.3828 LSD for sowing dates = 1.3002 LSD for interaction = 1.8388

Initial Soil status

pH_s = 8.75
EC_e = 7.62 (dS m^{-1})
SAR = 30.50 (mmol L^{-1})$^{1/2}$

Post-harvest soil analysis

Treatments	FSD-08			Galaxy-13		
	pH_s	**EC_e ($dS\ m^{-1}$)**	**SAR ($mmol\ L^{-1}$)$^{1/2}$**	**pH_s**	**EC_e ($dS\ m^{-1}$)**	**SAR ($mmol\ L^{-1}$)$^{1/2}$**
10 November	8.74	7.59	28.80	8.75	7.58	28.82
20 November	8.73	7.58	28.30	8.73	7.58	28.72
30 November	8.73	7.58	28.28	8.72	7.57	28.60
10 December	8.73	7.56	28.42	8.72	7.56	28.28

TITLE. 25	**YIELD IMPROVEMENT OF SUGARCANE CROP USING SINGLE BUD PLANTING WITH DIFFERENT SOWING TECHNIQUES IN SALT AFFECTED SOILS**
OBJECTIVE	To investigate the best planting method using single bud for getting maximum cane yield in salt affected soils
RESEACHER	M.Q.Nawaz and G.M.Wains
LOCATION	Research Farm SSRI, Pindi Bhattian
DURATION	2015-20
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	**Sowing Methods** 1. Ridge planting 2. Bed planting 3. Hill planting 4. Pit planting 5. Conventional planting
METHODOLOGY	A salt affected field will be selected, leveled and prepared for planting sugarcane crop. Trial will be laid in RCB design having three replications with plot size of 4.5 m x 6.00 m. Fertilizer 210-140-140 NPK kg ha^{-1} will be applied. Row to Row distance of 75 cm and bud to bud distance of 15 cm 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 before sowing and after harvesting the crops and analyzed for EC_e, pH_s and SAR determination.
PREVIOUS RESULTS	First Year

TITLE: 26	**PERFORMANCE OF CAMELINA UNDER DIFFERENT SEED PRIMING AND SOWING TECHNIQUES IN SALT AFFECTED SOILS**
OBJECTIVE	To introduce and popularized the oil seed crop (camelina) among the farming community of salt affected areas and to investigate the effect of different seed priming and sowing techniques on camelina crop in salt affected soils.
RESEACHER	M.Q.Nawaz and G.M.Wains
LOCATION	Research Farm SSRI, Pindi Bhattian
DURATION	2015-20
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	**A). Sowing Methods** 1. Drill sowing 2. Ridge sowing **B). Priming agents** 1. Canal water soaking 2. $CaCl_2$ (2% solution) 3. $MgSO_4$ (2% solution) 4. KH_2PO_4 (2% solution)
METHODOLOGY	The trial will be laid out in salt affected soil using split plot design having three replications. Sowing methods will be kept in main plots and seed priming agents will be applied in sub-plots. Sub-plot size will be 4m x 6m. Seed will be primed for 12 hours. Recommended dose of fertilizer (50-30-60 NPK kg ha^{-1}) will be applied. Data regarding yield and yield components will be recorded at maturity. Soil samples will be collected before sowing and after harvesting the crops and analyzed for EC_e, pH_s and SAR determination.
PREVIOUS RESULTS	2015-16

Camelina Grain yield t.ha^{-1} **2015-16**

Treatments	**Drill Sowing**	**Ridge Sowing**	**Broadcast sowing**	**Mean**
Canal water soaking	0.47 g	0.61 f	0.30 h	0.46 D
$CaCl_2$ (2% soln.)	1.02 ab	1.08 a	0.87 cd	0.99 A
$MgSO_4$ (2% soln.)	0.96 abc	0.92 bc	0.83 cde	0.90 B
CAN (2% soln.)	0.72 ef	0.69 ef	0.46 g	0.62 C
K_2SO_4 (2% soln.)	0.88 cd	0.94 bc	0.74 def	0.85 B
Mean	0.81 A	0.85 A	0.64 B	

Initial soil analysis

$pH_s = 8.63$

$EC_e = 5.26$ dSm^{-1}

SAR = 26.85 $(mmol\ L^{-1})^{1/2}$

Post harvest soil analysis

Treatments	Drill sowing			Ridge sowing			Broadcast sowing		
	pH_s	EC_e (dS m^{-1})	SAR (m mol L^{-1})$^{1/2}$	pH_s	EC_e (dS m^{-1})	SAR (m mol L^{-1})$^{1/2}$	pH_s	EC_e (dS m^{-1})	SAR (m mol L^{-1})$^{1/2}$
Canal water soaking	8.58	5.22	24.96	8.58	5.18	24.80	8.59	5.24	25.10
$CaCl_2$ (2% soln.)	8.57	5.20	24.38	8.58	5.16	24.48	8.58	5.22	24.92
$MgSO_4$ (2% soln.)	8.56	5.18	24.14	8.57	5.14	24.32	8.57	5.20	24.56
CAN (2% soln.)	8.56	5.16	23.92	8.56	5.14	23.80	8.57	5.20	24.18
K_2SO_4 (2% soln.)	8.56	5.16	23.86	8.55	5.12	23.62	8.55	5.18	23.92

TITLE: 27	**EFFECT OF PLANTING GEOMETRY ON YIELD OF QUINOA IN SALT AFFECTED SOIL**
OBJECTIVE	To find out the best planting geometry for getting maximum grain yield of newly introduced Quinoa crop in salt affected soils
LOCATION	Research Farm SSRI, Pindi Bhattian
RESEARCHER	M.Q. Nawaz, G.M.Wains and A.I.Saqib
DURATION	2013-17
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	**Planting Geometry** 1) 15cm x 30cm 2) 22cm x 30cm 3) 30cm x 30cm 4) 15cm x 45cm 5) 22cm x 45cm 6) 30cm x 45cm
METHODOLOGY	The trial will be laid out in RCBD with four replications in a salt affected field. Plot size will be 4m x 6m.Recommended dose of fertilizer (75-60-0 NPK kg ha^{-1}) will be applied**.** All other agronomic practices will be kept constant. Data regarding yield and yield components will be recorded. Soil analyses will be done before sowing and after harvesting of crop to determine EC_e , SAR and pH_s.
PREVIOUS RESULTS	**2015-16**

Grain yield (t ha^{-1}) (2015-16)

Planting geometry	Grain yield (t ha^{-1})
15cm x30 cm	1.47 E
22cm x30 cm	1.69 D
30cm x30 cm	2.03 A
15cm x45 cm	1.75 CD
22cm x45 cm	1.82 BC
30cm x45 cm	1.94 AB
LSD	0.1306

Initial Soil Analysis

pH_s= 8.64

EC_e= 7.36 dS m^{-1}

SAR= 33.10 (mmol L^{-1})$^{1/2}$

Post harvest soil analysis

Planting geometry	pH_s	EC_e (dS m^{-1})	SAR (mmol L^{-1})$^{1/2}$
15cm x30 cm	8.60	7.32	32.05
22cm x30 cm	8.62	7.34	33.00
30cm x30 cm	8.61	7.33	32.10
15cm x45 cm	8.59	7.30	32.03
22cm x45 cm	8.60	7.29	31.85
30cm x45 cm	8.60	7.28	32.60

TITLE: 28	**IMPACT OF SOWING METHODS AND SEED RATES ON QUINOA YIELD IN SALT AFFECTED SOIL**
OBJECTIVE	To determine the best sowing method and seed rates for Quinoa crop in salt affected soils
RESEACHER	M.Q.Nawaz, G.M.Wains and A.I.Saqib
LOCATION	Research Farm SSRI, Pindi Bhattian
DURATION	2013-17
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	**A) Sowing Methods** 1). Ridge 2). Drill **B) Seed Rates** 1). 3.0 kg ha^{-1} 2). 5.0 kg ha^{-1} 3). 7.0 kg ha^{-1} 4). 9.0 kg ha^{-1}

METHODOLOGY	The trial will be laid out in split plot design having three replications in salt affected soil. Quinoa will be the test crop. Sub-plot size will be 4m x 6m. Sowing methods will be kept in main plots and seed rates in sub-plots. Recommended dose of fertilizer (75-60-0 NPK kg ha^{-1}) will be applied**.** All other agronomic practices will be kept constant. Data regarding yield and yield components will be recorded. Soil analyses will be done before sowing and after harvesting of crop to determine EC_e , SAR and pH_s.
PREVIOUS RESULTS	2015-16

Seed yield (t ha^{-1})

Seed rates	**Sowing methods**		**Mean**
	Ridge sowing	**Drill sowing**	
3.0 kg ha^{-1}	1.50 cd	1.37 d	1.44 C
5.0 kg ha^{-1} (RSR)	1.71 b	1.51 c	1.61 B
7.0 kg ha^{-1}	1.87 a	1.80 ab	1.83 A
9.0 kg ha^{-1}	1.93 a	1.80 ab	1.87 A
Mean	1.75 A	1.62 B	

LSD for sowing methods = 0.1378 LSD for seed rates = 0.0835 LSD for interaction = 0.1182

Initial Soil Analysis

pH_s= 8.65
EC_e= 7.26 dS m^{-1}
SAR= 33.09 (mmol L^{-1})$^{1/2}$

Post harvest soil analysis

Treatments	**Ridge sowing**			**Drill sowing**		
	pH_s	**EC_e** (dS m^{-1})	**SAR** (mmol L^{-1})$^{1/2}$	**pH_s**	**EC_e** (dS m^{-1})	**SAR** (mmol L^{-1})$^{1/2}$
3.0 kg ha^{-1}	8.60	7.20	32.81	8.62	7.21	33.10
5.0 kg ha^{-1} (RSR)	8.59	7.16	32.00	8.60	7.19	32.60
7.0 kg ha^{-1}	8.58	7.15	31.60	8.60	7.23	32.40
9.0 kg ha^{-1}	8.58	7.14	30.80	8.59	7.16	31.60

TITLE: 29	**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 sowing techniques to mitigate the harmful effects of high RSC water on yield of direct seeded rice and wheat crop.
RESEARCHERS	M.Q.Nawaz, M.A.Saqib and G.M.Wains
DURATION	2013-2018
LOCATION	Research Farm, SSRI, PindiBhattian
NATURE OF EXPERIMENT	Field Experiment
TREATMENTS	**A) Sowing Techniques** 1) Ridge sowing 2) Drill 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 Wheat (Faisalabad-2008). Experiment will be laid out in split plot design with three replications. Sub-plot size will be 6 m x 4 m. Recommended dose of fertilizer 120-110-70 NPK kg ha^{-1} will be applied. Sowing methods 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	2015-16

Grain yield (t ha^{-1})

Soil amendments	**Sowing methods**		**Mean**
	Ridge Sowing	Broadcast sowing	
Gypsum on the basis of RSC of Water	2.63 e	2.35 e	2.49 D
Press-mud @ 10 t ha^{-1}	2.52 ef	2.26 f	2.39 D
Press-mud @ 20 t ha^{-1}	3.09 b	3.00 bc	3.05 B
Biogas slurry @ 10 t ha^{-1}	2.89 cd	2.76 de	2.83 C
Biogas slurry @ 20 t ha^{-1}	3.39 a	3.03 bc	3.21 A
Mean	2.90 A	2.68 B	

LSD for sowing methods = 0.2338 LSD for amendments = 0.1287 LSD for interaction = 0.1820

Amendments Analyses (%)

Amendments	N	P	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 = 17.90 (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

Treatments	Ridge sowing			Broadcast sowing		
	pH_s	EC_e (dS m^{-1})	SAR (mmol $L^{-1)1/2}$	pH_s	EC_e (dSm^{-1})	SAR (mmol L^{-1})$^{1/2}$
Gypsum on the basis of RSC of Water	8.16	2.89	21.71	8.20	3.19	22.77
Press-mud @ 10 t ha^{-1}	8.20	2.86	21.72	8.18	3.20	22.70
Press-mud @ 20 t ha^{-1}	8.21	2.80	21.73	8.19	3.18	22.68
Biogas slurry @ 10 t ha^{-1}	8.19	2.82	21.72	8.18	3.19	22.66
Biogas slurry @ 20 t ha^{-1}	8.17	2.78	21.65	8.19	3.18	22.61

TITLE: 30	**Effect of tillage and nitrogen on wheat production in salt affected soils**
OBJECTIVE	Effect of tillage practices on nitrogen use efficiency of salt affected soils for wheat crop.
RESEARCHERS	M. Rizwan, J. Akhtar and Ehsan-ul-Haq
DURATION	2015-2018
LOCATION	Research Farm, SSRI, Pindi Bhattian.
NATURE OF EXPERIMENT	Field experiment
TREATMENTS	1. Tillage Practices i. Cultivator ii. Disc harrow iii. M.B Plough iv. Chisel plough 2. Nitrogen Application Methods i. Broadcast ii. Band Placement iii. Side dressing
METHODOLOGY	A moderately salt affected field will be selected. Soil samples will be collected and analyzed for pH_s, EC_e, SAR, HC and BD. Field will be leveled and prepared according to treatment plan. Recommended dose of fertilizer for wheat crop 120-110-70 kg ha^{-1} (NPK) will be applied. P, K

	and ½N will be applied as basal dose. Whereas remaining ½N will be applied at first irrigation. Grain and straw samples will be analyzed for N concentration and uptake. Finally N use efficiency will be calculated. After the harvest of wheat crop, soil samples will be collected and analyzed for pH_s, EC_e, SAR, O.M, Total Nitrogen, HC and BD. Design Split Plot Replications Three
PREVIOUS RESULTS	2015-16

Soil analyses before start of study

Parameter	**Soil Depth (0-15) cm**
pH_s	8.48
EC_e (dS m^{-1})	4.48
SAR (mmol $L^{-1})^{1/2}$	27.36
BD (Mg m^{-3})	1.55
HC (cm hr^{-1})	0.51
O.M (%)	0.40

Wheat Grain yield (t ha^{-1}) 2015-16

Treatments	**Fertilizer application method**			**Mean**
	Broadcast	Band Placement	Side dressing	
Cultivator	2.28 d	2.51 bc	2.44 c	2.41 C
Disk harrow	2.44 c	2.58 bc	2.52 bc	2.51 B
MB Plough	2.52 bc	2.62 b	2.60 bc	2.58 B
Chisel plough	2.57 bc	2.84 a	2.62 b	2.68 A
Mean	2.45 C	2.64 A	2.55 B	

LSD for Treatment = 0.0958 LSD for Ammendments= 0.0780

LSD for Treatment * Ammendments = 0.1560

SOIL ANALYSIS AFTER HARVESTING OF WHEAT CROP 2015-16

pH_s

Treatments	Broadcast	Band Placement	Side dressing
Cultivator	8.62	8.60	8.61
Disk harrow	8.60	8.58	8.58
MB Plough	8.60	8.57	8.58
Chisel plough	8.57	8.54	8.55

EC_e (dS m^{-1})

Treatments	Broadcast	Band Placement	Side dressing
Cultivator	4.45	4.44	4.44
Disk harrow	4.39	4.36	4.38
MB Plough	4.36	4.35	4.37
Chisel plough	4.29	4.24	4.26

SAR (mmol L^{-1})$^{1/2}$

Treatments	Broadcast	Band Placement	Side dressing
Cultivator	27.34	27.22	27.25
Disk harrow	27.12	26.61	26.74
MB Plough	27.01	26.50	26.67
Chisel plough	26.83	26.06	26.19

O.M

Treatments	Broadcast	Band Placement	Side dressing
Cultivator	0.40	0.46	0.40
Disk harrow	0.52	0.54	0.52
MB Plough	0.52	0.58	0.57
Chisel plough	0.54	0.60	0.57

TITLE: 31	**EVALUATION OF NUYT & SSRI SALT TOLERANT LINES UNDER NATURAL FIELDS OF SALT AFFECTED SOIL.**
OBJECTIVE	To find out suitable wheat advance line from NYUT material have better yield along with salt tolerance potential than existing commercial varieties.
RESEARCHER	Mr. Muhammad Ali Sher and Mr. Ghulam Shabbir
DURATION	Continuous nature
LOCATION	Agri. Research Farm, SSRI, PindiBhattian
NATURE EXPERIMENT	Field Experiment
TREATMENTS	Wheat NYUT and SSRI salt tolerant lines. Salt affected Soil: 2 levels 1.Normal / Control: EC_e< 04 d Sm^{-1} and SAR <15 (mmol L^{-1})$^{1/2}$ 2.Salinity/sodicity level: EC_e≈8.10 d Sm^{-1} and SAR≈29.58 (mmol L^{-1})$^{1/2}$
METHODOLOGY	Soil sampling of salt affected farm area was done to monitor the desired

	salinity / sodicity levels for experiment initiation. Seed of NUYT and SSRI lines were sown in various salinity/sodicity levels in RCB Design in 2 replications. All kind of recommended agronomic practices were followed. At maturity and harvesting, data of yield and yield components traits was recorded. Post-harvest soil analysis was also done.
PREVIOUS RESULTS 2015-16	

A) GRAIN YIELD OF NUYT LINES (t ha^{-1}) 2015-16

Entries	**Grain yield (t ha^{-1})**
NUYT-10	2.28 A
NUYT-9	2.22 B
NUYT-2	2.13 C
NUYT-8	2.01 D
NUYT-11	1.99 DE
NUYT-12	1.93 E
NUYT-7	1.86 F
NUYT-19	1.85 F
NUYT-6	1.82 F
NUYT-1	1.76 G
NUYT-18	1.76 G
NUYT-1 5	1.70 GH
NUYT-3	1.70 GH
NUYT-4	1.69 H
NUYT-5	1.61 I
NUYT-17	1.49 J
NUYT-14	1.27 K
NUYT-21	1.24 K
NUYT-20	1.22 K
NUYT-16	1.14 L
NUYT-25	1.12 L
NUYT-24	1.02 M
NUYT-22	1.01 M
NUYT-13	0.97 MN
NUYT-23	0.94 N
LSD	**0.0612**

B. GRAIN YIELD OF SSRI WHEAT LINES (t ha^{-1}) 2015-16

Entries	Grain yield (t ha^{-1})
SIS-12	2.45 A
14 S1P1	2.24 B
SIS-13	2.06 B
SIS-27	1.85 C
LSD Value	**0.1618**

Initial Soil Analysis:	**After harvesting Soil Analysis:**
pH_s = 8.60 EC_e = 8.10 (dS m^{-1}) SAR = 29.58 (mmol L^{-1})$^{1/2}$	pH_s = 8.57 EC_e = 7.96 (dS m^{-1}) SAR = 28.80 (mmol L^{-1})$^{1/2}$

TITLE: 32	**SCREENING OF WHEAT GERMPLASM COLLECTED FROM DIFFERENT INSTITUTIONS UNDER SALINE-SODIC SOIL**
OBJECTIVE	To find out suitable germplasm lines having better initial growth along with salt tolerance potential than existing varieties.
RESEARCHER	Mr. Muhammad Ali Sher and Mr. Ghulam Shabbir Nahra
DURATION	2015-17 (2 years)
LOCATION	Agri. Research Farm, SSRI, Pindi Bhattian
NATURE EXPERIMENT	Field Experiment
TREATMENTS	20 Wheat germplasm lines collected from different institutions Salt affected Soil: 2 levels 1.Normal: Control level: EC_e< 04 d Sm^{-1} and SAR <15 (mmol L^{-1})$^{1/2}$ 2. salinity sodicity level: EC_e≈ 7.85 d Sm^{-1} and SAR≈29.53 (mmol L^{-1})$^{1/2}$
METHODOLOGY	Soil sampling from salt affected farm area was done to select suitable salt affected soil for screening till crop maturity. Seed of 12 wheat germplasm lines were sown in saline-sodicity field according to RCB Design in 3 replications. All kind of recommended agronomic practices was followed. At maturity and harvesting, data of yield and yield components traits was recorded. Post-harvest soil analysis was also done.
PREVIOUS RESULTS	2015-16

	GRAIN YIELD (t ha^{-1}) 2015-16	
	Entries	**Grain yield (t ha^{-1})**
	SD-14	1.96 A
	SD -10	1.94 AB
	SD-1	1.92 AB
	SD-6	1.85 BC
	SD-4	1.78 C
	SD-2	1.67 D
	SD11	1.49 E
	SD-17	1.49 E
	SD-3	1.36 F
	SD-15	1.31 FG
	SD-5	1.27 FG
	SD-8	1.24 G
	SD-9	1.14 H
	SD-19	1.06 HI
	SD-20	1.03 IJ
	SD-13	0.97 JK
	SD-16	0.93 KL
	SD-7	0.92 KLM
	SD-12	0.86 LM
	SD-18	0.83 M
	LSD Value	**0.0933**
	Initial Soil Analysis: pH_s = 8.54 EC_e = 7.85 (dS m^{-1}) SAR = 29.53 (mmol $L^{-1})^{1/2}$	**After harvesting Soil Analysis:** pH_s = 8.53 EC_e = 7.69 (dS m^{-1}) SAR = 28.85 (mmol $L^{-1})^{1/2}$

TITLE: 33	**SCREENING OF BARLEY GERMPLASM COLLECTED FROM NATIONAL & PROVINCIAL RESEARCH INSTITUTIONS ACROSS PAKISTAN UNDER SALINE-SODIC SOIL**
OBJECTIVE	To find out suitable germplasm lines have better yield potential along with salt tolerance potential than existing varieties.
RESEARCHER	Mr. Muhammad Ali Sher and Mr. Ghulam Shabbir
DURATION	2015-17 (2 years)

LOCATION	Agri. Research Farm, SSRI, PindiBhattian
NATURE EXPERIMENT	Field Experiment
TREATMENTS	11 barley germplasm lines collected from national and provincial institutes across Pakistan. Salt affected Soil: 2 levels 1.Normal: Control level: EC_e< 04 d Sm^{-1} and SAR <15 (mmol $L^{-1})^{1/2}$ 2.Salinity sodicity level: EC_e≈ 8.56 d Sm^{-1} and SAR≈31.70 (mmol $L^{-1})^{1/2}$
METHODOLOGY	Soil sampling of salt affected farm area was done to select suitable saline-sodic soil for screening. Seed of 11 germplasm lines were sown in field according to RCB Design in 2 replications. Plant to plant and row to row distance was maintained at 22.5 cm. plant protection measures were taken time to time according to crop situation. Field was irrigated according to crop requirement. At maturity and harvesting, data of yield and yield components traits was recorded. Post-harvest soil analysis was also done.
PREVIOUS RESULTS	2015-16

GRAIN YIELD OF BARLEY (t ha^{-1}) 2015-16

Entries	**Grain yield (t ha^{-1})**
B-9	2.20 A
B-4	2.11 AB
B-1	2.03 BC
B-7	1.97 C
B-11	1.86 D
B-8	1.84 D
B-3	1.81 D
B-6	1.62 E
B-10	1.55 E
B-5	1.39 F
B-12	1.34 F
B-2	1.24 G
LSD Value	**0.0976**

Initial soil status	Soil analysis after harvesting of wheat
pHs = 8.54	pHs = 8.53
ECe = 8.56 (dS m^{-1})	ECe = 8.32 (dS m^{-1})
SAR = 31.65 (mmol L^{-1})$^{1/2}$	SAR = 30.48 (mmol L^{-1})$^{1/2}$

TITLE: 34	**SCREENING OF SUNFLOWER GERMPLASM COLLECTED FROM NATIONAL & PROVINCIAL RESEARCH INSTITUTIONS ACROSS PAKISTAN UNDER SALT AFFECTED SOIL FOR HIGH YIELD POTENTIAL.**
OBJECTIVE	To find out suitable germplasm lines have better yield along with salt tolerance potential than existing varieties.
RESEARCHER	Mr. Muhammad Ali Sher, Mr. Ghulam Shabbir
DURATION	2015-16
LOCATION	Agri. Research Farm, SSRI, PindiBhattian
NATURE OF EXPERIMENT	Salt Affected Fields
TREATMENTS	10 sunflower germplasm lines collected from national and provincial institutes across Pakistan. Salt affected Soil: 2 levels 1.Normal/Control level: EC_e< 04 d Sm^{-1}& SAR <15 (mmol L^{-1})$^{1/2}$ 2.Salinity/sodicity level: EC_e≈6.53 d Sm^{-1}& SAR≈27.21 (mmol L^{-1})$^{1/2}$
METHODOLOGY	Soil sampling of salt affected farm area was done to select suitable saline-sodic soil for screening. Seed of 10 germplasm lines were sown in field according to RCB Design in 2 replications. Plant to plant and row to row distance was maintained at 22.5 cm. plant protection measures were taken time to time according to crop situation. Field was irrigated according to crop requirement. At maturity and harvesting, data of yield and yield components traits was recorded. Post-harvest soil analysis was also done.
PREVIOUS RESULTS	2016

SUNFLOWER ACHENE YIELD (t ha^{-1}) 2015-16

Entries	Achene Yield (t ha^{-1})
FH-17	1.52 A
FH-572	1.41 B
FH-615	1.40 B
FH-612	1.35 BC
FH-614	1.31 C
FH-622	1.19 D
FH-620	1.16 D
FH-545	1.11 D
FH-331	1.00 E
FH-19	0.87 F
FH-16	0.76 G
LSD Value	**0.1135**

Initial soil status	**Soil analysis after harvesting of Sunflower**
pH_s = 8.54	pH_s = 8.53
EC_e = 6.53 (dS m^{-1})	EC_e = 6.42 (dS m^{-1})
SAR = 27.31 (mmol L^{-1})$^{1/2}$	SAR = 26.98 (mmol L^{-1})$^{1/2}$