

Soil and Water Conservation Research Institute Chakwal

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OVERVIEW AND HISTORY

Total geographical area of Punjab Province is 20.65 million hectares. Out of these 7.30 million hectares are designated as Barani tract with only 3.10 million hectares available for cultivation. The agriculture in Barani area (rainfed) is confronted with two main problems i.e., soil erosion and water stress. Soil and water are critical natural resources that sustain human life and the lives of all other creatures on our planet. The careful husbandry of these natural resources is essential for food security and environmental protection. Sustainable use of these resources is imperative to socially, economically and ecologically viable communities. The huge losses of soil in Barani area because of wind and water erosion has caused frustration among the inhabitants, therefore, many of them have chosen alternate professions. The problem is further accentuated with uncertain behavior of rainfall. The rainfall in these areas varies from less than 200 mm to over 1000 mm, 70% of which occurs during the summer months of July–September (Monsoon). Therefore, Soil and Water Conservation Research Institute was established by the Govt. of Punjab to develop technology for soil conservation and efficient use of available moisture for sustainable and profitable crop production. To employ the findings and to develop the technology for different climatic zones of rainfed area, Soil & Water Conservation Research Station, Fateh Jang and Sohawa were established under ADP scheme during 2004. The research stations at Sohawa and Fateh Jung were upgraded and strengthened during 2004 -09 in order to boost agricultural production and improving the living standard of the farming community of rainfed tract, through conservation and optimum use of natural resources. The institute has standardized soil and water conservation technologies after extensive research on soil and water conservation keeping in view the specific Agro-climatic zones (Low rain fall <500mm, medium 500-800mm and High rainfall>1000mm) of rainfed areas. Moreover, the institute has started capacity building of professionals & farmers on various soil & water conservation technologies through the international projects funded by ICARDA, USDA, USAID and UNESCO.

A. CURRENT RESEARCH ACTIVITIES

1. Improving crop productivity through In-Situ moisture conservation Practices

Highest grain yield was recorded under minimum tillage + residues incorporation (4210 kg/ha) followed by tillage + residues incorporation in S1 (3460 kg/ha), tillage + residues incorporation in S2 (3235 kg/ha) and lowest under minimum tillage + residues removed in S1 (2620 kg/ha) (Fig.1) The results showed that crop residues alone and in combination with minimum tillage improved the soil moisture contents.

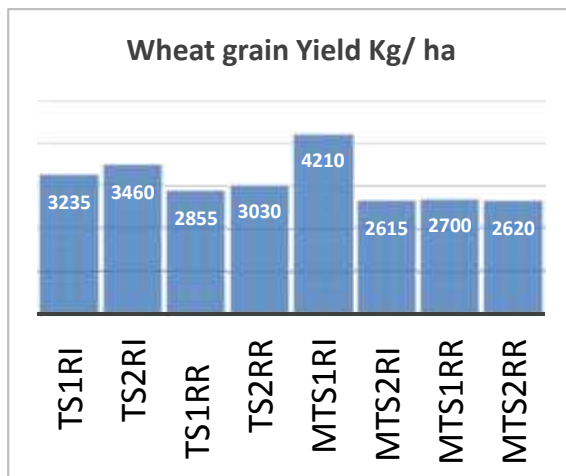


Fig.1 Effect of tillage and residue management practices on Wheat yield under three cropping systems.

Highest groundnut yield (1374Kg/ha) was achieved under tillage in S3 (Groundnut-Fallow-Groundnut) where residues were incorporated followed by S3 (1146Kg/ha) where residues were removed as farmer practice (Fig.2). There was 19 % increase in yield due

to tillage and about 4 % due to residue incorporation in S3(Groundnut-Fallow-Groundnut). Contrary to this yield was significantly low under S2(Wheat-Groundnut-Wheat).

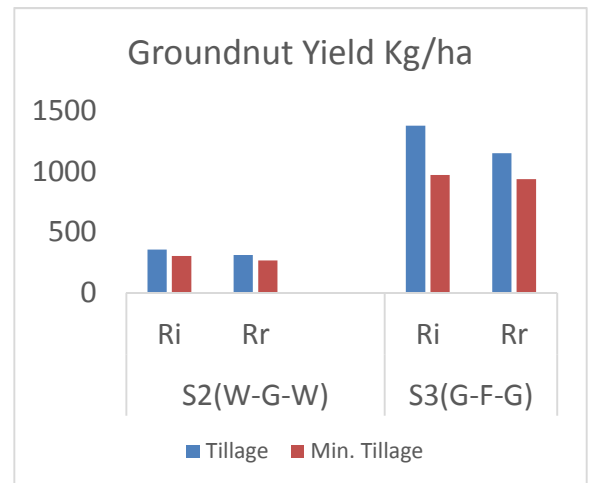


Fig.2 Effect of residues management on Groundnut yield

2. Effect of cowpea as mulch on wheat under rainfed condition.

The study was designed to compare the effect of green manure as mulch and as incorporation on wheat under rainfed conditions. Results showed that GM (Incorporation) gave slightly better results than Mulching as shown in fig. 3

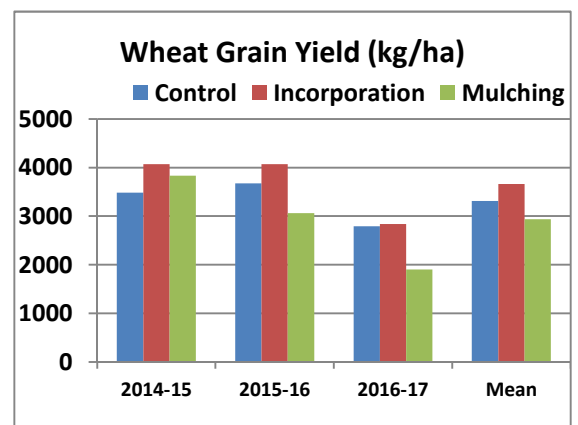


Fig.3 Effect of green manure as mulch and incorporation on Wheat yield.

Net profit was Rs. 51881/ha, Rs 55789/ha and Rs 37475/ha in control, incorporated and mulching treatments, respectively as shown in fig.4 The results led to the conclusion that green manuring of cowpea appeared to be useful and effective for growth and development of succeeding wheat crop.

Further research is in progress for conclusion and recommendation under rainfed areas of Potohar.

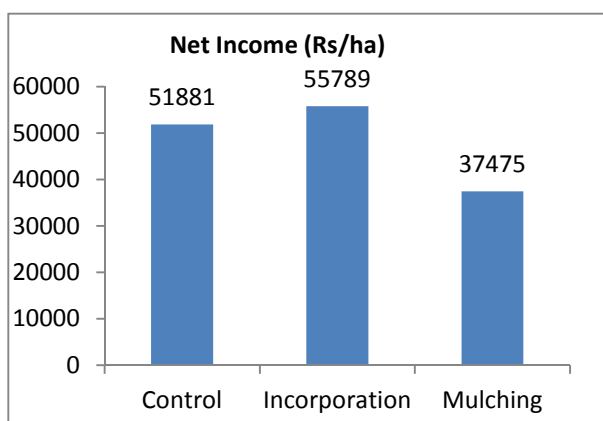


Fig.4 Net profit under various treatments

3. Study and evaluation of erosion control structures installed at Chakwal.

Fifteen (15) sites were visited to conduct reconnaissance survey of the structures and collected data. It was observed that only minor repairs are required in some structures. Structures significantly improved the land development (15%) and crop yield (20%) as compared to control.

4. Evaluation of mechanical check dams for soil conservation in uncultivated gullied areas.

From analysis of data collected during the pre-monsoon 2015 to post-monsoon 2017, it is concluded that bed development rate in uncultivated gullies

mainly depends upon surface area of the gully exposed to rainfall; Seasonal rainfall, rainfall duration & intensity; and Land use. Maximum depth of deposition was observed at check dam #1 (5 cm) during monsoon 2016 (Fig.5).

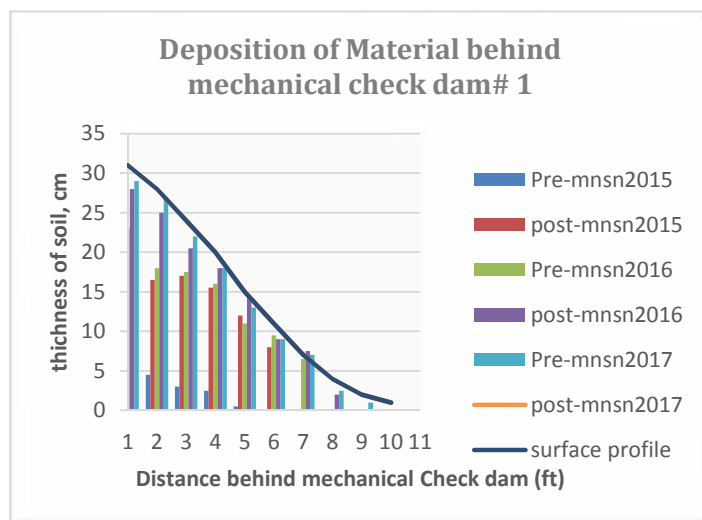


Fig.5 Effect of mechanical check dam on gully development

5. Efficiency of different mulches to enhance water productivity of stored rain water in green chilies

The study was conducted to compare the effect of various mulches on soil moisture conservation in green chilies. Data showed that highest soil moisture was recorded in black mulch followed by wheat straw. Plastic mulch is more effective in improving growth and yield of chilies as it conserves the soil moisture by reducing the evaporation and weed growth.

Treatments	Yield (Kg)	Water (m ³)	Water Productivity Kg/m ³

Control	2715	1611	1.69
Black Mulch	4326.9	1403	3.08
Straw mulch	3738.9	1522	2.46

Table. 1 Effect of mulching on yield and water productivity

6. Selection of effective live barrier grasses species for controlling soil and water erosion

The study was conducted for screening of grasses under natural conditions for providing vegetative cover, palatability to livestock and biomass production for adoptability in degraded lands. Highest biomass was observed of Vetiver followed by Canchrus, panicum and paltosa respectively. The results showed that grass species "Vetiver" produced maximum biomass (2.38 t/ha) while "Paltosa" minimum, i.e. 0.81 t/ha. The Vetiver reduced soil erosion from bunds and strengthened the field bunds as compared to the other grass species. The Panicum and Canchrus remained green throughout the year. All the grasses are being multiplied at farmers' fields.

7. Potentials and prospects of hydrogels for soil moisture conservation under rainfed conditions

Effect of Hydrogels application for soil moisture conservation and its impact on citrus growth was studied.

Treatments	Av. Plant height (m)	Avg. plant periphery (m)	No. Fruit Plant ⁻¹
Control	3.62	18.30	240
Qemisoyl	4.20	20.90	338
Soil Magic	3.98	18.93	310

Table. 2 Effect of hydrogels on plant parameters

The results revealed that mean

increase in plant height was 8.35% and 6.19%, soil moisture was 22.36 % and 18.97 % and in no. of fruits per plant was 31.03% and 23.72 % by Qemisoyl and soil magic respectively (Fig.6) In conclusion the application of hydrogels improved the soil moisture and increased average fruit yield (31%).

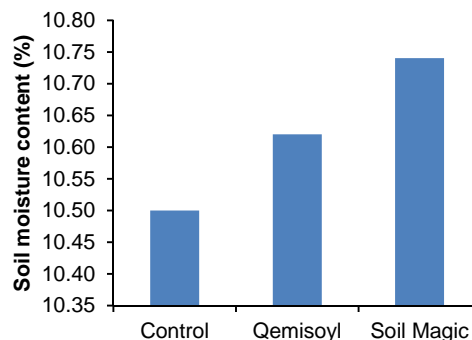


Fig.6 Effect of hydrogel application on soil moisture content (%)

8. Screening of various grasses against moisture stress

Various grass species were screened based on their survival under rainfed/moisture stressed conditions. Results showed the following ranking of grasses for their survival under rainfed conditions: Vetiver, Mott, Kai, Babbar, Khavi, Madhana, Palwan and lemon.

A. Ongoing research projects

1. Improving Soil fertility and soil health
2. Watershed rehabilitation and irrigation improvement in Pakistan: Demonstration and dissemination of best practices and technologies to help the rural farmers

These two projects are funded by ICARDA and USDA. Under this project 10 farmer days were

organized, and more than 100 professionals were trained.

B. Completed research projects

Community Based Training Program on Watershed Management for Flood & drought Control. The project was started in June 2016 and the objective was to train the local farming community, professionals & NGO's about watershed management practices standardized by the institute.

Under the project five professional training were organized in different projects under which **224** professionals were trained. **Fifteen** farmer days were conducted and 700 farmers (Male:400 and female: 300) were trained for different established technologies of this institute.

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