Soil organic Carbon Stock affected by different cropping system of Prayagraj District, Eastern Uttar Pradesh, India

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Abstract— *Cropping system is an effective agricultural practice which play crucial role in soil carbon stabilization, soil health and fertility as well as in sequestering atmospheric CO_2 in soil for long period of time. With these considerations in mind, a research was conducted in the Prayagraj district of eastern Uttar Pradesh to evaluate how major agricultural systems affect soil carbon stock. The major cropping system includes Wheat-Wheat, Mustard- Mustard, Rice-Wheat and Rice-Mustard Soil samples were collected from eight tehsil of Prayagraj district randomly from depth 0-15 cm and 15-30 cm depth. The findings show that soil organic carbon store in rice-wheat cropping systems is higher than in other cropping systems.*

Keywords— Cropping system, Soil carbon stock, Atmospheric CO_2, Carbon stabilization.

I. INTRODUCTION

The concentration of Co_2 in earth's atmosphere is currently at nearly 418.96 ppm in 2022 and rising **(Mauna Loa observatory/NOAA).** This represents a 47 percent increase since the beginning of industrial age when the concentration was near 280 ppm. CO_2 increase caused by primarily human activities because carbon produced by burning of fossil fuels **(Eawaran *et al.*, 1993)**. Industry, transportation, and home use currently emit roughly 10 Gt CO2 into the atmosphere each year. Increasing SOC in agricultural systems has been considered as a possible solution to mitigate climate change, e.g., via removing atmospheric carbon dioxide (CO_2) into the long-lived C pool as it occupies 40% of the earth land surface **(Smith 2008)**. Soil are important global carbon pools as it constitutes the third largest carbon pool estimated at 2500 Pg to 1 m depth so soil system has the potential to sequester significant amount of carbon by improved management, which could significantly offset fossil fuels GHG emissions **(Lal 2004).** Through changed agricultural techniques, it is proposed, much of this carbon can be restored to domesticated soils and thus serve as a significant tool to mitigate climate change, Soil carbon sequestration implies transferring atmospheric CO_2 into long-lived pools and storing it in soil securely for long term to either mitigate or defeat global warming and avoid dangerous climate change so it is not immediately re-emitted **(Lal *et al.*, 1995)**. Simply we can say that soil carbon sequestration is the process of transferring carbon dioxide from the atmosphere into the soil through crop residues and other organic solids, and in a form that is not immediately reemitted **(Jones 2007)**. More recently, increasing crop rotational diversity has been shown to play a major role in increasing SOC storage and ecosystem functions, driven by enhanced root C input, soil microbial diversity, and soil aggregate stability **(McDaniel *et al.*, 2014).** Crop rotations can be further improved by incorporation of perennial forages with extensive root systems to increase root C input and physical protection in soil aggregates, resulting in SOC sequestration **(Varvel 2000, Kelley *et al.*, 2003).**

II. MATERIALS AND METHODS

2.1 Study site

The field experiments were carried out at Prayagraj district located between 24° 47' to 25° 47' N latitudes and 81° 19'E to 82° 21'E longitudes. It covers an area of 5246 km^2. This district lies in the southern part of the state in the Gangetic plain and adjoining Vindhyan Plateau of India. The district comprises of eight tahsils, namely Sadar tehsil, Soraon, Phulpur, Handia, Bara, Karchana, Koraon and Meja.Tahsil.

Table showing names of site description along with latitude and longitude of the Tehsil.

TABLE A

TABLE SHOWING NAMES OF SITE DESCRIPTION

1	**Meja**	V1- Samahan, V2- Bisahijanpur, V3- Chatva upakhar, V4- Luter
2	**Saroan**	V 1- Naranyanpur, V2- Abdalpur, V3- Sarsa, V4- Gohri
3	**Karchana**	V1- Rampur Talika, V2- Majhua, V3- Chuppepur, V4- Moongari
4	**Handiya**	V1- Siyandih, V2- Bhadwan, V3-Birapur kasaudhan, V4- Shankerpur
5	**Karoan**	V1- Pacheda, V2- Semri baghrai, V3- Patharlal, V4- Taroan
6	**Bara**	V1- Barakhas, V2- Nivi, V3- Jharsa, V4- Sehunda
7	**Phulpur**	V1- Serdeh, V2- Karihar, V3- Kaserua, V4- Andhawa
8	**Sadar**	V1- Bamroli, V2- Jhalwa, V3- Fulwa, V4-Mandari

2.2 Soil Sampling and Analysis

Analysis of soil was done during grand growth of the crops. The soil samples were randomly collected from eight Tehsil of Prayagraj district and from each Tehsil four village were selected for the sampling. Soil sample were collected from each village with different cropping system i.e., Wheat-Wheat, Mustard- Mustard, Rice-Wheat and Rice- Mustard from 0-15 cm and 15-30 cm depth. The soil was returned to the laboratory after sample and air-dried at room temperature. The dirt was lowered in weight and sieved through a 2 mm mesh before being used for analysis.

Analysis of Bulk density (g/cc) by **Muthuvel, *et al.*, (1992)**, Organic carbon (%) and soil total organic carbon by **Walkley and Black (1947)** and soil organic carbon stock by **Batjes (1996).**

2.3 Carbon stock Analysis

2.3.1 Bulk density x soil depth x total organic carbon

Total organic carbon = %OC x 1.3

According to walkey and black method 77% is Organic matter

100÷77=1.29

Statistical analysis of variance F4 way classification was used and their after for comparing two objects together the value of critical difference was also analyzed.

III. RESULTS AND DISCUSSION

Table 1 shows the bulk density (g/cc) value of different cropping system at grand growth of Prayagraj district. The maximum value of bulk density was found 1.25 (g/cc) of village Fulwa in Sadar tehsil at 15-30 cm depth of rice-mustard cropping and minimum value of bulk density was found 1.00 (g/cc) of village Karihar in Phulpur tehsil at 0-15 cm depth of muatard-mustard crop.

Table 2 shows the organic carbon (%) value of major crops at growing stage of Prayagraj district. The maximum value of organic carbon (%) was found 0.92 (%) of village Bisahijanpur in Meja tehsil at 0 to 15 cm depth of rice- wheat cropping system and minimum value of organic carbon (%) was found 0.11(%) of village Bhadwan in Handiya tehsil at 15 to 30 cm depth of wheat-wheat cropping system.

Table 3 shows the total organic carbon (%) value of major crops at grand growth stage of Prayagraj district. The maximum value of total organic carbon was found 1.18 (%) of village Kaserua in Phulpur tehsil at 0 to 15 cm depth of rice-wheat cropping system and minimum value of carbon stock was found 0.14 (%) in Handiya tehsil of village Bhadwan in Handiya tehsil at 15 to 30 cm depth of wheat-wheat cropping system.

Table 4 shows the total organic carbon stock (t/ ha^{-1}) value of major crops at grand growth stage of Prayagraj district. The maximum value of total organic carbon stock (t/ ha^{-1}) was found 38.13 (t/ ha^{-1}) of village Kaserua in Phulpur tehsil at 0 to 15 cm depth of rice-wheat cropping system and minimum value of total organic carbon stock (t/ ha^{-1}) was found 5.06 (t/ ha^{-1}) of village Bhadwan in Handiya tehsil at15 to 30 cm depth of wheat-wheat cropping system.

Many prior studies have indicated that more diversified crops improve soil organic carbon sequestration compared to mono cropping systems **Gan YT *et al.*, (2015); Campbell CA *et al*., 2005)**. Stabilization of soil organic carbon under various cropping systems; rice-wheat farming stabilises more soil organic carbon even without fertilizer **(Stevenson, 1965; Paustian *et al*., 1992) and Brar and Benbi (2009).**

TABLE 1
BULK DENSITY OF SOILS OF DIFFERENT CROPPING SYSTEM AT 0-15 CM AND 15-30 CM DEPTHS AT GROWING STAGE OF MAJOR CROPS OF 2017-18.

Tehsils	Cropping system	(0-15 cm) depth				Mean	(15-30 cm) depth				Mean
		V1	V2	V3	V4		V1	V2	V3	V4	
Meja	Wheat/Wheat	1.11	1.01	1.02	1.11	1.06	1.20	1.11	1.18	1.14	1.16
	Mustard/Mustard	1.10	1.08	1.10	1.11	1.10	1.22	1.18	1.25	1.18	1.21
	Rice/ wheat	1.08	1.01	1.11	1.01	1.05	1.14	1.11	1.18	1.11	1.14
	Rice/Mustard	1.25	1.01	1.11	1.11	1.12	1.18	1.11	1.18	1.20	1.17
Saroan	Wheat/Wheat	1.14	1.11	1.18	1.11	1.14	1.20	1.22	1.25	1.18	1.21
	Mustard/Mustard	1.10	1.20	1.11	1.12	1.13	1.18	1.24	1.17	1.25	1.21
	Rice/ wheat	1.08	1.11	1.11	1.10	1.10	1.18	1.20	1.23	1.18	1.20
	Rice/Mustard	1.00	1.08	1.01	1.11	1.05	1.18	1.18	1.11	1.16	1.16
Karchana	Wheat/Wheat	1.18	1.14	1.10	1.18	1.15	1.20	1.20	1.24	1.24	1.22
	Mustard/Mustard	1.10	1.11	1.11	1.11	1.11	1.17	1.18	1.20	1.18	1.18
	Rice/ wheat	1.11	1.11	1.01	1.11	1.08	1.18	1.15	1.17	1.25	1.19
	Rice/Mustard	1.18	1.14	1.11	1.11	1.14	1.22	1.25	1.18	1.18	1.21
Handiya	Wheat/Wheat	1.11	1.08	1.01	1.01	1.05	1.11	1.18	1.14	1.20	1.16
	Mustard/Mustard	1.18	1.11	1.14	1.18	1.15	1.20	1.18	1.25	1.33	1.24
	Rice/ wheat	1.12	1.01	1.06	1.02	1.05	1.20	1.18	1.17	1.20	1.19
	Rice/Mustard	1.18	1.10	1.11	1.10	1.12	1.20	1.17	1.25	1.20	1.21
karoan	Wheat/Wheat	1.18	1.11	1.11	1.04	1.11	1.20	1.20	1.18	1.17	1.19
	Mustard/Mustard	1.11	1.08	1.10	1.11	1.10	1.22	1.18	1.18	1.18	1.19
	Rice/ wheat	1.16	1.10	1.11	1.06	1.11	1.25	1.18	1.20	1.11	1.19
	Rice/Mustard	1.08	1.11	1.01	1.07	1.07	1.11	1.18	1.11	1.18	1.15
Bara	Wheat/Wheat	1.18	1.14	1.01	1.10	1.11	1.25	1.24	1.16	1.20	1.21
	Mustard/Mustard	1.14	1.18	1.11	1.16	1.15	1.20	1.25	1.18	1.25	1.22
	Rice/ wheat	1.18	1.11	1.05	1.08	1.11	1.25	1.20	1.19	1.20	1.21
	Rice/Mustard	1.11	1.20	1.16	1.11	1.15	1.20	1.25	1.20	1.33	1.25
Phulpur	Wheat/Wheat	1.01	1.01	1.00	1.08	1.02	1.11	1.11	1.12	1.18	1.13
	Mustard/Mustard	1.08	1.00	1.11	1.11	1.08	1.18	1.20	1.21	1.25	1.21
	Rice/ wheat	1.01	1.10	1.01	1.10	1.05	1.11	1.14	1.11	1.17	1.13
	Rice/Mustard	1.11	1.12	1.08	1.11	1.11	1.18	1.19	1.20	1.20	1.19
Sadar	Wheat/Wheat	1.08	1.11	1.16	1.15	1.13	1.18	1.18	1.20	1.20	1.19
	Mustard/Mustard	1.14	1.08	1.11	1.11	1.11	1.20	1.18	1.20	1.24	1.21
	Rice/ wheat	1.11	1.18	1.17	1.18	1.16	1.20	1.20	1.25	1.20	1.21
	Rice/Mustard	1.18	1.11	1.08	1.18	1.14	1.25	1.18	1.11	1.25	1.20

TABLE 2
SOILS ORGANIC CARBON (%) OF DIFFERENT CROPPING SYSTEM AT 0-15 CM AND 15-30 CM DEPTHS AT GROWING STAGE OF MAJOR CROPS OF 2017-18.

Tehsils	Cropping system	(0-15 cm) depth				Mean	(15-30 cm) depth				Mean
		V1	V2	V3	V4		V1	V2	V3	V4	
Meja	Wheat/Wheat	0.4	0.85	0.56	0.51	0.58	0.3	0.46	0.4	0.49	0.41
	Mustard/Mustard	0.38	0.67	0.49	0.32	0.47	0.22	0.45	0.39	0.4	0.37
	Rice/ wheat	0.45	0.92	0.73	0.7	0.70	0.36	0.62	0.51	0.54	0.51
	Rice/Mustard	0.40	0.78	0.69	0.38	0.56	0.29	0.51	0.48	0.51	0.45
Saroan	Wheat/Wheat	0.47	0.75	0.48	0.3	0.50	0.28	0.66	0.39	0.2	0.38
	Mustard/Mustard	0.32	0.6	0.23	0.6	0.44	0.22	0.32	0.36	0.12	0.26
	Rice/ wheat	0.69	0.41	0.73	0.72	0.64	0.40	0.12	0.56	0.50	0.40
	Rice/Mustard	0.61	0.62	0.60	0.71	0.64	0.43	0.40	0.39	0.51	0.43
Karchana	Wheat/Wheat	0.35	0.49	0.72	0.45	0.50	0.23	0.31	0.54	0.31	0.35
	Mustard/Mustard	0.42	0.47	0.7	0.31	0.48	0.22	0.38	0.48	0.2	0.32
	Rice/ wheat	0.37	0.52	0.75	0.48	0.53	0.29	0.40	0.58	0.35	0.41
	Rice/Mustard	0.50	0.51	0.76	0.36	0.53	0.32	0.40	0.56	0.31	0.40
Handiya	Wheat/Wheat	0.37	0.25	0.6	0.43	0.41	0.3	0.11	0.29	0.22	0.23
	Mustard/Mustard	0.31	0.27	0.32	0.3	0.30	0.21	0.21	0.23	0.25	0.23
	Rice/ wheat	0.40	0.31	0.61	0.47	0.45	0.36	0.20	0.59	0.31	0.37
	Rice/Mustard	0.36	0.30	0.34	0.31	0.33	0.27	0.28	0.28	0.30	0.28
karoan	Wheat/Wheat	0.71	0.42	0.42	0.37	0.48	0.48	0.25	0.31	0.30	0.34
	Mustard/Mustard	0.33	0.27	0.45	0.32	0.34	0.23	0.20	0.33	0.23	0.25
	Rice/ wheat	0.71	0.47	0.42	0.40	0.50	0.48	0.28	0.34	0.30	0.35
	Rice/Mustard	0.36	0.28	0.50	0.29	0.36	0.27	0.20	0.34	0.28	0.27
Bara	Wheat/Wheat	0.42	0.40	0.46	0.61	0.47	0.28	0.21	0.35	0.42	0.32
	Mustard/Mustard	0.48	0.41	0.52	0.62	0.51	0.37	0.32	0.34	0.30	0.33
	Rice/ wheat	0.46	0.40	0.45	0.61	0.48	0.34	0.27	0.37	0.48	0.37
	Rice/Mustard	0.50	0.43	0.57	0.68	0.55	0.38	0.35	0.47	0.60	0.45
Phulpur	Wheat/Wheat	0.57	0.53	0.87	0.72	0.67	0.46	0.38	0.70	0.52	0.52
	Mustard/Mustard	0.76	0.80	0.88	0.71	0.79	0.40	0.69	0.61	0.50	0.55
	Rice/ wheat	0.58	0.57	0.91	0.78	0.71	0.56	0.40	0.81	0.61	0.60
	Rice/Mustard	0.76	0.83	0.88	0.71	0.80	0.65	0.67	0.70	0.60	0.66
Sadar	Wheat/Wheat	0.52	0.58	0.52	0.70	0.58	0.42	0.50	0.38	0.56	0.47
	Mustard/Mustard	0.52	0.58	0.42	0.61	0.53	0.41	0.48	0.32	0.45	0.42
	Rice/ wheat	0.57	0.60	0.51	0.72	0.60	0.50	0.47	0.42	0.56	0.49
	Rice/Mustard	0.56	0.57	0.48	0.67	0.57	0.48	0.50	0.41	0.51	0.48

TABLE 3
SOILS TOTAL ORGANIC CARBON OF DIFFERENT CROPPING SYSTEM AT 0-15 CM AND 15-30 CM DEPTHS AT GROWING STAGE OF MAJOR CROPS OF 2017-18.

Tehsils	Cropping system	(0-15 cm) depth				Mean	(15-30 cm) depth				Mean
		V1	V2	V3	V4		V1	V2	V3	V4	
Meja	Wheat/Wheat	0.52	1.11	0.73	0.66	0.39	0.39	0.60	0.52	0.64	0.54
	Mustard/Mustard	0.49	0.87	0.64	0.42	0.29	0.29	0.59	0.51	0.52	0.47
	Rice/ wheat	0.59	1.20	0.95	0.91	0.47	0.47	0.81	0.66	0.70	0.66
	Rice/Mustard	0.52	1.01	0.90	0.49	0.38	0.38	0.66	0.62	0.66	0.58
Saroan	Wheat/Wheat	0.61	0.98	0.62	0.39	0.36	0.36	0.86	0.51	0.26	0.50
	Mustard/Mustard	0.42	0.78	0.30	0.78	0.29	0.29	0.42	0.47	0.16	0.33
	Rice/ wheat	0.90	0.53	0.95	0.94	0.52	0.52	0.16	0.73	0.65	0.51
	Rice/Mustard	0.79	0.81	0.78	0.92	0.56	0.56	0.52	0.51	0.66	0.56
Karchana	Wheat/Wheat	0.46	0.64	0.94	0.59	0.30	0.30	0.40	0.70	0.40	0.45
	Mustard/Mustard	0.55	0.61	0.91	0.40	0.29	0.29	0.49	0.62	0.26	0.42
	Rice/ wheat	0.48	0.68	0.98	0.62	0.38	0.38	0.52	0.75	0.46	0.53
	Rice/Mustard	0.65	0.66	0.99	0.47	0.42	0.42	0.52	0.73	0.40	0.52
Handiya	Wheat/Wheat	0.48	0.33	0.78	0.56	0.39	0.39	0.14	0.38	0.29	0.30
	Mustard/Mustard	0.40	0.35	0.42	0.39	0.27	0.27	0.27	0.30	0.33	0.29
	Rice/ wheat	0.52	0.40	0.79	0.61	0.47	0.47	0.26	0.77	0.40	0.47
	Rice/Mustard	0.47	0.39	0.44	0.40	0.35	0.35	0.36	0.36	0.39	0.37
karoan	Wheat/Wheat	0.92	0.55	0.55	0.48	0.62	0.62	0.33	0.40	0.39	0.44
	Mustard/Mustard	0.43	0.35	0.59	0.42	0.30	0.30	0.26	0.43	0.30	0.32
	Rice/ wheat	0.92	0.61	0.55	0.52	0.62	0.62	0.36	0.44	0.39	0.46
	Rice/Mustard	0.47	0.36	0.65	0.38	0.35	0.35	0.26	0.44	0.36	0.35
Bara	Wheat/Wheat	0.55	0.52	0.60	0.79	0.36	0.36	0.27	0.46	0.55	0.41
	Mustard/Mustard	0.62	0.53	0.68	0.81	0.48	0.48	0.42	0.44	0.39	0.43
	Rice/ wheat	0.60	0.52	0.59	0.79	0.44	0.44	0.35	0.48	0.62	0.47
	Rice/Mustard	0.65	0.56	0.74	0.88	0.49	0.49	0.46	0.61	0.78	0.59
Phulpur	Wheat/Wheat	0.74	0.69	1.13	0.94	0.60	0.60	0.49	0.91	0.68	0.67
	Mustard/Mustard	0.99	1.04	1.14	0.92	0.52	0.52	0.90	0.79	0.65	0.72
	Rice/ wheat	0.75	0.74	1.18	1.01	0.73	0.73	0.52	1.05	0.79	0.77
	Rice/Mustard	0.99	1.08	1.14	0.92	0.85	0.85	0.87	0.91	0.78	0.85
Sadar	Wheat/Wheat	0.68	0.75	0.68	0.91	0.55	0.55	0.65	0.49	0.73	0.60
	Mustard/Mustard	0.68	0.75	0.55	0.79	0.53	0.53	0.62	0.42	0.59	0.54
	Rice/ wheat	0.74	0.78	0.66	0.94	0.65	0.65	0.61	0.55	0.73	0.63
	Rice/Mustard	0.73	0.74	0.62	0.87	0.62	0.62	0.65	0.53	0.66	0.62

TABLE 4
SOILS ORGANIC CARBON STOCK (T/ HA) OF DIFFERENT CROPPING SYSTEM AT 0-15 CM AND 15-30 CM DEPTHS AT GROWING STAGE OF MAJOR CROPS OF 2017-18.

Tehsils	Cropping system	(0-15 cm) depth				Mean	(15-30 cm) depth				Mean
		V1	V2	V3	V4		V1	V2	V3	V4	
Meja	Wheat/Wheat	17.32	33.15	22.28	22.08	23.71	14.04	19.91	18.41	21.79	18.54
	Mustard/Mustard	16.30	28.22	21.02	13.85	19.85	10.47	20.71	19.01	18.41	17.15
	Rice/ wheat	18.95	35.88	31.60	27.30	28.43	16.01	26.84	23.47	23.38	22.42
	Rice/Mustard	19.50	30.42	29.87	16.45	24.06	13.35	22.08	22.09	23.87	20.35
Saroan	Wheat/Wheat	20.90	32.47	22.09	12.99	22.11	13.10	31.40	19.01	9.20	18.18
	Mustard/Mustard	13.73	28.08	9.96	26.21	19.49	10.12	15.48	16.43	5.85	11.97
	Rice/ wheat	29.06	17.75	31.60	30.89	27.33	18.41	5.62	26.86	23.01	18.47
	Rice/Mustard	23.79	26.11	23.40	30.74	26.01	19.79	18.41	16.88	23.07	19.54
Karchana	Wheat/Wheat	16.11	21.79	30.89	20.71	22.37	10.76	14.51	26.11	14.99	16.59
	Mustard/Mustard	18.02	20.35	30.30	13.42	20.52	10.04	17.49	22.46	9.20	14.80
	Rice/ wheat	16.02	22.51	29.25	20.78	22.14	13.35	17.94	26.47	17.06	18.70
	Rice/Mustard	23.01	22.67	32.90	15.58	23.54	15.23	19.50	25.77	14.27	18.69
Handiya	Wheat/Wheat	16.02	10.53	23.40	16.77	16.68	12.99	5.06	12.89	10.30	10.31
	Mustard/Mustard	14.27	11.69	14.23	13.81	13.50	9.83	9.66	11.21	12.97	10.92
	Rice/ wheat	17.47	12.21	25.22	18.70	18.40	16.85	9.20	26.92	14.51	16.87
	Rice/Mustard	16.57	12.87	14.72	13.30	14.36	12.64	12.78	13.65	14.04	13.28
karoan	Wheat/Wheat	32.67	18.18	18.18	15.01	21.01	22.46	11.70	14.27	13.69	15.53
	Mustard/Mustard	14.29	11.37	19.31	13.85	14.70	10.94	9.20	15.19	10.58	11.48
	Rice/ wheat	32.12	20.16	18.18	16.54	21.75	23.40	12.89	15.91	12.99	16.30
	Rice/Mustard	15.16	12.12	19.50	12.10	14.72	11.69	9.20	14.72	12.89	12.12
Bara	Wheat/Wheat	19.33	17.78	17.94	26.17	20.31	13.65	10.16	15.83	19.66	14.82
	Mustard/Mustard	21.34	18.87	22.51	28.05	22.69	17.32	15.60	15.65	14.63	15.80
	Rice/ wheat	21.17	17.32	18.43	25.69	20.65	16.58	12.64	17.17	22.46	17.21
	Rice/Mustard	21.65	20.12	25.79	29.44	24.25	17.78	17.06	22.00	31.12	21.99
Phulpur	Wheat/Wheat	22.23	20.67	33.93	30.33	26.79	19.93	16.47	30.58	23.93	22.73
	Mustard/Mustard	32.01	31.20	38.13	30.74	33.02	18.41	32.29	28.79	24.38	25.97
	Rice/ wheat	22.62	24.45	35.49	33.46	29.01	24.24	17.78	35.06	27.83	26.23
	Rice/Mustard	32.93	36.25	37.07	30.74	34.25	29.91	31.09	32.76	28.08	30.46
Sadar	Wheat/Wheat	21.90	25.11	23.52	31.40	25.48	19.33	23.01	17.78	26.21	21.58
	Mustard/Mustard	23.12	24.43	18.18	26.41	23.03	19.19	22.09	14.98	21.76	19.50
	Rice/ wheat	24.68	27.61	23.27	33.13	27.17	23.40	22.00	20.48	26.21	23.02
	Rice/Mustard	25.77	24.68	20.22	30.83	25.37	23.40	23.01	17.75	24.86	22.26

	Due to depth	Due to cropping system	Due to tehsil	Due to village
Result	S	S	S	S
S. ed.	0.61	0.87	1.23	0.87
CD at 5%	1.22	1.73	2.44	1.73

IV. CONCLUSIONS

The current study indicates that different cropping systems have significant impact on soil organic carbon stock. Soils under different cropping systems showed best results than monoculture crops. The study indicates that rice-wheat cropping system shows higher organic carbon stock than all other cropping systems and lowest in mustard-mustard cropping system.

Therefore, present study shows the different cropping system have a potential to enhance soil organic carbon and helpful in soil carbon stabilization.

REFERENCES

[1] **Batjes, N.H. (1996)**. Total carbon and nitrogen in the soils of the world. *Eur. J. Soil Sci*. 47: 151–163.

[2] **Brar, J.S. and Benbi, D.K. (2009).** A 25-year record of carbon sequestration and soil properties in intensive agriculture. Agronomy for Sustainable Development, 29:257–265.

[3] **Campbell CA, Janzen HH, Paustian K, Gregorich EG, Sherrod L, Liang BC, Zentner RP (2005).** Carbon storage in soils of the North American Great Plains: efect of cropping frequency. Agron J. 2005;97(2):349–63

[4] **Eswaran, H., Van Den Berg, E. and Reich, P. (1993)**. Organic carbon in soils of the world. *Soil Sci. Soc. Am. J*. 57:192-194.

[5] **Gan, Y.T., Hamel, C., O'Donovan, J.T., Cutforth, H., Zentner, R.P. and Campbell, C.A., Niu, Y.N. and Poppy, L. (2015)**. Diversifying crop rotations with pulses enhances system productivity. *Sci Rep.*, 5:14625. 22.

[6] **Jones, C. (2007).** Australian Soil Carbon Accreditation Scheme, Presentation for "Managing The Carbon Cycle" Katanning Workshop, 21-22 March 2007, Carbon For Life Inc. Australia.

[7] **Kelley, K.W., Long, J.H. and Todd, T.C. (2003)**. Long-term crop rotations affect soybean yield, seed weight, and soil chemical properties. *Field Crops Res*., 83: 41–50

[8] **Lal, R. (2004).** Soil carbon sequestration in India. *Climatic Change*, 65: 277–296.

[9] **Lal, R., Kimble, J., Levin, E. and Stewart, B. A. (1995)**. Advances in soil science: Soil management and greenhouse effect. *Bocan Raton: Lewis Publishers*. P. 93.

[10] **Mc Daniel, M.D., Tiemann, L.K., Grandy, A.S., (2014)**. Does agricultural crop diversity enhance soil microbial biomass and organic matter dynamics? A meta-analysis. *Ecol. Appl.* 24:560-570.

[11] **Muthuval, P., Udaysoorian., Natesan, R. And Ramaswami, P.P. (1992).** Introduction to soil analysis, Tamil Nadu Agricultural University, Coimbbatore-641002.

[12] **Paustian, K., Parton, W.J. and Persson, J. (1992)**. Modeling soil organic matter in organic amended and nitrogen fertilized long-term plots. *Soil Science Society of America Journal*, 56: 476–488

[13] **Smith, P., Fang, C., Dawson, J.J.C. and Moncrieff, J.B. (2008).** Impact of global warming on soil organic carbon. *Advances Agron*, 97:1–43.

[14] **Stevenson, F.J. (1965).** Origin and distribution of nitrogen in soil. In: Bartholomew W.V., Clarke F.E. (Eds.), *Agronomy Series* No.10, pp. 1–42

[15] **Varvel, G.E. (2000).** Crop rotation and nitrogen effects on normalized grain yields in a long-term study. *Agron. J.*, 92: 938–941.

[16] **Walkey, A.J. and Black, I.A. (1947)**. An examination of the Degtjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method, *Soil Sci*. 37: 29-38.