

# Soil and Water Conservation Research Institute Chakwal

## Abridge Report (2016-2017)



### Overview and History

Erosion and moisture stress are two main problems that farmers of Barani area are facing. Conservation agriculture can help to overcome the erosion and moisture problems by conserving soil and storing water in the soil. If erosion and water dependence are severe, combination of conservation agriculture with other techniques to control erosion and water scarcity are most suitable solutions. In rainfed areas (Barani areas), rain water-harvesting methods are most appropriate to make more water available to the crop.

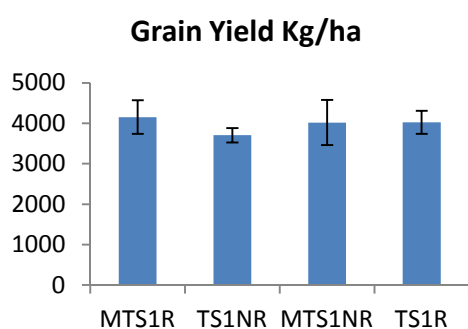
To address the problems of erosion and water in rainfed areas, “**Soil and Water Conservation Research Institute Chakwal**” (SAWCRI) was established in 1989. The institute has standardized soil and water conservation technologies after extensive research on soil and water conservation keeping in view the specific Agro-climatic zones (Low rain fall <500mm, medium 500-800mm and High rainfall >1000mm) of rainfed areas.

In Barani area soil & water erosion 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). Due to high intensity, short duration rainfalls and lack of watershed management/awareness and rainwater harvesting activities, this precious water is lost as surface runoff. This is not only the loss of water but also results in loss of fertile topsoil that may increase erosion severity because of flooding in low land areas and silting in dams/rivers/ponds. Sustainable use of these precious resources is imperative to socially, economically and ecologically viable communities. Its research stations at Sohawa, District Jhelum and Fatehjang, District Attock to address the issues and problem soil and water directly. Soil and water conservation research institute (SAWCRI) is also focusing on the onfarm composting & green manuring to maintain the soil health, fertility and improving moisture holding capacity. 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 (4253 kg/ha) followed by tillage + residues (4187 kg/ha), minimum tillage + residues removed (4109 kg/ha) and lowest under tillage + residues removed (3773 kg/ha). The results showed that crop residues alone and in combination with minimum tillage improved the soil moisture contents.

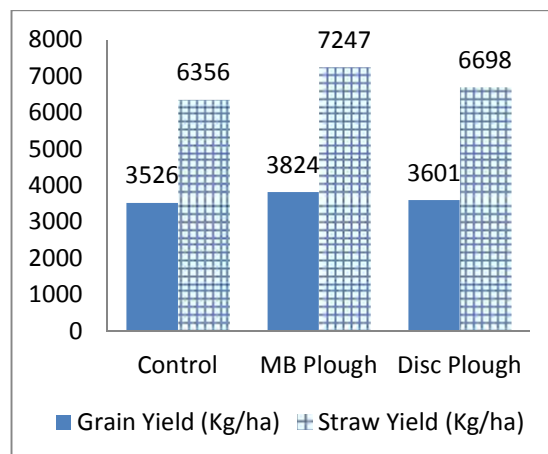


**Fig: Effect on grain yield**

The highest water use efficiency was achieved under minimum tillage + residues (9.8 kg/ha/mm) followed by tillage + residues (9.6 kg/ha/mm), minimum tillage + residues removed (9.4 kg/ha/mm) and tillage + residues removed (8.7 kg/ha/mm).

### 2. Comparison of different tillage practices for moisture conservation and improvement of wheat yield

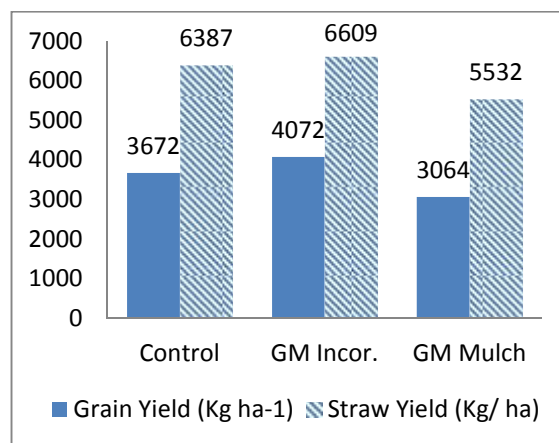
The study was designed to compare the efficiency of different tillage implements for moisture conservation and wheat yield. The treatments were Cultivator, MB and Disc Plough. Highest yield parameter as well as soil moisture was slightly better in MB Plough as compared to other treatments as shown in fig.



**Fig: Effect of tillage implements on yield**

### 3. Effect of cowpea as mulch on wheat under rainfed condition.

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



**Fig: Effect of GM as mulch and incorporation on grain and straw yield**

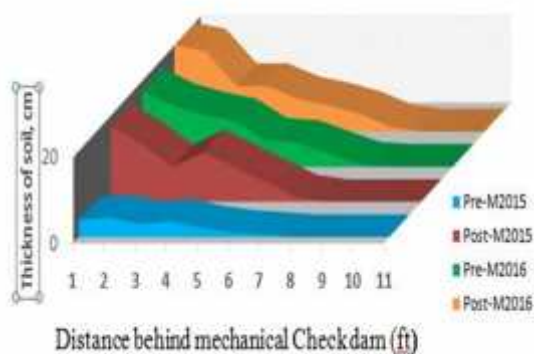
### 4. Study and evaluation of erosion control structures installed at Chakwal.

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.

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

From the data analysis collected during the pre-monsoon 2015 to pre-monsoon 2017, it is concluded that bed development rate in uncultivated gullies mainly depend on surface area of gully exposed to rainfall and maximum sediment deposition was 14 mm behind check dam at lower side of gully.



### 6. 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.

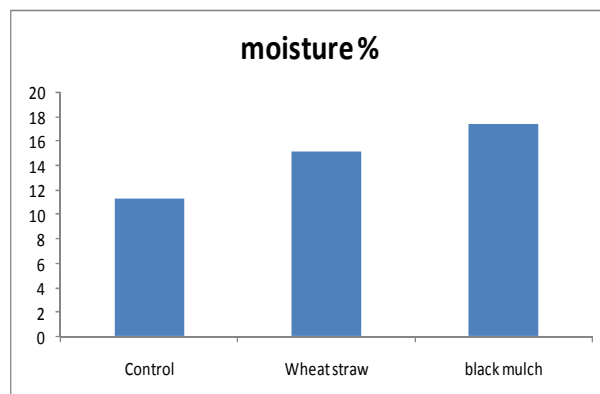


Fig: Soil moisture under various mulches

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

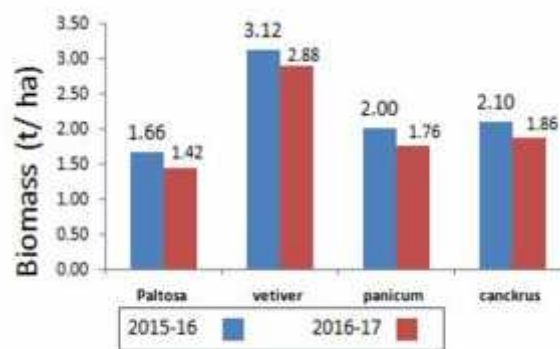


Fig: Biomass of selected grass during 2015-2017

Highest biomass was observed of Vetivar followed by cancrus, panicum and paltosa respectively.

### 8. Effect of land use intensity and type on soil properties

Experiment was conducted at three locations (high rainfall, medium rainfall & low rainfall) to observe the effects of cropping systems on soil properties. The results revealed that soil moisture was highest under cereal-legume system followed by orchard trees, legume-fallow and cereal-fallow respectively.

### 9. 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: Vetivar, 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.

#### **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 this a manual "Training manual on community based watershed management to control flood and drought" was prepared and published in English, Urdu, Pashto, Sindhi and Baluchi. **(Annexure-I).**

During this year three professional trainings were organized in different projects under which **100** participants were trained **(Annexure-II)**. Five farmer days were conducted in which 600 farmers (Male: 400 and female: 200) were trained for different established technologies of this institutes. **(Annexure-III)**

#### **Publications**

1. Afzal, F., B. Reddy, A. Gul, M. Khalid, A. Subhani, K. Shazad, U.M. Quraishi, A .M. H .Ibrahim, and A.Rahid.2017.Physiological

biochemical and agronomic trait associated with drought tolerance in a synthetic –derived wheat diversity panel .Crop and pastureSci.68:213-224.(I.F-178)

2. Umair, A., M. Abid, I. Ali, K. Bashir,W. Naseem and H.A.Rauf.2017. Nutrient priming in different maize cultivars and evaluation of vigour improvement under controlled conditions"Pak.J.SCI.Ind.Res.Ser.B.Biol.Sci.60(2)

3. Ghulam N, F. Hussain, R. Shyan Wu, V. Nangia, R. Bibi and A. Majid 2017 "Optimizing micro watershed management for soil erosion control under various slope gradient and vegetation cover conditions" using SWAT modeling. J. Hyd. & Earth. Sys. Sci.

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