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Block wise study of soil parameters under different land use system of district Sultanpur

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Abstract
A survey was conducted during the year 2021 to study the influence of different land use pattern on soil properties under different block of district Sultanpur. Six different land use pattern were taken under study namely, i.-Rice-Wheat Cropping System, ii.-Legume based cropping system, iii.-Vegetable based cropping system, iv.-Horticulture based cropping system, v-Salt affected Soils, vi- Pasture/ forest Soils. Result revealed that, among the different land use system, the pasture forest based land use observed better soil properties *viz.* normal pH, EC, with high organic carbon content, which was closely followed by horticulture based cropping system.

Keywords: pH, EC, OC, land use system

Introduction
Sultanpur is an agrarian district of the eastern-plain zone of U.P. It lies between 810 32' and 820 4' East longitude and 250 59' and 250 40' North latitude with geographical areas of 4436 km^2. Initially district was divided into four sub-divisions and 19 blocks for administrative and development purposes. Later on, it was reorganized and divided into 7 sub divisions, 24 blocks, 187 Nyaya Panchayats comprising of 2,531 villages in 1991. Again the district has been reorganized excluding 2 subdivisions, 10 blocks, 73 Nyaya Panchayats and 800 villages. At present district has 4 subdivisions, 14 blocks, 113 Nyaya Panchayats and 1731 Villages in July 2010**.** The soil acts as a reservoir of water and nutrients and therefore, provides support to plants. However, in addition being a physical medium, the soil may be considered a living system, vital for producing the food and fiber for the human need and for maintaining the ecosystems on which whole life depends. Soil directly and indirectly affects agricultural productivity, water quality, and the global climate through its function as a medium for plant growth and as regulator of water flow and nutrient cycling. Soil health or soil quality is defined as the ability of a specific kind of soil to function within its natural ecosystem boundaries to support plant and animal productivity, maintain or enhance water or air quality, and provide support to human health and habitation (Karlen *et al.*, 2008) [2]. It is a dynamic interaction between various physical, chemical and biological properties, which are influenced by many external factors such as land use systems, land management practices, environment and socio-economic priorities. Soil properties reflect the change in the capacity of different kind of soil to function, that changes its response to management or climate. The National Resources Conservation Service (NRCS) added inherent and dynamic soil quality terms to its definition. The inherent soil quality is the part of soil quality resulting due to natural composition of the soil and due to various factors and processes of soil formation which are not affected by the human interventions. Whereas dynamic soil quality is defined as the aspect of soil quality that changes as a result of soil put to various use and its management by human over a time scale.

Material and Methods
Three spots of each block were selected from selected sites randomly under each land use system. Soil samples were taken with the help of auger from 0-15 cm, 15-30 cm, 30-45 cm and 45-60 cm depths respectively in each land use system. In all 120 samples, 36 each from crop plantation forestlandand12frombarrenweretakenwithGPS system. In addition, undisturbed soil samples of known volume were taken with sharp edged core sampler for determination of bulk density.

A portion of the composite soil samples, was stored at low temperature (4 ^{0}C) in deep freeze for the determination of biological soil properties. The samples stored at low temperature were used for various biological studies within 20-30 days of sampling. To assess the various treatment effects, soil sample were collected from different sites. Soil pH and EC were determined by following Jackson (1973). Soil organic carbon was determined by Walkley and Black (1934) rapid titration procedure.

Results and Discussion

Thesoil sampling site and their pH, EC and Organic are presented in the table 1, 2 and 3. It is evident from the table that maximum pH (8.62) was recordedunder salt affected soil (SAS) site of Dostpur blocks, which isclosely followed by pH (8.59) in the Motigarpur blocks and minimum pH (7.04) was found at posture/ forest soil (PFS) site of Dhanpatganj blocks, which is followed by pH (7.08) in the Kadipur blocks. The maximum EC (1.71 dSm^{-1}) was recorded from salt affected soil (SAS) site of Dubeypur blocks, which isclosely followed by EC (1.65 dSm^{-1}) in the Dostpur blocks and minimum EC (0.24 dSm^{-1}) was found at posture/ forest soil (PFS) site of Karaudikalan blocks, which is followed by EC (0.25 dSm^{-1}) in the Pratapur Kamaicha blocks. The maximum OC (6.88 gkg^{-1}) was recorded from posture/ forest soil (PFS) site of Motigarpur blocks, which isclosely followed by OC (6.67 gkg^{-1}) in the Lambhua blocks and minimum OC (2.12 gkg^{-1}) was found at salt affected soil (SAS) site of Lambhua blocks, which is followed by OC (3.02 gkg^{-1}) in the Akhand Nagar blocks. The pH value range from (7.04 to 8.62) and with an average value of 7.72, organic carbon range from (2.12 to 6.88 gkg^{-1}) and with an average value (4.55 gkg^{-1}), Electronic conductivity ranged from (0.24 to1.71dSm^{-1}) and with an average value (0.50 dSm^{-1}). The Standard deviation of pH, Organic Carbon and Electronic conductivity were 0.40, 1.09 and 0.38 respectively.The discussed soil pH and EC was less at upper soil due to the continuous use of plantation and cultivation results to decrease in soil pH value at the upper soil layer. The reduction in soil pH was mainly due to the release of organic acids in the soil upon decomposition of organic matter received from tree and solubilisation of residues. This is in accordance with the results of Najar (2002) [3]. A similar decreasing trend of soil organic carbon was also observed by Sheikh *et al.,* (2009) [5]. The higher concentration of soil organic carbon in the top layer has also been reported by Notaro *et al.,* (2013) [4]; Dinakaran and Krishnayya (2008) [1].

Table 1: Soil pHunder different land use systems.

Land Use Systems	Blocks													
	Akhand Nagar	Baldirai	Bhadai Yaan	Dhanpat Ganj	Dostpur	Dubeypur	Jaisinghpur	Kadipur	Karaudi Kalan	Kurebhar	Kurwar	Lambhua	Motigarpur	Pratapur Kamaicha
RWCS	7.63	7.77	7.84	7.04	8.04	8.12	7.79	7.87	7.54	7.84	7.85	7.84	8.18	7.51
LBCS	7.57	7.67	7.51	7.12	7.68	7.65	7.64	7.82	7.43	7.67	7.74	7.66	7.85	7.46
VBCS	7.78	7.87	7.42	7.09	8.07	7.99	7.97	7.88	7.45	7.68	7.85	7.51	7.87	7.59
HBCS	7.81	7.54	7.42	7.17	7.99	7.68	7.87	7.16	7.37	7.68	7.96	7.44	8.09	7.64
SAS	8.34	8.45	8.17	8.08	8.62	8.58	8.42	8.57	8.14	8.27	8.37	8.12	8.59	8.15
PFS	7.35	7.25	7.38	7.18	7.22	7.47	7.26	7.08	7.37	7.12	7.17	7.25	7.14	7.23
Min.	7.35	7.25	7.38	7.04	7.22	7.47	7.26	7.08	7.37	7.12	7.17	7.25	7.14	7.23
Max.	8.34	8.45	8.17	8.08	8.62	8.58	8.42	8.57	8.14	8.27	8.37	8.12	8.59	8.15
T. average	7.77	7.78	7.66	7.35	7.93	7.94	7.83	7.74	7.61	7.71	7.81	7.62	7.90	7.60
Stdev.s	0.33	0.40	0.32	0.40	0.46	0.40	0.43	0.61	0.33	0.37	0.39	0.33	0.52	0.31

Table 2: Soil EC (dSm^{-1}) under different land use systems.

Land Use Systems	Blocks													
	Akhand Nagar	Baldirai	Bhadai Yaan	Dhanpat Ganj	Dostpur	Dubeypur	Jaisinghpur	Kadipur	Karaudi Kalan	Kurebhar	Kurwar	Lambhua	Motigarpur	Pratapur Kamaicha
RWCS	0.35	0.37	0.39	0.27	0.68	0.63	0.44	0.37	0.39	0.33	0.38	0.37	0.54	0.35
LBCS	0.28	0.27	0.29	0.24	0.38	0.37	0.32	0.32	0.30	0.31	0.25	0.28	0.47	0.29
VBCS	0.29	0.28	0.29	0.25	0.41	0.49	0.39	3.34	0.27	0.31	0.31	0.28	0.49	0.31
HBCS	0.30	0.30	0.30	0.26	0.53	0.58	0.41	0.35	0.31	0.39	0.28	0.29	0.52	0.32
SAS	1.17	0.98	1.07	0.87	1.65	1.71	1.42	1.58	0.94	1.27	1.37	0.76	1.45	1.37
PFS	0.24	0.25	0.24	0.28	0.27	0.26	0.24	0.28	0.24	0.28	0.27	0.24	0.26	0.25
Min.	0.24	0.25	0.24	0.24	0.27	0.26	0.24	0.28	0.24	0.28	0.25	0.24	0.26	0.25
Max.	1.17	0.98	1.07	0.87	1.65	1.71	1.42	3.34	0.94	1.27	1.37	0.76	1.45	1.37
T. average	0.48	0.44	0.47	0.38	0.73	0.76	0.60	1.19	0.44	0.52	0.52	0.40	0.69	0.53
Stdev.s	0.36	0.28	0.32	0.25	0.51	0.53	0.44	1.23	0.27	0.39	0.44	0.20	0.42	0.44

Table 3: Soil Organic Carbon (gkg^{-1}) under different land use systems.

Land Use Systems	Blocks													
	Akhand Nagar	Baldirai	Bhadai Yaan	Dhanpat Ganj	Dostpur	Dubeypur	Jaisinghpur	Kadipur	Karaudi Kalan	Kurebhar	Kurwar	Lambhua	Motigarpur	Pratapur Kamaicha
RWCS	3.67	3.75	3.89	3.78	3.89	3.95	3.61	3.78	3.42	3.51	3.64	3.67	3.92	3.51
LBCS	4.55	4.67	4.79	4.89	4.52	4.57	4.58	4.76	4.52	4.53	4.59	4.81	4.82	4.51
VBCS	4.16	4.17	4.26	4.28	4.49	4.34	4.31	4.33	4.46	4.31	4.34	4.21	4.23	4.54
HBCS	5.56	5.61	5.39	5.42	5.25	5.16	5.35	5.33	5.42	5.31	5.45	5.32	5.21	5.16
SAS	3.02	3.07	3.16	3.21	3.18	3.27	3.25	3.34	3.33	3.16	3.24	2.12	3.26	3.01
PFS	6.52	6.62	6.36	6.37	6.38	6.47	6.88	6.16	6.37	6.26	6.28	6.67	5.89	5.79

Min.	3.02	3.07	3.16	3.21	3.18	3.27	3.25	3.34	3.33	3.16	3.24	2.12	3.26	3.01
Max.	6.52	6.62	6.36	6.37	6.38	6.47	6.88	6.16	6.37	6.26	6.28	6.67	5.89	5.79
T. average	4.63	4.70	4.67	4.69	4.66	4.69	4.76	4.65	4.65	4.56	4.63	4.45	4.56	4.42
Stdev.s	1.28	1.29	1.13	1.15	1.11	1.10	1.31	1.03	1.17	1.15	1.13	1.54	0.95	1.03

Conclusion

It is concluded from the data appreciable improvement in soil important properties in pasture forest land use system observed which is closely followed by horticulture based land use system.

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