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RESEARCH ARTICLE

Soil Physical Properties of TNAU-Research Farms, Coimbatore

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ABSTRACT

The physical properties of 14 pedons representative of various soil series in the research farms of TNAU, Coimbatore were studied during 2017-19. The depth of soils ranged from shallow (<65 cm) to very deep (>150cm). Soil depth was shallow in a steep slope, whereas deep soils were found in nearly level to very gently sloping plain. The texture of the surface and subsurface soils ranged from sandy clay loam to clay. The bulk density of the surface and subsurface soil samples ranged from 1.09 to 1.78 Mg m^{-3} irrespective of the depth. Higher bulk density has been recorded in the subsurface than in the surface layer. The hydraulic conductivity of the pedon soil sample varied from 0.40 to 8.69 cm hr^{-1} and decreased with increasing depth. The infiltration rate ranged from 0.80 to 13.75 cm hr^{-1} represented moderate to very rapid category. Low moisture and medium-textured soil recorded the highest infiltration rate, whereas clay dominated soil showed a low infiltration rate. The total porosity of soil varied from 36.18 to 50.99 per cent irrespective of soil depth with the capillary and non-capillary porosity of 26.70 to 39.76 per cent and 3.42 to 16.59 per cent respectively.

Keywords: TNAU farms, soil physical properties, soil series, porosity and hydraulic conductivity.

INTRODUCTION

Soil physical properties are recognized as the key to soil fertility and crop production. The amount of plant nutrients present in the soil gives only a unilateral picture of its productive potential. The physical conditions of the soil, on the other hand, regulates movement and retention of air and water, microbiological activities, the emergence of seedlings, penetration of roots, timeliness of tillage operations and above all the availability of plant nutrients which is vital for better plant growth. The poor and adverse conditions of formative factors like organic matter, microorganisms, cations and soil colloids coupled with determination factors like cultivation, irrigation, weather etc., cause adverse soil physical conditions, which decreases crop growth and yield. Hence a study was conducted to assess the physical properties of soils in TNAU farms.

MATERIAL AND METHODS

The farm maps of TNAU were used as a base material, and grid survey was undertaken at each farm. Based on the morphological characteristics and physiography, fourteen geo-referenced pedons were examined at Orchard (two), Eastern Block (two), Millet Breeding Station (one), Cotton Breeding Station (one), New Area (one), Botanical Garden (two), Wetland (two), Paddy Breeding Station (two) and Coconut Farm (one). Soil Profile Description was done according to the Soil Survey Staff (1951) and collected core and bulk soil samples from individual layers. In situ infiltration measurements were also taken in all the fields. The soil samples were analyzed for various soil properties by adopting standard procedures. Land capability classification was done based on Klingebiel and Montgomery's (1961) criteria. The geo-referenced location points of pedons are furnished in Table 1.

RESULTS AND DISCUSSION

Morphological characteristics of soils (Table 2)

Marked differences were observed in soil depth, colour, texture, structure, concretions, and special features like clay films. Parent material topography and climate played a very important role in the changes in soil morphology Manickam *et al.* (1973) and Khan and Ram. (1977). The process of erosion and deposition of soil materials were found to be regulated by the physiographic position, as reported by Bipul Deka *et al.* (2009).

The depth of the soils ranged from shallow (<65 cm) to very deep (>150 cm). Soil depth was shallow in a steep slope, whereas deep soils were found in nearly level to very gently sloping plain. The depth of different pedons studied varied from 65 cm to 127 cm and found to have moderately shallow to deep solum.

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Table 1. Geo-referenced location points of pedons of AC & RI, Coimbatore

Pedon	Field	Latitude (°N)	Longitude (°E)	Altitude (msl)
Pedon 1	Orchard - Fd.No. 5	11.00941	76.93192	426.7
Pedon 2	Orchard - Orchard - West	11.00995	76.93357	426.7
Pedon 3	Eastern Block - NA 9	11.00689	76.93606	426.6
Pedon 4	Eastern Block - 37E	11.01703	76.93759	426.6
Pedon 5	Millet Breeding Station - 7B	11.02337	76.92808	426.6
Pedon 6	New Area - 4B	11.02405	76.92645	426.5
Pedon 7	Cotton Breeding Station- P1	11.02397	76.93014	426.6
Pedon 8	Botanical Garden – 10 B	11.01970	76.93139	426.6
Pedon 9	Botanical Garden – 10 E	11.01998	76.93542	426.6
Pedon 10	Paddy Breeding Station - C Block	11.00015	76.92175	426.6
Pedon 11	Paddy Breeding Station - I Block	11.00068	76.92242	426.6
Pedon 12	Wetland - A Block	11.00141	76.92571	426.6
Pedon 13	Wetland - M Block	11.00186	76.92625	426.6
Pedon14	Coconut Farm	11.01121	76.93492	426.7

The texture of surface soils was clay in pedon 1, 3 and 11; sandy clay loam in pedons 5, 6, 7, 9 and 10, loam in pedon 4, 12 and 13, silty clay loam in pedon 2, sandy loam in pedon 8, clay loam in pedon 14 respectively. The texture of subsurface soils was also varied widely with clay texture in pedons 1, 3, 11, and 14, clay loam in pedons 2 and 12, sandy clay loam in pedons 4, 6, and 10, sandy loam in pedons 7, 8 and 9 and 13 and sandy clay in pedon 5.

The texture of surface and subsurface soils ranged from sandy clay loam to clay. The wide variation in soil texture was caused by topographic position, nature of parent material, in-situ weathering, and translocation of clay and age of soils as explained by Varaprasad Rao *et al.* (2008). The change in texture of subsurface soil was due to the process of illuviation and mixing of horizons. The transportation of soil from upland to low land by water movement is responsible for textural variation from sandy loam to clay particle size distribution.

The soil structure of most of the pedons were subangular blocky and varying in different depth of profile. Pedon 1, 4, 5, 6, 7, 11, 12, 13 and 14 has subangular blocky structure in surface soils. Pedons 2, 3, 8, 9, and 10 had prismatic, crumby and angular blocky structure, respectively. The subangular blocky structure was observed in pedons with medium to heavy texture. In subsurface soil, all pedons having subangular blocky to medium angular blocky structure in different depth. Sawhney *et al*. (2005) reported that in soils with good base saturation percentage, particularly concerning Ca tended to form blocky structure either angular or subangular.

Physical Properties

Soils of Eastern block

Two profile pits were dug up, and depth-wise soil samples were collected and analyzed for soil physical properties. The results revealed that the bulk density values ranged from 0.81 to 1.71 Mg m^{-3} irrespective of depth. The subsurface soil samples collected from the field No.37E recorded low bulk density value, and higher bulk density of 1.71 Mg m^{-3} was recorded in field NA 9, that too in subsoil (40 - 60 cm depth). This may be due to the compaction of subsoil by continuous use of heavy machinery.

The data on hydraulic conductivity ranged from 1.62 to 3.70 cm hr^{-1} which was moderately slow almost in both the profiles. Generally, black soils are found to possess low hydraulic conductivity due to high clay content, which leads to low infiltration rate resulting in runoff and erosion of soil and nutrients. The infiltration rate ranged from 2.60 to 5.40 cm $hr^{-1,}$ with the higher value recorded in Field NA 9 and lower in Field No.37.

The total porosity of soils varied from 33.39 to 49.50 per cent irrespective of soil depth. The capillary and non-capillary porosity ranged from 19.92 to 31.98 per cent and from 9.52 to 20.28 per cent respectively, which showed that there was no physical constraint.

The moisture storage capacity of soils ranged from 10.56 to 14.95 cm $m^{-1,}$ which falls under low to high moisture storage capacity ratings. Maximum water storage capacity was registered in the Field No.37E, which may be attributed to the fact that soils have high capillary porosity.

Soils of Wetland

The bulk density values of the profiles in A and M blocks of wetland varied from 0.76 to 1.28 Mg m^{-3}. There was an increase in bulk density up to one-meter depth in A block profile whereas, in M block, it showed an inconsistent trend. The maximum bulk density value was recorded in block A and minimum in block M. The results on hydraulic conductivity revealed significant variation with increasing depth in both the profiles. It ranged from 0.40 to 2.12 cm hr^{-1} for different layers of both the profiles and decreased with increasing depth in both the profiles.

Table 2. Textural class of TNAU farms soils

Horizon (cm)	Clay (%)	Silt (%)	Sand (%)	Textural Class	Horizon (cm)	Clay (%)	Silt (%)	Sand (%)	Textural Class
				1. Orchard					
		Fd.No. 5					Orchard - West		
0-25	52.2	19.0	26.0	Clay	0-20	32.1	49.3	16.9	Silty Clay loam
25-50	35.4	10.8	48.4	Sandy Clay	20-35	38.8	43.8	15.7	Silty Clay loam
50-70	51.9	10.3	32.5	Clay	35-55	37.6	39.1	21.6	Clay loam
70-100	40.2	11.5	44.6	Clay	55-80	61.4	12.8	22.4	Clay
				2.Eastern block					
		Fd.No. NA 9					Field 37E		
0-20	47.3	8.7	37.2	Clay	0-20	23.6	40.5	30.7	Loam
20-40	44.7	12.0	36.8	Clay	20-40	24.7	36.2	36.8	Loam
40-60	48.9	15.0	30.5	Clay	40-60	32.7	12.5	48.4	Sandy clay loam
60-80	51.4	8.5	33.9	Clay	60-80	31.2	8.5	55.7	Sandy clay loam
				3.Millet Breeding Station					4. New Area
		Fd. No. 7 B					Fd. No. 4B		
0-20	30.9	7.8	54.6	Sandy clay loam	0-28	22.6	11.5	61.8	Sandy clay loam
20-48	37.9	8.0	48.4	Sandy clay	28-48	31.9	12.4	51.9	Sandy clay loam
48-75	31.4	6.1	57.5	Sandy clay loam	48-65	31.9	19.0	44.3	Sandy clay loam
75-100	43.9	8.0	42.8	Sandy clay					
100-150	41.8	11.1	44.3	Sandy clay					
		5.Cotton Breeding Station (Fd. No. P1)					6. Coconut Farm		
0-15	28.7	6.3	60.3	Sandy clay loam	0-15	11.5	14.4	67.7	Sandy loam
15-47	22.2	11.0	63.1	Sandy clay loam	15-47	13.6	15.2	68.9	Sandy loam
47-65	15.7	14.3	63.6	Sandy loam	47-65	14.9	12.2	68.8	Sandy loam
65-112	34.9	15.0	47.5	Sandy clay loam	65-112	16.7	18.8	57.7	Sandy loam
				7. Botanical Garden					
		F.No. 10 B					F. No. 10 E		
0-19	28.7	6.3	60.3	Sandy clay loam	0-19	30.9	7.8	54.6	Sandy clay loam
19-41	22.2	11.0	63.1	Sandy clay loam	19-45	37.9	8.0	48.4	Sandy clay
41-57	12.4	18.7	63.6	Sandy loam	45-57	31.4	6.1	57.5	Sandy clay loam
57-110	15.7	14.3	63.6	Sandy loam	57-110	43.9	8.0	42.8	Sandy clay
				8.Paddy breeding Station					
		C block					I Block		
0-20	45.0	23.9	28.2	Clay	0-20	25.0	32.4	39.9	Loam
20-38	40.0	24.9	32.6	Clay	20-38	30.3	32.6	34.3	Clay loam
38-81	42.5	25.0	27.8	Clay	38-81	33.7	30.8	33.0	Clay loam
81-104	41.2	28.6	25.9	Clay	81-104	36.9	28.4	32.1	Clay loam
104-127	42.5	31.3	23.0	Clay	104-127	34.9	31.8	30.3	Clay loam
				9.Wetland					
		A Block					M Block		
0-20	26.3	29.0	40.9	Loam	0-20	32.5	33.5	30.3	Clay loam
20-38	10.5	24.7	59.9	Sandy loam	20-38	45.5	16.6	33.3	Clay
38-81	19.8	16.6	60.9	Sandy loam	38-81	50.0	9.8	36.0	Clay
81-104	25.0	17.1	55.1	Loam	81-104	42.5	22.7	32.4	Clay
104-127	16.0	16.4	64.2	Sandy loam	104-127	48.0	18.3	31.0	Clay

The porosity values though varied with profiles and different depths, the non-capillary porosity was less compared to the corresponding capillary porosity. The total porosity was varied from 47.24 to 58.64 per cent irrespective of profiles and soil depths. The capillary and non-capillary porosity ranged from 43.36 to 4.40 per cent and from 2.01 to 5.13 per cent, respectively. The infiltration rate was moderately slow for both the profiles (0.92 to 0.94 cm hr^{-1}) with a very high water storage capacity (20.0 to 27.90 cm hr^{-1}).

Paddy Breeding Station (PBS)

The soils of PBS were found to be very deep, exceeding a soil depth of 127 cm. The bulk density was ranged from 0.99 to 1.24 Mg m^{-3} and found to decrease with increasing depth.

Table 3. Soil Physical Properties of TNAU farm soils

Depth (cm)	Bulk Density (Mg m^{-3})	Hydraulic Conductivity (cm hr^{-1})	Porosity (%)			Moisture (%)		Moisture Storage (cm m^{-1})			IR (cm m^{-1})
			Total	Capillary	Non - capillary	F.C	PWP	A.W	Horizon	Total	
1.Orchard											
Fd.No.5											
0-25	1.69	12.45	36.52	28.39	8.13	15.55	11.89	3.66	1.55	16.73	8.03
25-50	1.92	12.38	43.61	39.49	4.12	25.53	13.63	11.9	5.71		
50-70	1.58	2.61	34.40	30.25	4.15	15.03	6.18	8.85	2.80		
70-100	1.92	0.333	42.45	33.24	9.21	25.54	12.52	13.02	5.00		
Orchard - West											
0-20	1.65	1.89	43.28	38.27	5.01	25.79	23.44	2.35	1.03	23.04	15.2
20-35	1.71	0.444	38.60	34.39	4.21	18.3	13.49	4.81	3.93		
35-55	1.66	2.05	32.46	24.34	8.12	25.2	20.2	5.00	5.05		
55-80	1.75	0.111	27.62	24.36	3.26	30.37	24.10	6.27	2.07		
2. Eastern block											
Fd.No. NA 9											
0-20	1.60	2.52	49.50	31.90	17.60	12.67	5.72	6.95	2.24	10.56	5.40
20-40	1.71	2.31	39.84	19.92	19.52	19.36	10.51	8.85	3.78		
40-60	0.81	2.11	34.99	25.47	9.52	21.72	14.78	6.94	0.84		
60-80	1.53	1.62	49.22	29.50	19.72	19.80	13.89	5.91	1.35		
Field 37E											
0-20	1.27	3.73	41.78	31.68	10.10	29.83	17.39	12.44	3.15	14.95	2.60
20-40	1.07	3.70	46.20	31.38	14.82	23.92	9.47	14.45	3.09		
40-60	1.48	3.43	33.39	22.97	10.42	27.48	12.46	15.02	4.45		
60-80	0.88	3.35	42.37	22.10	20.28	26.46	14.32	12.14	2.13		
3. Millet Breeding Station											
Fd.No.7 B											
0-20	1.63	2.08	47.91	41.13	6.78	16.89	8.79	8.10	2.64	13.96	13.75
20-48	1.31	1.494	49.90	45.25	4.65	14.29	9.26	5.03	0.99		
48-75	1.48	0.199	43.87	38.79	5.08	20.65	13.54	7.11	1.58		
75-100	1.53	0.249	40.61	33.77	6.84	15.34	12.95	2.39	0.73		
100-150	1.51	0.242	42.35	39.07	3.28	29.40	16.68	12.72	3.83		
4. New Area											
Fd. No. 4 B											
0-28	1.33	0.823	35.94	31.18	4.76	18.25	12.98	5.27	1.40	10.47	14.50
28-48	1.39	0.242	46.92	34.27	12.65	16.91	11.93	4.98	1.38		
48-65	1.50	0.125	45.31	40.57	4.74	25.99	15.23	10.75	4.03		
5. Cotton Breeding Station											
Fd.No. P1											
0-15	1.56	1.016	44.71	39.33	5.38	12.69	8.56	4.13	1.14	10.40	11.85
15-47	1.46	3.63	39.46	29.05	10.41	14.28	8.61	5.67	1.41		
47-65	1.55	0.339	31.84	25.93	5.91	10.72	8.33	2.39	0.93		
65-112	1.65	4.114	28.71	21.30	7.41	18.37	10.18	8.19	2.03		
6. Botanical Garden											
Fd.No. 10B											
0-19	1.47	3.87	44.11	39.00	5.11	20.52	12.01	8.51	2.49	16.66	12.50
19-45	1.49	0.242	41.46	36.29	5.17	24.99	14.95	10.04	2.99		
45-57	1.55	0.363	44.86	38.47	6.39	19.65	10.73	8.92	2.77		
57-110	1.75	2.90	36.31	30.83	5.78	14.90	9.92	4.98	1.74		
Fd.No. 10 E											
0-19	1.27	1.42	33.11	26.62	6.49	17.71	13.12	4.65	1.18	9.01	12.20
19-45	1.46	0.726	45.09	42.10	2.99	18.25	16.14	2.11	0.61		
45-57	1.43	0.968	41.53	38.88	2.65	19.58	7.16	12.42	3.54		
57-110	1.55	0.242	45.38	34.93	10.45	14.16	8.21	5.95	4.15		
7. Paddy breeding station											
C.Block											
0-20	0.99	0.97	50.14	45.64	4.50	49.12	24.20	24.92	8.64	27.55	0.80
20-38	1.12	0.47	52.16	47.37	4.79	50.64	25.12	25.52	8.58		
38-81	1.14	0.42	51.15	48.75	2.40	50.80	25.30	25.50	7.27		
81-104	1.16	0.40	50.46	47.78	2.68	50.64	25.19	25.45	7.38		
104-127	1.06	0.39	47.35	44.64	2.71	50.86	25.32	25.54	9.48		
I Block											
0-20	1.04	1.02	58.57	56.14	2.43	50.86	21.32	29.54	10.75	34.84	0.87
20-38	1.24	0.67	59.12	57.33	1.79	51.14	21.84	29.30	10.90		
38-81	1.20	0.60	56.64	54.22	2.42	51.32	21.90	29.42	8.83		
81-104	1.21	0.47	55.50	53.36	2.14	51.60	21.98	29.62	8.96		
104-127	1.24	0.42	54.10	54.10	2.32	51.84	22.30	29.54	12.82		
8. Wetland											
A Block											
0-20	1.20	2.12	54.86	49.56	5.40	42.15	20.25	21.90	5.26	27.90	0.92
20-38	1.24	1.05	50.16	45.86	4.30	45.30	23.12	22.18	4.96		
38-81	1.26	0.88	52.45	47.32	5.13	46.12	23.82	22.30	6.18		
81-104	1.28	0.46	50.25	47.64	2.61	47.30	24.30	23.00	6.48		
104-127	1.26	0.40	47.24	43.36	3.88	46.30	24.15	22.15	7.82		
M Block											
0-20	0.78	1.20	58.64	54.40	4.24	47.80	22.33	25.47	3.97	20.0	0.94
20-38	0.98	0.84	56.26	53.20	3.06	47.91	23.20	24.71	2.42		
38-81	0.84	0.72	55.16	53.15	2.01	48.31	23.64	24.67	6.21		
81-104	0.78	0.67	50.14	47.80	2.34	48.55	23.84	24.71	1.93		
104-127	0.76	0.66	49.36	46.30	3.06	48.82	23.90	24.92	3.79		
9. Coconut Farm											
0-15	1.42	4.56	48.20	40.11	8.09	34.60	18.32	16.28	4.62	23.65	2.16
15-47	1.45	1.44	46.44	37.25	9.19	38.14	22.10	16.04	3.49		
47-65	1.48	1.36	43.24	38.25	4.99	38.26	22.16	16.10	4.05		
65-112	1.46	1.20	40.12	33.21	6.91	38.60	22.30	16.30	4.28		

(F.C – Field Capacity; PWP – Permanent Wilting Point; A.W – Available Water)

The hydraulic conductivity was very low in all layers, with the values of 0.40 to 1.02 cm hr^{-1}. Bottom layers registered low hydraulic conductivity when compared to top layers. The total pore space percentage varied from 47.35 to 59.12 irrespective of different layers of soil profiles, and the maximum was recorded in Block No. I. The non-capillary pore percentage was low compared to capillary porosity. The capillary porosity was more than 44 per cent in all the horizons, whereas non-capillary porosity was even less than 5 per cent. The rate of infiltration was moderately slow (0.80 to 0.87 cm hr^{-1}), and the moisture storage capacity was very high (27.55 and 34.84 cm m^{-1}). The obvious reason may be the high clay content and capillary porosity in all the depths of profile.

Millet Breeding Station

The bulk density ranged from 1.31 to 1.63 Mg $m^{-3,}$ and the variation in bulk density was inconsistent with soil depth. The hydraulic conductivity ranged from 0.199 to 2.08 cm hr^{-1}. The porosity values though varied with different depths, the non-capillary porosity was less compared to capillary porosity. The range of total porosity was 40.61 to 49.90 per cent. The capillary and non-capillary porosity ranged from 33.77 to 45.25 per cent and from 3.28 to 6.78 per cent, respectively. The moisture storage capacity was medium (13.96 cm m^{-1}) with the infiltration rate of 13.75 cm hr^{-1} in field number 7B, which falls under a moderately rapid category.

Table 4. Land Capability Classification(LCC) of the TNAU Research Farms, Coimbatore

Farm	Depth	Texture	Slope	Erosion	pH	LCC
Eastern Block	II	II	I	I	II	II
WetLand	I	III	I	I	I	I
Paddy Breeding Station	I	III	I	I	I	I
Millet Breeding Station	I	II	I	I	II	I
Cotton Breeding Station	I	II	I	I	III	I
New Area	II	II	I	I	II	I
Botanical Garden	I	II	I	I	II	I
Orchard	II	II	I	I	II	II
Coconut Farm	I	III	I	I	II	I

Cotton Breeding Station

The bulk density ranged from 1.46 to 1.65 Mg m^{-3} irrespective of soil depth and no definite trend with soil depth was observed. A higher bulk density of 1.65 was recorded in the subsoil horizon of field number PI. The data on hydraulic conductivity showed slow to moderately slow permeable nature of the soil (0.34 to 4.11 cm hr^{-1}). But deeper layer of soil showed higher value of hydraulic conductivity (4.11 cm hr^{-1}).

Regarding pore space percentage, it ranged from 28.71 to 44.71 and decreased with increasing soil depth. The capillary porosity contributed 80 - 85 per cent of total porosity and the remaining by non-capillary porosity.The moisture storage capacity registered (10.40 cm m^{-1}) was medium while the infiltration rate was 11.85 cm $hr^{-1,}$ which falls under rapid rating.

New Area

The soils of New Area are shallow in nature with the soil depth of less than 65 cm. The profile of field No.4B showed a shallow depth of 65 cm having 3 layers only. The bulk density varied from 1.33 to 1.50 Mg m^{-3} and increased with increasing depth. The hydraulic conductivity was very slow to moderately slow with the range of 0.125 to 0.823 cm hr^{-1}. The porosity percentage varied from 35.94 to 46.92 and increased as the depth increased. The capillary porosity was 31.18 to 40.57 per cent, and non-capillary porosity was 4.74 to 12.65 per cent. The water storage capacity was 10.47 cm $m^{-1,}$ which is in medium status. The infiltration rate was rapid, with 14.50 cm hr^{-1}.

Botanical Garden

The soil depth was 110+ cm with 4 layers. The bulk density increased with increasing soil depth with a range of 1.27 to 1.75 Mg m^{-3}. The hydraulic conductivity varied from 0.242 to 3.87 cm hr^{-1} and surface horizon recorded the maximum and decreased with subsurface horizons. The total porosity varied widely (33.11 to 45.38 per cent), and inconsistent distribution was recorded in soil depths. The capillary porosity was found to be 26.62 to 42.10 per cent with the non-capillary porosity of 2.65 to 10.45 per cent. The infiltration rate was rapid, with a range of 12.20 to 12.50 cm hr^{-1}. The water storage capacity of the profile was 9.01 to 16.66 cm $m^{-1,}$ which was very high. This might be due to high clay content and high capillary porosity.

Orchard

Two soil profiles were opened at Field No. 5 and Orchard West. The bulk density values of different

profiles varied widely, ranging from 1.58 to 1.92 Mg m^{-3}. There was an inconsistent trend in bulk density with increasing soil depth. The results on hydraulic conductivity showed slow to rapid rate (0.11 to 12.45 cm hr^{-1}), and the highest value was recorded in field No. 5 where the hydraulic conductivity was 12.45 and 12.38 cm hr^{-1} respectively in surface (0-25 cm) and subsurface horizons (25-50 cm).

The increased bulk density and decreased hydraulic conductivity may be due to continuous cultivation of fruit trees over the years without tillage operations. The pore space percentage varied from 27.62 to 43.61 irrespective of different fields and depths. The capillary porosity was 24.34 to 39.49 per cent and non-capillary porosity was 3.26 to 9.21 per cent. The infiltration rate ranged from 8.03 to 15.20 cm $hr^{-1,}$ which is moderately rapid to a rapid rate. The water storage capacity varied from 16.73 to 23.04 cm hr^{-1} and higher value recorded in orchard west.

Coconut Farm

One profile pit was opened, and the soil analysis data showed inconsistent values with increasing depth with respect to bulk density and hydraulic conductivity. However, hydraulic conductivity was higher (4.56 cm hr^{-1}) in top horizon, whereas subsoil layers registered very low hydraulic conductivity (1.20 to 1.44 cm hr^{-1}). The bulk density values ranged from 1.42 to 1.48 Mg m^{-3}.

The total porosity was 40.12 to 48.20 per cent, and more than 85 per cent was contributed by capillary porosity. The infiltration rate was moderately slow, with a value of 2.16 cm hr^{-1}. The moisture storage capacity was very high (23.65 cm m^{-1}).

CONCLUSION

Based on soil limitations and soil physical related properties like texture, depth, slope, erosion, drainage, and nature of the substrate, farm soils of Wetland, Paddy breeding station, Millet breeding station, Cotton breeding station, New area, Botanical garden and Coconut farm were classified into Class I land capability with no limitations. In contrast, soils of Eastern block and Orchard were classified into Class II land capability sub-class due to limitation of soil texture.

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