

Effect of Tillage Practices on Physico-Chemical Properties of the Soil around Bikaner City (Rajasthan)

Research Article

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Abstract

"Tillage" can also mean the land that is tilled. The word "cultivation" has several senses that overlap substantially with those of "tillage". In a general context, both can refer to agriculture. Within agriculture, both can refer to any kind of soil agitation. Additionally, "cultivation" or "cultivating" may refer to an even narrower sense of shallow, selective secondary tillage of row crop fields that kills weeds while sparing the crop plants. Tillage is a mechanical modification of soil structure require considerable expense of high-energy inputs to prepare the seed bed, to incorporate fertilizer, manure and residues into the soil, to alleviate compaction and to control weeds excessive tillage practices without residue retention may adversely affect long - term soil; productivity due to erosion and loss of organic carbon.

Keywords: Soil Parameters; Conventional tillage; Conservation tillage; Zero tillage

Introduction

Bikaner is city in the Northwest of the State of Rajasthan India, Bikaner with their Coordinates: 28° 01' 00" N 73° 18' 43"E, having total area 155 km² elevation:-242 M (794 ft.) Bikaner is situated in the middle of the Thar Desert and has a hot semi-arid Climate BSH. The soils of Bikaner district are light textured, sand to sandy loam with clay content with very little chemical weathering has taken place and the development of soil is indistinct. Soils are generally desertic type with low fertility, low water retention capacity, good porosity and good permeability.

Farmers use machines like a plow or disc to turn over and loosen the soil after harvest (a process called tillage) [1]. This can leave the soil exposed to rain and wind, which can sometimes lead to erosion (wearing away) of the topsoil that is needed to grow a crop. Conventional tillage refers tm tillage operations considered standard

for a specific location and crop and that tend to bury the crop residues; usually considered as a base for determining the cost effectiveness of erosion control practices Conservation tillage is any methods of soil cultivation that leaves the previous year's crop residue (such as corn stalks or wheat stubble) on fields before and after planting the next crop to reduce soil Erosion and after planting the next crop to reduce soil Erosion and run off, As well as other benefits such as carbon sequestration (MDA,2011). With this technique, at least 30 % of the soil surface is covered with crop residue / organic residue following planting. It also features no inversion of the soil. This type of soil tillage is Characterized by tillage depth and the percentage of surface area disturbed. Conservation Tillage is recognized having higher efficiency than conventional Tillage in improving soil quality; crop productivity reducing the Intensity of soil tillage decreases the manpower and energy required for crop production and affects long - term benefits from improved soil structure. Study was undertaken in

following villages of Bikaner district with their geographical location & Administration setup [2-5].

Udasar: Geographical coordinates are 28° 4'0" North, 73°23'0" East and its original Name (with diacritics) is Udasar.

Pemasar: The pemasar village is located in the sate Rajasthan having state code 08 and having the village code 069052. The Bikaner is the District of the village with district code 101. Total geographical area in which this village is expanded in 940 hectare 19.4 square kilometer (sqkm) /2322. 7905857914 acres.

Raisar: The village is located in the state Rajasthan having state code 08 and having the village code 069080.

Sagar: The total geographical area in which this village is expanded in 1251.09 hectares/ 12.5109 square kilometer (sqkm) /3091.5107169976 acres.

Material and Methods

The study site was located at the Bikaner. The soil was a Decatur silt loam conventional tillage involved Disking and Chisel ploughing in the fall followed by disking and field cultivating in the spring.

- Soil sampling was calculating soil sample performed in April 2018 prior to July 2018.
- Soil cores were separated into three depth (0-15 and 15-30 cm, Bo-75 cm) in the field, composited by Depth and thoroughly Mixed.
- Soil organic carbon content. Soil pH was measured using 1:1 soil and 1:2 soils/ 0.01 M Cacl2 Suspensions.
- Bulk Density was determined by measuring the Moisture loss from intact soil & cores of a known volume after drying at 105°C for 24 Hours. (Auburn, AL 36849, USA).

Different Soil types: Bikaner has a Mean annual Rainfall Ranging from 200 to 300 mm. Surface soil samples (0.15-30.75 Cm) depth soil samples were collected from the Bikaner district, in village Udasar, Pemasar, Sager, Raisar District in Bikaner Rajasthan.

Results

Selected Chemical and physical properties of soils from conventional tillage (Table 1 & 2).

Discussion

The study reveals that in Conventional Tillage agricultural practices around the various selected villages of Bikaner city depicts the parameters like Organic Carbon (%) in Raisar found highest 0.20% with the depth of 0-15 in soil while in Pemasar it was found lowest 0.10 % in the depth of 30-75 in soil. The another parameter like Bulk Density (mg m-3) is found highest bulk density 2.777 in the Udasar with depth of 0-50 to 30-75 while in Sagar lowest bulk density 1.671 in the depth of 0-15 soil. Soil PH in Raisar found highest soil pH 9.15 in the depth of soil 0-15while in Pemasar found lowest soil pH 8.45 in the depth of 10-30. TheWater Holding Capacity in Sagar found highest water holding capacity 93.312 in the depth of 15-30 in soil while in Pemasar it was found lowest water holding capacity 3.558

Table 1: Selected Chemical and physical properties of soils from conventional tillage.

| Located areas | Tillage treatment | Depth (cm) | Organic carbon (%) | Bulk density (mg m-3) | Soil pH (1: 2 Cacl2) | Water holding capacity |
|---------------|-------------------|------------|--------------------|-----------------------|----------------------|------------------------|
| UDASAR | CT | 0-15 | 0.16 | 2.117 | 8.62 | 8.134 |
| | CT | 15-30 | 0.14 | 2.777 | 8.64 | 7.040 |
| | CT | 30-75 | 0.11 | 2.125 | 8.73 | 6.253 |
| PEMASAR | CT | 0-15 | 0.10 | 1.847 | 8.63 | 6.763 |
| | CT | 15-30 | 0.12 | 1.886 | 8.45 | 5.892 |
| | CT | 30-75 | 0.10 | 2.117 | 8.48 | 3.558 |
| SAGAR | CT | 0-15 | 0.16 | 1.671 | 8.55 | 5.789 |
| | CT | 15-30 | 0.11 | 1.799 | 8.36 | 93.312 |
| | CT | 30-75 | 0.12 | 2.109 | 8.40 | 25.610 |
| RAISAR | CT | 0-15 | 0.20 | 2.133 | 9.15 | 5.269 |
| | CT | 15-30 | 0.13 | 2.125 | 9.07 | 23.884 |
| | CT | 30-75 | 0.11 | 2.109 | 9.01 | 50.512 |

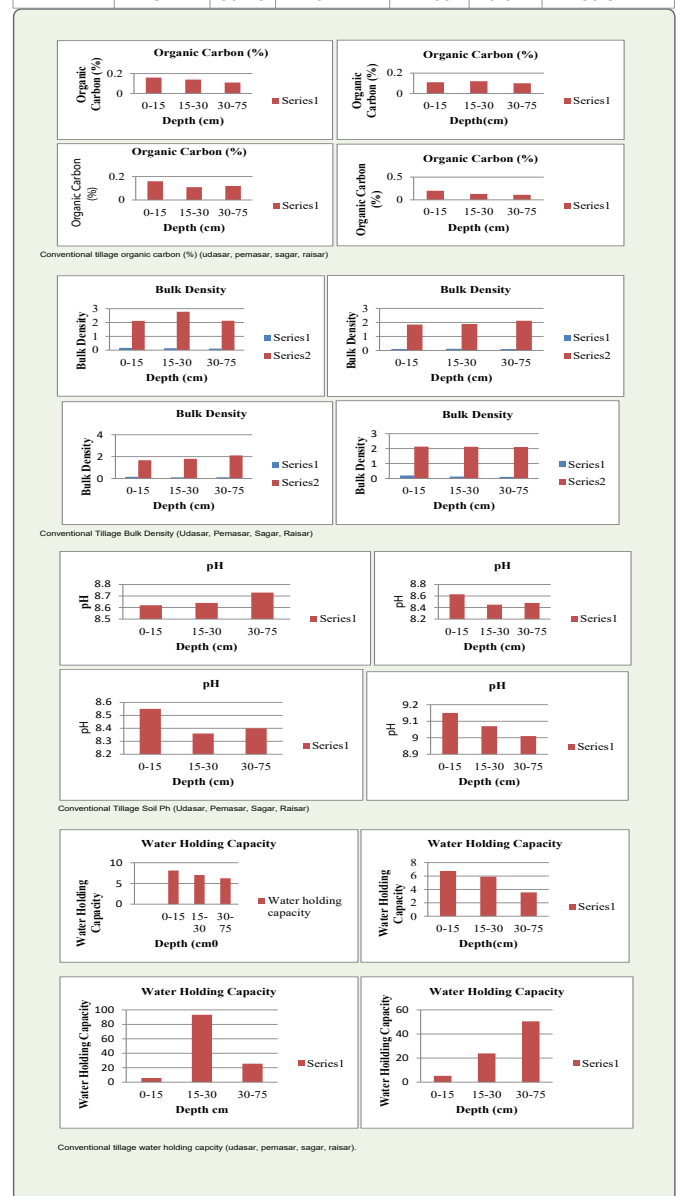


Table 2: Selected Chemical and physical properties of soil from conservation tillage.

| Located areas | Tillage Treatment | Depth (cm) | Organic carbon (%) | Bulk density (mgm-3) | Soil PH (1:2 Cacl2) | Water holding capacity |
|---------------|-------------------|------------|--------------------|----------------------|---------------------|------------------------|
| UDASAR | CT | 0-15 | 0.13 | 4.832 | 8.64 | 18.413 |
| | CT | 15-30 | 0.15 | 4.179 | 8.81 | 28.012 |
| | CT | 30-75 | 0.18 | 4.976 | 8.92 | 18.012 |
| PEMASAR | CT | 0-15 | 0.15 | 4.816 | 9.12 | 15.941 |
| | CT | 15-30 | 0.10 | 4.777 | 9.07 | 1.119 |
| | CT | 30-75 | 0.12 | 4.179 | 9.09 | 20.956 |
| SAGAR | CT | 0-15 | 0.13 | 4.378 | 8.97 | 6.392 |
| | CT | 15-30 | 0.14 | 4.578 | 8.90 | 23.088 |
| | CT | 30-75 | 0.21 | 4.936 | 8.43 | 21.222 |
| RAISAR | CT | 0-15 | 0.21 | 4.179 | 8.90 | 24.256 |
| | CT | 15-30 | 0.18 | 4.140 | 8.80 | 31.892 |
| | CT | 30-75 | 0.14 | 4.197 | 8.59 | 38.840 |

in the depth of 30-75 in soil. In Conservation Tillage practices it was found that the Organic Carbon (%) in Sagar and Pemasar highest organic carbon percentage 0.21 % found in the depth of 30-75 and the depth of 0-15 respectively while in Pemasar found lowest organic carbon percent 0.10 % in the depth of 15-30. The another parameter like Bulk Density in Udasar found highest bulk density 4.976 in the depth of 30-75 in soil and in Raisar found lowest bulk density 4.140 in the depth of 15-30. The Soil PH in Pemasar found highest soil ph 9.12 in the depth of 30-75 in soil as the Sagar has found lowest soil ph 8.43 in the depth of 30-75 in soil. The Capacity of water holding in Raisar found highest 38.840 in the depth of 30-75 in soil and lowest in Pemasar 1.119 in the depth of 15-30 in soil [6].

Conclusion

Soil seems to be in favour of promoting conservation Agriculture in general rather than conventional tillage thus is not sustainable and environmentally friendly. However, the International development organizations Tillage makes the soil serve as a source rather than a sink of atmospheric pollutants. Conservation tillage is more favoured than CT & also reported that the structural conditions of soil under no- tillage improve with time provides there is an adequate amount of residue mulch on the surface and compacting.

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