AN AJSS

An Asian Journal of Soil Science

Volume **8** | Issue 2 | December, 2013 | 476-486

Research Article

Characterization and classification of soils of water management project, MPKV, Rahuri Dist. Ahmednagar, Maharashtra

PUKHRAJ KATARIYA **AND** B.D. BHAKARE

Received : 17.10.2013; **Revised :** 16.11.2013; **Accepted :** 24.11.2013

MEMBERS OF RESEARCH FORUM :

Corresponding author :
PUKHRAJ KATARIYA, Department of Soil Science and Agriculture Chemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA

Co-authors :
B.D. BHAKARE, Department of Soil Science and Agriculture Chemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA

Summary

The detailed soil survey of Water Management Project area, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra was carried out during the year 2009. The studies on morphological characteristics physical and chemical properties of soils were undertaken through grid and profile sampling. Based on the data obtained the soils were categorized and classified upto soil series level and the soil fertility status was mapped. soils of water management project area in general were clayey to silt clay loam in texture. The colour of soil samples was hue 10 YR with value varied from 3 to 5 and chroma 2 to 6. The pH of the soil of Water Management Project area ranged between 7.52 to 8.30 with mean value of 7.91 and categorized as moderately alkaline in nature. The pH was below 8.0 in the light textured and well drained soil. The EC of surface soils ranged from 0.29 to 0.51 dSm^{-1} with mean value of 0.41 dSm^{-1}. The organic carbon content of soils ranged from 0.43 to 0.87 per cent with mean value of 0.73 per cent and categorized in medium to high range. The soils were categorized in low in available N content (137.98 to 276.32 kg ha^{-1}), medium to high available P (9.60 to 27.77 kg ha^{-1}) and available K was high (269 to 694 kg ha^{-1}). Based on soil characteristics, the soils are classified as *Vertic Haplustept, Typic Haplustept, Fluventic Haplustept, Typic Haplustert.*

Key words : Water managemen project, pH, Organic carbon

How to cite this article : Katariya, Pukhraj and Bhakare, B.D. (2013). Characterization and classification of soils of water management project, MPKV, Rahuri Dist. Ahmednagar, Maharashtra. *Asian J. Soil Sci.*, **8**(2): 476-486.

Introduction

The AICRP on Water Management Project is situated at the central campus of Mahatma Phule Krishi Vidypaeeth, Rahuri 30 km away from Ahmednagar. The location of the campus is between 19^0 47' N to 19^0 57' N latitude and between 74^0 19' E longitude. The project was continued during the seventh five year plan. The elevation of the project area from mean sea level is between 434.94 to 438.60 m. while the location of the project is between $19^0$21. 998'N to $074^0$38.733E to $19^0$21.833'N and $074^0$38.585'E as derived with the help of GPS. The depth of soil varies from 60 to 120 cm. Textural class ranged from silty loam to clay. In general the soils are well drained and there is no problem of water logging. The water level is below 3m. The physiographical area comes under lower piedmont plain. Soils of the area were derived from the igneous rock *viz.*, Basalt. The dominant type of clay mineral is *Smectite*. The average rainfall of 606.75 mm was received in 33.29 average rainy days from January 1986 to December 2009 which was 16.68 per cent higher than annual average rainfall of 520 mm. The rainfall received in the months of June and July for the years was helpful for land preparation and sowing of *Kharif* crops. The mean maximum and minimum yearly temperature ranged from 30.80C to 36.60C and 13.70C to 18.00 C, respectively. The mean yearly morning relative humidity ranged from 62.5% to 79.5% and evening humidity ranged from 34% to 47.5%, respectively. The Mula canal water is the source of irrigation. The quality of water is good (C1S1). The present study, therefore, was planned to characterize and classify the soils of Water Management Project.

Resource and Research Methods

High intensity detailed soil survey of Water Management Project was carried out by following standard method as suggested by Soil Survey Staff (1998) and NBSS and LUP guidelines. A map of scale 1:5000 was used as base map. Soil mapping was done by traversing the area of grid spot at every 50 m distance with auger bore sample checking for soil depth, texture and colour etc. The grid spot showing similar characteristics were chosen for studying the representative soil profile for compilation of soil profile and auger bored properties and then the pedons were exposed for profile study. The soil samples were collected horizon wise from typifying pedon and studied for morphological, chemical and physical properties. The surface soil samples were also collected for studying the different chemical and physical properties of soils and were taxonomically classified and correlated with established soil series as per soil series of Maharashtra (Soil Series of Maharashtra by Challa *et al.*, 1999). Six representative pedons (pedon 1 to 6) from water management project MPKV Rahuri were exposed up to 1m or to a lithic contact. All these pedons were examined morphologically. Soil samples collected from each horizon were analysed for physical and chemical soil properties *viz.*, soil texture feel method, soil texture [International Pipette Piper (1966)] (profile sample), bulk density clod coating Soil colour by Munsell colour chart Hydraulic Conductivity (Constant Head Method), Field capacity and perrmanent wilting point (Pressure membrane apparatus), Consistency (Soil workability), chemical properties pH Potentiometric, EC Conductiometric, organic carbon Walkley and Black (1934) (wet oxidation), available nitrogen alkaline permanganate, available phosphorus $NaHCO_3$ (0.5M) pH 8.5 (Ascorbic acid), available potassium 1 N neutral ammonium acetate extract pH 7.0, Free $CaCO_3$ rapid titration, micronutrient DTPA - extractable, cations Ca^{++}, Mg^{++}, Na^+, K^+ Versanate titration flame photometer, CO_3^{-2}, HCO_3^-, Cl^-, SO_4^{2} turbidimetry the soils were classified taxonomically as per key to soil taxonomy (2006).

Research Findings and Discussion

The data regarding morphological characteristics of surface soil (grid samples) presented in Table 1 revealed that the soils of water management project in general were clayey to silty clay loam in texture, the depth of the soil ranged between 0 to >120 cm. The colour of the soil samples were in hue 10 YR, with value varying from 3 to 5 and chroma 2 to 6.

Chemical properties of surface soil :

The data pertaining to chemical properties of soil *viz*., pH, EC, organic carbon and available nutrients are presented in Table 2. pH of the soil ranged from slightly alkaline to moderately alkaline (7.50 to 8.30) with mean value of 7.89 (moderately alkaline) of water management project area. The electrical conductivity of soil was normal and which varied from 0.29 to 0.51 dSm^{-1} with mean value of 0.41 dSm^{-1}. Organic carbon content of the Water Management Project soils varied from 0.43 to 0.87 per cent with mean value of 0.73 per cent. it was observed that the available N and P contents were in low to medium range whereas, available K content was high. Available nitrogen content ranged from 137.98 to 276.32 kg ha^{-1} with mean value 165.88 kg ha^{-1} categorized as low. The available phosphorus ranged from 9.60 to 22.32 kg ha^{-1} with mean value 15.96 kg ha^{-1} and categorized as low to medium. Available potassium ranged from 269 to 694 kg ha^{-1} with mean value 481.50 and categorized as high.

Six representative profiles were opened with standard size and depth of the soil. The pedons were demarcated on the basis of the guidelines given by Soil Survey Manual, 1998 and observations for colour, texture, structure, consistency were taken and are reported under individual pedon. Typifying pedon-1 (*Vertic Haplustept*) The soils are developed over soft weathered basalt and occur on nearly leveled to very gentle slopping pidmont, with dark yellowish brown to very dark grayish brown colour, depth > 70 cm, clayey texture, strong to moderate blocky structure, dry slight to very hard with slight to very sticky plasticity with moderate effervences. These soils are classified as fine montmorillonitic *hyperthermic* family of *Vertic Haplustept*. The physico-chemical properties revealed that the soils are clayey in texture with bulk density ranged between 1.34 to 1.43 Mgm^{-3}, hydraulic conductivity 0.82 to 0.93 $cmhr^{-1}$, FC 37.69 to 40.30 per cent and PWP 18.18 to 20.00 per cent. pH is moderately alkaline with low hydraulic conductivity and moderate $CaCO_3$, low to medium N, medium P and high K content, with cations in order of Ca > Mg > Na > K while anions in the order of Cl > HCO_3 > SO_4. Chaudhari *et al*. (2006). Typifying pedons -2 and 3 (*Typic Haplustept*). The soil of the pedon was deep developed over soft weathered basalt, with dark grey to very dark grayish brown, clayey to clay loam, sub-angular blocky, dry very hard, medium to very plastic strong effervences with wide cracks. These soils are classified as fine montmorillonitic hyperthermic family of *Typic Haplustept*. The physic-chemical properties revealed that the depth is more than 80 cm with clayey to silty clay loam texture, bulk density ranged between 1.14 to 1.48 Mgm^{-3}, hydraulic conductivity 0.79 to 1.72 cm hr^{-1}, field capacity 28.18 to 43.60 per cent and permanent wilting point 14.00 to 21.01 per cent. pH being medium to strongly alkaline, low in EC and medium to low in $CaCO_3$, low in N, low to medium in P and high in K content with cations in the order of Mg > Ca > Na > K while anions in the order of HCO_3 > Cl > SO_4. Vara Prasad Rao *et al*. (2008)Typifying pedons- 4 and 5 (*Fluventic Haplustept*). The soils in the pedons are deep (> 120 cm) developed over alluvial material and occur on nearly leveled to very gently slopping pidmont. These soils are brown to dark yellowish brown with

Table 1 : Morphological characters of soils (grid samples) of water management project

Sr. No.	Sample No.	Morphological characters				
		Location	Elevation (m)	Depth (cm)	Texture	Colour
1.	A1	19^{0}21. 998' N 0 74^{0}38. 753' E	434.94	~ 80	Clay	10YR5/3
2.	A2	19^{0}21. 997' N 0 74^{0}38. 726' E	434.94	> 120	Clay	10YR5/3
3.	A3	19^{0}21. 996' N 0 74^{0}38. 702' E	434.94	> 120	Clay	10YR5/3
4.	A4	19^{0}21. 995' N 0 74^{0}38. 673' E	434.94	> 120	Clay	10YR4/3
5.	A5	19^{0}21. 991' N 0 74^{0}38. 646' E	434.94	> 120	Clay	10YR4/3
6.	A6	19^{0}21. 992' N 0 74^{0}38. 618' E	434.94	> 120	Clay	10YR5/3
7.	A7	19^{0}21. 989' N 0 74^{0}38. 592' E	435.25	> 120	Clay	10YR4/3
8.	A8	19^{0}21. 986' N 0 74^{0}38. 566' E	435.25	> 120	Clay	10YR4/3
9.	A9	19^{0}21. 987' N 0 74^{0}38. 541' E	435.55	> 120	Clay	10YR5/3
10.	A10	19^{0}21. 985' N 0 74^{0}38. 513' E	435.55	> 120	Clay	10YR5/4
11.	A11	19^{0}21. 985' N 0 74^{0}38. 488' E	434.94	> 120	Silty Clay Loam	10YR5/3
12.	A12	19^{0}21. 985' N 0 74^{0}38. 462' E	434.94	> 120	Silty Clay Loam	10YR5/3
13.	A13	19^{0}21. 985' N 0 74^{0}38. 432' E	434.94	> 120	Silty Clay Loam	10YR5/4
14.	B1	19^{0}21. 959' N 0 74^{0}38. 400' E	434.94	~ 80	Clay	10YR4/2
15.	B2	19^{0}21. 958' N 0 74^{0}38. 421' E	434.94	>120	Clay	10YR4/2
16.	B3	19^{0}21. 960' N 0 74^{0}38. 448' E	434.94	>120	Clay	10YR4/2
17.	B4	19^{0}21. 959' N 0 74^{0}38. 471' E	434.94	>120	Clay	10YR4/2
18.	B5	19^{0}21. 959' N 0 74^{0}38. 496' E	434.94	>120	Clay	10YR4/2
19.	B6	19^{0}21. 960' N 0 74^{0}38. 519' E	434.94	>120	Clay	10YR4/3
20.	B7	19^{0}21. 960' N 0 74^{0}38. 543' E	435.25	>120	Clay	10YR4/2
21.	B8	19^{0}21. 961' N 0 74^{0}38. 576' E	435.55	>120	Clay	10YR4/3
22.	B9	19^{0}21. 962' N 0 74^{0}38. 606' E	435.25	>120	Clay	10YR4/3
23.	B10	19^{0}21. 963' N 0 74^{0}38. 636' E	435.25	>120	Clay	10YR4/3
24.	B11	19^{0}21. 965' N 0 74^{0}38. 665' E	434.94	>120	Clay	10YR5/4

Table 1..... Contd.

Table 1..... Contd...

25.	B12	$19^0$21. 967' N 0 $74^0$38. 690' E	434.94	>120	Silty Clay Loam	10YR5/3
26.	B13	$19^0$21. 969' N 0 $74^0$38. 717' E	435.25	>120	Silty Clay Loam	10YR5/3
27.	C1	$19^0$21. 943' N 0 $74^0$38. 757' E	434.94	≃ 80	Silty Clay Loam	10YR5/3
28.	C2	$19^0$21. 942' N 0 $74^0$38. 727' E	434.94	> 120	Clay	10YR4/3
29.	C3	$19^0$21. 937' N 0 $74^0$38. 698' E	434.94	> 120	Clay	10YR4/3
30.	C4	$19^0$21. 937' N 0 $74^0$38. 667' E	434.94	> 120	Clay	10YR4/2
31.	C5	$19^0$21. 934' N 0 $74^0$38. 639' E	434.94	> 120	Clay	10YR4/2
32.	C6	$19^0$21. 931' N 0 $74^0$38. 609' E	434.94	> 120	Clay	10YR4/3
33.	C7	$19^0$21. 929' N 0 $74^0$38. 581' E	435.25	> 120	Clay	10YR5/6
34.	C8	$19^0$21. 927' N 0 $74^0$38. 552' E	435.55	> 120	Clay	10YR5/6
35.	C9	$19^0$21. 933' N 0 $74^0$38. 523' E	436.47	> 120	Clay	10YR5/6
36.	C10	$19^0$21. 934' N 0 $74^0$38. 492' E	434.94	> 120	Clay	10YR5/4
37.	C11	$19^0$21. 938' N 0 $74^0$38. 462' E	434.94	> 120	Clay	10YR5/4
38.	D1	$19^0$21. 911' N 0 $74^0$38. 758' E	434.94	≃ 80	Clay	10YR5/4
39.	D2	$19^0$21. 915' N 0 $74^0$38. 737' E	434.94	≃ 100	Clay	10YR 5/3
40.	D3	$19^0$21. 912' N 0 $74^0$38. 699' E	434.94	> 120	Clay	10YR5/3
41.	D4	$19^0$21. 909' N 0 $74^0$38. 675' E	434.94	> 120	Clay	10YR4/2
42.	D5	$19^0$21. 907' N 0 $74^0$38. 644' E	435.86	> 120	Clay	10YR5/3
43.	D6	$19^0$21. 906' N 0 $74^0$38. 616' E	435.86	> 120	Clay	10YR4/2
44.	D7	$19^0$21. 905' N 0 $74^0$38. 588' E	436.47	> 120	Clay	10YR4/2
45.	D8	$19^0$21. 902' N 0 $74^0$38. 560' E	436.47	> 120	Clay	10YR4/2
46.	D9	$19^0$21. 899' N 0 $74^0$38. 536' E	435.86	> 120	Silty Clay Loam	10YR5/4
47.	D10	$19^0$21. 867' N 0 $74^0$38. 502' E	435.86	> 120	Silty Clay Loam	10YR4/2
48.	E1	$19^0$21. 869' N 0 $74^0$38. 532' E	437.38	~ 80	Clay	10YR4/3

Table 1..... Contd...

Table 1..... Contd...

49.	E2	$19^0$21. 871' N 0 $74^0$38. 559' E	437.38	~ 100	Clay	10YR4/3
50.	E3	$19^0$21. 782' N 0 $74^0$38. 588' E	437.38	> 120	Clay	10YR4/3
51.	E4	$19^0$21. 870' N 0 $74^0$38. 615' E	437.38	> 120	Clay	10YR5/3
52.	E5	$19^0$21. 873' N 0 $74^0$38. 638' E	437.08	> 120	Clay	10YR5/3
53.	E6	$19^0$21. 869^0 N 0 $74^0$38. 671' E	437.38	> 120	Clay	10YR5/3
54.	E7	$19^0$21. 871^0 N 0 $74^0$38. 701' E	436.47	> 120	Clay	10YR5/4
55.	E8	$19^0$21. 877^0 N 0 $74^0$38. 734' E	436.47	> 120	Clay	10YR4/3
56.	E9	$19^0$21. 846' N 0 $74^0$38. 753' E	436.161	> 120	Silty Clay Loam	10YR5/4
57.	E10	$19^0$21. 848' N 0 $74^0$38. 730' E	436.161	> 120	Silty Clay Loam	10YR5/4
58.	F1	$19^0$21. 848' N 0 $74^0$38. 706' E	436.169	~ 80	Clay	10YR4/2
59.	F2	$19^0$21. 847' N 0 $74^0$38. 681' E	436.169	~ 100	Clay	10YR4/2
60.	F3	$19^0$21. 858' N 0 $74^0$38. 614' E	436.169	> 120	Clay	10YR4/2
61.	F4	$19^0$21. 862' N 0 $74^0$38. 590' E	436.169	> 120	Clay	10YR4/2
62.	F5	$19^0$21. 861' N 0 $74^0$38. 566' E	437.38	> 120	Clay	10YR4/2
63.	F6	$19^0$21. 840' N 0 $74^0$38. 627' E	437.38	> 120	Clay	10YR4/3
64.	F7	$19^0$21. 838' N 0 $74^0$38. 600' E	437.08	> 120	Clay	10YR5/3
65.	F8	$19^0$21. 826' N 0 $74^0$38. 574' E	436.161	> 120	Clay	10YR5/3
66.	F9	$19^0$21. 833' N 0 $74^0$38. 546' E	434.94	> 120	Silty Clay Loam	10YR4/3
67.	F10	$19^0$21. 837' N 0 $74^0$38. 540' E	434.94	> 120	Silty Clay Loam	10YR4/3
68.	G1	$19^0$21. 847' N 0 $74^0$38. 757' E	435.86	~ 80	Clay	10YR3/2
69.	G2	$19^0$21. 848' N 0 $74^0$38. 275' E	435.86	~ 100	Clay	10YR3/2
70.	G3	$19^0$21. 848' N 0 $74^0$38. 697' E	435.86	> 120	Clay	10YR3/2
71.	G4	$19^0$21. 846' N 0 $74^0$38. 665' E	435.86	> 120	Clay	10YR4/2
72.	G5	$19^0$21. 858' N 0 $74^0$38. 653' E	435.86	> 120	Clay	10YR4/2

Table 1..... Contd...

Table 1..... Contd...

73.	G6	19^{0}21. 862' N 0 74^{0}38. 605' E	435.55	> 120	Clay	10YR4/2
74.	G7	19^{0}21. 850' N 0 74^{0}38. 679' E	435.55	> 120	Clay	10YR4/2
75.	G8	19^{0}21. 840' N 0 74^{0}38. 550' E	435.55	> 120	Clay	10YR4/2
76.	G9	19^{0}21. 838' N 0 74^{0}38. 522' E	434.94	> 120	Silty Clay Loam	10YR4/2
77.	G10	19^{0}21. 836' N 0 74^{0}38. 490' E	434.94	> 120	Silty Clay Loam	10YR4/2
78.	H1	19^{0}21. 847' N 0 74^{0}38. 758' E	434.94	> 120	Clay	10YR3/2
79.	H2	19^{0}21. 848' N 0 74^{0}38. 737' E	434.94	> 120	Clay	10YR3/2
80.	H3	19^{0}21. 840' N 0 74^{0}38. 699' E	434.94	> 120	Clay	10YR3/2
81.	H4	19^{0}21. 838' N 0 74^{0}38. 674' E	435.25	> 120	Clay	10YR4/2
82.	H5	19^{0}21. 836' N 0 74^{0}38. 643' E	434.94	> 120	Clay	10YR4/2
83.	H6	19^{0}21. 833' N 0 74^{0}38. 615' E	434.94	> 120	Silty Clay Loam	10YR4/2
84.	H7	19^{0}21. 833' N 0 74^{0}38. 585' E	434.94	> 120	Silty Clay Loam	10YR4/2

Table 2 : Chemical characters of soils (grid samples) of water management project

Sr. No.	Sample No.	Chemical properties					
		pH	EC (dSm^{-1})	Organic carbon (%)	Available		
					N	P	K
					Kg ha^{-1}		
1.	A1	7.52	0.36	0.58	163.07	10.60	291
2.	A2	7.61	0.30	0.64	150.52	16.49	325
3.	A3	7.63	0.29	0.52	188.16	17.84	347
4.	A4	7.72	0.32	0.58	150.52	15.15	403
5.	A5	7.91	0.35	0.50	175.61	16.27	269
6.	A6	7.53	0.29	0.43	163.07	14.70	302
7.	A7	7.62	0.31	0.70	188.16	18.51	291
8.	A8	7.52	0.36	0.74	137.98	19.63	314
9.	A9	7.81	0.34	0.68	150.52	15.15	358
10.	A10	7.92	0.32	0.64	245.00	16.49	381
11.	A11	7.67	0.37	0.60	150.52	16.94	347
12.	A12	7.79	0.32	0.66	175.61	10.84	325
13.	A13	7.93	0.35	0.70	137.98	9.60	392
14.	B1	7.93	0.41	0.83	163.07	12.70	403
15.	B2	7.95	0.43	0.79	137.98	12.03	381
16.	B3	8.10	0.35	0.85	175.61	15.82	403
17.	B4	8.00	0.39	0.81	188.16	16.27	426
18.	B5	7.96	0.37	0.66	145.44	13.44	414
19.	B6	8.10	0.41	0.62	137.98	27.77	504
20.	B7	7.97	0.43	0.70	137.98	17.92	470

Table 2..... Contd...

Table 2..... Contd...

21.	B8	8.19	0.45	0.64	150.52	15.68	538
22.	B9	8.12	0.39	0.79	175.61	17.69	459
23.	B10	8.03	0.43	0.70	137.98	14.92	358
24.	B11	8.07	0.46	0.64	145.44	16.27	482
25.	B12	8.07	0.42	0.64	175.61	13.03	280
26.	B13	7.95	0.43	0.68	145.44	14.25	515
27.	C1	7.79	0.49	0.71	188.16	13.03	403
28.	C2	8.12	0.51	0.78	175.61	11.60	392
29.	C3	8.30	0.39	0.81	175.61	16.27	358
30.	C4	8.21	0.41	0.74	188.16	19.63	325
31.	C5	8.03	0.46	0.78	145.44	19.63	448
32.	C6	7.96	0.48	0.72	145.44	16.44	280
33.	C7	8.01	0.45	0.79	150.52	20.75	358
34.	C8	7.93	0.42	0.68	150.52	17.16	381
35.	C9	8.02	0.47	0.79	175.61	16.27	325
36.	C10	8.12	0.46	0.70	200.70	17.84	426
37.	C11	8.16	0.43	0.72	200.70	13.27	549
38.	D1	8.12	0.42	0.68	150.52	21.42	515
39.	D2	8.01	0.43	0.70	163.07	20.75	515
40.	D3	8.03	0.39	0.74	175.61	22.32	336
41.	D4	7.97	0.41	0.64	145.44	21.2	381
42.	D5	8.01	0.43	0.68	163.07	22.99	437
43.	D6	8.03	0.45	0.70	150.52	20.30	470
44.	D7	8.01	0.42	0.64	150.52	21.20	571
45.	D8	7.89	0.41	0.58	145.44	20.75	482
46.	D9	7.97	0.42	0.68	175.61	17.84	549
47.	D10	8.01	0.45	0.62	188.16	13.72	560
48.	E1	8.10	0.39	0.70	188.16	20.08	504
49.	E2	7.97	0.43	0.74	145.44	21.2	470
50.	E3	8.00	0.42	0.78	150.52	17.84	448
51.	E4	7.99	0.44	0.83	188.16	21.2	515
52.	E5	8.03	0.42	0.85	163.07	16.49	549
53.	E6	8.10	0.43	0.79	137.98	15.15	560
54.	E7	8.12	0.39	0.81	175.61	16.72	560
55.	E8	8.03	0.37	0.76	175.61	18.51	582
56.	E9	7.97	0.39	0.72	150.52	17.16	616
57.	E10	8.01	0.41	0.78	145.44	15.15	605
58.	F1	8.03	0.42	0.85	225.79	16.49	392
59.	F2	8.13	0.45	0.79	250.88	17.16	616
60.	F3	7.97	0.41	0.87	188.16	18.28	672
61.	F4	8.05	0.39	0.83	225.79	16.94	694
62.	F5	8.12	0.42	0.74	276.32	20.75	539
63.	F6	8.10	0.41	0.85	213.60	19.40	549
64.	F7	8.19	0.43	0.68	213.60	19.40	549
65.	F8	8.19	0.45	0.64	225.79	17.47	616

Table 2..... Contd...

Table 2..... Contd...

66.	F9	8.14	0.43	0.58	188.16	20.38	672
67.	F10	8.15	0.41	0.60	188.16	18.36	504
68.	G1	7.99	0.35	0.85	150.52	15.84	549
69.	G2	8.01	0.39	0.87	188.16	19.04	538
70.	G3	8.04	0.41	0.79	175.16	15.68	448
71.	G4	8.01	0.43	0.83	137.98	18.51	549
72.	G5	8.12	0.42	0.85	150.52	16.27	616
73.	G6	8.13	0.45	0.74	150.52	16.72	560
74.	G7	8.14	0.44	0.78	145.44	20.08	650
75.	G8	8.13	0.41	0.81	145.44	19.40	582
76.	G9	8.10	0.46	0.85	150.52	19.73	661
77.	G10	8.13	0.42	0.78	150.52	17.84	571
78.	H1	7.99	0.41	0.85	175.16	18.96	616
79.	H2	8.01	0.42	0.79	175.16	20.30	582
80.	H3	7.82	0.46	0.83	137.98	20.75	608
81.	H4	8.01	0.42	0.81	175.16	20.08	605
82.	H5	7.99	0.41	0.87	188.16	19.63	650
83.	H6	8.02	0.43	0.85	188.16	20.08	694
84.	H7	7.97	0.45	0.78	175.16	14.11	672

Table 2..... Contd...

Table 3 : Taxonomic classification of soil of water management project, MPKV, Rahuri

Soil series	Pedon No.	Ordern	Subordern	Greet group	Sub group	Toxonomic	Classification
Pather series	Pedon 1	Inceptisol	ustept	haplustept	Vertic	Vertic	Haplustept
Ghoshpuri	Pedon 2 & 3	Inceptisol	ustept	haplustept	Typic	Typic	Haplustept
Kolyachiwadi	Pedon 4 & 5	Inceptisol	ustept	haplustept	Fluventic	Fluventic	Haplustept
Babulgaon	Pedon 6	Vertisol	ustert	haplustert	Typic	Typic	Haplustert

Soil survey Staff (2006) keys to soil taxonomy by soil survey staff, USDA, Natural Resource Cont. Service, Tenth Edition PP: 123-204

silty clay loam texture, weak to moderate fine sub angular blocky, moist friable wet slightly sticky, slight plastic, violent effervences, medium permeability. These soils are classified as fine loam mixed hyperthermic family of *fluventic Haplustepts*.The physic-chemical properties indicated that the soils are silty clay loam in texture, with bulk density 1.24 to 1.47 Mgm^{-3}, hydraulic conductivity 0.65 to 0.92 $cmhr^{-1}$, field capacity 30.69 to 39.20 per cent, permanent wilting point 12.35 to 19.40 per cent. The pH of the soil ranged between moderate to strongly alkaline with low EC, low to medium $CaCO_3$, low in available N, low to medium in available P and high available K content. The cations were in the order of Mg> Ca> Na> K in pedon-4 while Ca> Na> Mg> K in pedon-5 and the anions in order of HCO_3 > Cl > SO_4>CO_3 for both pedons. Gupta *et al.*(2004) water management series- 4 Typifying pedon-6 (*Typic Haplustert*).These soils are deep developed over weathered basalt, having black to very dark grey colour, clayey in texture, subangular and angular blocky structure, dry very hard, wet very sticky, with pressure faces and intersecting slickensides with wide cracks when dry. The physico-chemical properties revealed that soils are clayey in texture with bulk density ranged from 1.26 to 1.36 Mgm^{-3}, hydraulic conductivity 0.65 to 0.91 $cmhr^{-1}$, field capacity 34.05 to 43.15 per cent and permanent wilting point 14.10 to 22.00 per cent. These values are increased with depth in the solum. The pH of the soil was low to moderate alkaline, low EC, low $CaCO_3$, low in N, medium in P and high in K content. The cations and anions were in the order of Ca> Na>Mg> K and HCO_3> Cl > SO_4> CO_3, respectively.

Taxonomy :

Pedons 1 to 5 are classified under *Inceptisol* order and have an ustic moisture regimes comes under *ustept* at suborder level and other *ustept* classified as *Haplustept* at great group level in which Pedon-1 showing *vertic* characteristics *i.e.* clayey, cracks with in 125 cm of mineral soil surface that are more than 5 mm wide through a thickness of 30 cm or more, pedons 2 and 3 are *Typic Haplustept* at subgroup levels due to paralithic content within 100 cm depth and pedons 4 and 5 are *Fluventic Haplustept* as they are showing coarse mixed loamy texture distributed throughout the control section of profile.Pedon 6 is classified under *Vertisol* order and have

Table 4 : Morphological properties of soils (profile samples) of water management project pedon - 1

Profile	Horizon (cm)	Soil colour	Structure	Consistency		Contact
				Dry	Wet	
Pedon – 1 Vertic Haplustept						
P1H1	0-28	10YR3/2	3c sbk	Dsh	ws	Typic
P1H2	28-38	10YR 4/4	2m sbk	Dl	ws	Typic
P1H3	38-70	10YR 3/1	2m abk	Dvh	wvs	Typic
Pedon – 2 Typic Haplustept						
P2H1	0-25	10YR 3/3	3m sbk	dh	ws	Typic
P2H2	25-48	10YR 3/1	2m sbk	dh	wvs	Typic
P2H3	48->120	10YR 4/4	1fgr	dl	ws	Typic
Pedon – 3 Typic Haplustept						
P3H1	0-30	10YR 4/2	2m sbk	dh	wss	Typic
P3H2	30-88	10YR 3/2	1m sbk	dh	wss	Typic
P3H3	>88	10YR 6/4	1f sbk	dl	ws	Typic
Pedon – 4 Fluventic Haplustept						
P4H1	0-30	10YR 5/4	1m sbk	ds	wss	Typic
P4H2	30-85	10YR 4/3	1m sbk	ds	wss	Typic
P4H3	85->120	10YR 3/3	2f sbk	dh	ws	Typic
Pedon – 5 Fluventic Haplustept						
P5H1	0-30	10YR3/6	1f sbk	dsh	wss	Typic
P5H2	30-60	10YR3/4	1f sbk	dh	ws	Typic
P5H3	60->120	10YR3/6	1f sbk	dsh	wss	Typic
Pedon – 6 Typic Haplustert						
P6H1	0-40	10YR3/1	3m sbk	dvh	wvs	Typic
P6H2	40-70	10YR2/1	2m abk	dvh	wvs	Typic
P6H3	70-105	10YR2/1	2m abk	dvh	wvs	Typic
P6H4	>105	10YR5/2	1f sbk	dsh	wss	Typic

abk: angular blocky ; sbk: subangular blocky ; dsh: dry slight hard ; dl: dry loose dvh: dry very hard ; ws: wet sticky ; wvs: wet very sticky

Table 5 : Physical properties of soils (profile samples) of water management project pedon - 1

Profile	Depth (cm)	Soil texture			B.D.	H.C.	F.C. (%)	P.W.P. (%)
		Sand (%)	Silt (%)	Clay (%)	Mg m^{-3}	cm hr^{-1}	(w/w)	(w/w)
Pedon – 1 Vertic Haplustept								
P1H1	0-28	20.4	22.61	57.5	1.34	0.93	40.30	20.00
P1H2	28-38	20.35	23.15	56.5	1.39	0.90	39.25	19.10
P1H3	38-70	21.01	24.00	55.00	1.43	0.82	37.69	18.18
Pedon – 2 Typic Haplustept								
P2H1	0-25	19.15	21.10	60.00	1.14	0.90	42.12	21.01
P2H2	25-48	19.17	22.23	59.00	1.41	0.82	40.80	20.09
P2H3	48->120	20.20	43.00	37.50	1.48	0.79	39.15	17.00
Pedon – 3 Typic Haplustept								
P3H1	0-30	19.75	23.15	57.55	1.18	0.83	43.60	20.5
P3H2	38-88	20.10	23.45	56.00	1.18	0.86	41.35	18.7
P3H3	>88	32.00	38.55	29.9	1.25	1.72	28.18	14.0
Pedon – 4 Fluventic Haplustept								
P4H1	0-30	19.15	36.20	44.65	1.37	0.79	39.20	19.40
P4H2	30-85	18.00	35.40	46.60	1.42	0.72	38.36	18.30
P4H3	85->120	19.50	38.10	42.04	1.47	0.65	36.20	17.50
Pedon – 5 Fluventic Haplustept								
P5H1	0-30	22.15	34.35	43.5	1.24	0.83	34.70	15.00
P5H2	30-60	21.10	37.10	41.8	1.26	0.89	33.38	14.48
P5H3	60->120	22.75	37.65	39.6	1.34	0.92	30.69	12.35
Pedon – 6 Typic Haplustept								
P6H1	0-40	19.5	24.5	56.3	1.26	0.72	43.15	22.00
P6H2	40-70	20.0	22.00	58.0	1.27	0.68	42.0	21.05
P6H3	70-105	20.45	22.1	57.5	1.31	0.65	40.17	19.50
P6H4	>105	21.0	39.0	40.0	1.36	0.91	34.05	14.10

Table 6 : Chemical properties of soils (profile samples) of water management project pedon- 1

Profile	Depth (cm)	pH	E.C. (dSm^{-1})	O.C. (%)	$CaCO_3$ (%)	Available nutrients (Kg ha^{-1})			Micronutrient (ppm)			
						N	P	K	Fe	Zn	Cu	Mn
Pedon – 1 Vertic Haplustept												
P1H1	0-28	8.12	0.41	0.98	9.25	188	16.9	423	4.29	0.31	0.59	1.89
P1H2	28-38	8.26	0.36	0.82	10.0	163	15.4	414	3.19	0.30	0.54	1.81
P1H3	38-70	8.35	0.33	0.64	11.0	138	15.3	392	2.86	0.27	0.51	1.61
Pedon – 2 Typic Haplustept												
P2H1	0-25	8.48	0.25	0.90	8.25	176	18.2	806	4.8	0.61	0.39	2.35
P2H2	25-48	8.56	0.21	0.78	11.75	156	17.8	784	4.6	1.01	0.38	2.02
P2H3	48->120	8.58	0.18	0.72	12.5	138	16.9	550	4.1	0.80	0.35	1.85
Pedon – 3 Typic Haplustept												
P3H1	0-30	8.28	0.20	0.39	14.25	188	12.3	526	7.15	0.28	0.6	3.48
P3H2	38-88	8.29	0.19	0.33	15.0	163	10.9	448	4.99	0.21	0.56	1.77
P3H3	>88	8.31	0.17	0.29	16.0	145	9.2	381	2.53	0.14	0.57	0.97
Pedon – 4 Fluventic Haplustept												
P4H1	0-30	9.00	0.54	0.60	10.0	201	15.2	448	5.43	0.15	1.45	2.03
P4H2	30-85	8.95	0.51	0.49	11.0	176	14.5	426	2.84	0.14	1.12	1.23
P4H3	85->120	8.82	0.45	0.39	12.5	156	13.8	392	1.27	0.13	0.67	0.79
Pedon – 5 Fluventic Haplustept												
P5H1	0-30	8.38	0.40	0.58	8.0	176	16.7	784	2.17	0.19	0.53	3.53
P5H2	30-85	8.48	0.37	0.48	10.75	163	15.5	728	1.64	0.11	0.51	1.18
P5H3	85->120	8.51	0.31	0.39	12.25	148	14.0	594	1.43	0.11	0.39	1.04
Pedon – 6 Typic Haplustept												
P6H1	0-40	8.39	0.42	0.78	7.0	188	15.0	650	7.00	0.50	0.69	1.14
P6H2	40-70	8.42	0.38	0.68	7.5	188	14.3	616	6.21	0.44	0.54	1.05
P6H3	70-105	8.52	0.31	0.52	9.25	151	13.9	571	4.20	0.28	0.54	1.03
P6H4	>105	8.70	0.29	0.44	10.75	140	13.0	515	3.96	0.17	0.30	0.81

Table 6b : Saturation paste extract analysis of soil pedon- 1

Profile	Depth (cm)	Cations (meL^{-1})				Anions (MeL^{-1})			
		Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{-2}	HCO_3^{-}	Cl^{-}	SO_4
Pedon – 1 Vertic Haplustept									
P1H1	0-28	5.7	4.6	0.47	0.05	0.00	2.5	4.3	1.4
P1H2	28-38	5.5	4.4	0.45	0.03	0.00	2.0	4.0	1.3
P1H3	38-70	5.1	4.2	0.44	0.03	0.00	2.5	4.0	1.2
Pedon – 2 Typic Haplustept									
P2H1	0-25	5.60	8.50	4.6	0.06	0.00	6.0	4.2	1.3
P2H2	25-48	5.40	8.3	4.5	0.04	0.00	5.0	4.0	1.2
P2H3	48->120	5.20	8.1	4.3	0.03	0.00	3.5	3.7	1.1
Pedon – 3 Typic Haplustept									
P3H1	0-30	5.80	8.6	4.7	0.05	0.0	5.5	4.3	1.4
P3H2	38-88	5.40	8.4	4.6	0.03	0.0	4.0	4.1	1.2
P3H3	>88	5.30	8.1	4.3	0.01	0.0	3.5	3.8	1.1
Pedon – 4 Fluventic Haplustept									
P4H1	0-30	5.60	8.7	4.5	0.05	1.00	6.00	4.1	1.3
P4H2	30-85	5.30	8.4	4.3	0.04	0.80	5.00	4.0	1.2
P4H3	85->120	5.20	8.2	4.2	0.02	0.65	4.00	3.7	1.1
Pedon – 5 Fluventic Haplustept									
P5H1	0-30	5.50	3.3	4.1	0.06	0.0	5.00	4.2	1.0
P5H2	30-60	5.20	3.2	4.0	0.04	0.0	4.50	4.1	0.9
P5H3	60->120	5.10	3.0	3.8	0.03	0.0	3.80	3.9	0.8
Pedon – 6 Typic Haplustept									
P6H1	0-40	5.60	2.5	4.1	0.05	0.00	6.00	4.6	1.45
P6H2	40-70	5.40	2.3	4.2	0.04	0.00	5.50	4.4	1.30
P6H3	70-105	5.30	2.2	4.3	0.02	0.00	4.00	4.3	1.15
P6H4	>105	5.10	2.1	4.5	0.01	0.00	3.50	4.1	1.01

an ustic moisture regimes, comes under ustert at suborder level and other *ustert* classified as *Haplustert* and other *Haplustert* classified as *Typic Haplustert* (Key to Soils Taxonomy, 2006).

All these pedons were correlated with the characteristics of established soil series of Maharashtra and Pedon 1 showing the characteristics and correlated with the *Pather* series of Maharashtra whereas, Pedons 2 and 3 are correlated with *Ghospuri* soil series. Pedons 4 and 5 are correlated with *Kolyachiwadi* soil series and pedon-6 is correlated with *Babulgaon* soil series of Maharashtra (Soil Series of Maharashtra by Chala *et al.,* 1999) (Table 3).

Literature Cited

Challa, O., Gajbhiye, K.S. and Velayutham, M. (1999). Soil Series of Maharashtra. NBSS, publ. No. 79, Nagpur, 428 p.

Chaudhary, D.R., Ghosh, A., Sharma, M.K. and Chikara, J. (2006). Characterization of some salt-affected soils of Amethi Uttar Pradesh. *Agropedology,* **16**(2) : 126-129.

Key to soil taxonomy. (2006). Eighth edition, natural resource conservation service, USDA, Blacksburg, Virginia.

Piper, C.S. (1966). *Soil and plant Analysis*, Hans. Publication Bombay, Asian Ed., PP- 368.

Soil Survey Staff (1998). Keys to soil taxonomy. Agency for International Development, US Development of Agriculture, Soil Management Support Services (SMSS). Technical Monograph No. 18 Virginia polytechnic Institute and state university, USA.

Soil Survey Staff (2006). Keys to soil taxonomy by soil survey staff, USDA, Natural Resource ……. Service, Tenth Edition, pp.: 123-204.

Vara, Prasad, Rao, A.P., Naidu, M.V.S., Ramavatharam, U. and Rama, Rao, G. (2008). Characterizaton, classification and evaluation of soils on different land fores in Ramchandrapuram mandal of Chittore district in Andhra Pradesh for sustainable land use planning *J. Indian Soc. Soil. Sci.,* **6**(1) : 23-33.

Walkley, A. and Black, C.A. (1934). Estimation of organic carbon by chromic acid titration method. *Soil Sci.,* **37** : 29-38.