

## SOIL PHYSICAL PROPERTIES OF DHARMAPURI DISTRICT

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### ABSTRACT

The physical properties of 14 soil series of Dharmapuri district were studied and the areas of physical constraints identified.

**Key words:** Soil physical properties, Dharmapuri district.

A successful farming system depends on the maintenance of the soil structure and its productivity. Soil drainage properties, ease with which the roots penetrate for foraging, soil depth and soil moisture relationship contribute most for production from a nutritionally fertile soil. Soil physical constraints such as impeded drainage, presence of hardpans at shallow depths, crusting surface soils, excessive permeability, etc need immediate attention and alleviation. Bench mark profiles in Dharmapuri districts were studied for the physical properties and to identify areas of physical constraints.

### MATERIALS AND METHODS

Dharmapuri district has an area of 9615.9 Sq.km and 34.6 per cent of the total area is occupied by forests. The district is composed of a series of plains, valleys, plateaus and hills of varying heights. Fourteen soil series were identified

in the reconnaissance soil survey of the district by the soil survey organisation of Tamil Nadu. (Ratnam and Jayaraman, 1977).

Fourteen Bench mark profiles were examined in these different soil series identified by the Soil Survey Organisations in Dharmapuri district (Anon, 1977). Undisturbed soil cores of the size 7.0 cm dia x 7.0 cm height were collected horizon wise and physical parameters were estimated in the laboratory following standard methods of analysis (Gupta and Dakshinamoorthi, 1981). *In situ* estimation of infiltration rate was carried out with the double ring infiltrometer.

### RESULTS AND DISCUSSION

The location, series and the major morphological features of the fourteen series studied are furnished below.

S.No.	Soil series	Location	Order	Sub group
1.	Vannapatti	Nallampalli	Entisol	Typic Ustorthents
2.	Hosur	Zuzuvadi	Alfisol	Ultic Haplustalfs
3.	Mathagiri	Mattagiri	Ultisol	Rhodic Paleudults
4.	Salem	Belagondapalli	Entisol	Typic Ustorthents
5.	Sonnepuram	Sonnepuram	Alfisol	Ultic Haplustalfs
6.	Kalamangalam	Chinnabelagondapalli	Entisol	Typic Ustifluvents
7.	Krishnagiri	Krishnagiri	Alfisol	Typic Haplustalfs
8.	Mariampatti	Mariammanpatti	Inceptisol	Typic Ustochrepts
9.	Sulakarai	Onnakarai	Inceptisol	Typic Haplaquepts
10.	Dharmapuri	Dharmapuri	Vertisol	Typic Chromusterts

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11.	Harur	Harur	Alfisol	Udic Haplustalfs
12.	Nattam	Naickenkottai	Entisol	Typic Udifluvents
13.	Toppur	Goniharhalli	Alfisol	Typic Haplustalfs
14.	Jeyapuram	Pappireddipatti	Vertisol	Typic Chromusterts

**Vannappati series:** The soils are yellowish red to reddish brown in colour, medium textured, neutral pH, non-calcic from weathered gneiss. The infiltration rate and hydraulic conductivity were high. The hydraulic conductivity decreased with depth perhaps due to increase in bulk density which increased with depth from subsoil. The 15 bar moisture increased with depth due to increase in the fineness of the texture from loamy sand in the surface layer to sandy clay loam in the subsurface layer.

**Hosur series:** The soils are yellowish red to dark reddish brown. The texture was sandy loam in the surface horizon (0-20cm) to sandy clay loam in the lower horizon (20-33cm), non calcic and neutral soil. The infiltration rate was moderate. The bulk density increased with depth. The 15 bar moisture increased with depth. Hydraulic conductivity decreased with depth.

**Mattagiri series:** Mattagiri soils are dark red to dark reddish brown with a sandy loam surface texture. Infiltration rate was moderately slow and hydraulic conductivity which was also moderately slow decreased with depth. It is a well aggregated soil. The bulk density was slightly high in the subsoil. The 15 bar moisture was low.

**Salem series:** The soils are dark reddish brown, deep to very deep with loamy sand texture in the Ap horizon to sandy clay loam texture in the B2t horizon below. The infiltration was moderate. The hydraulic conductivity decreased with depth. The soils had good aggregation properties. The bulk density increased with depth. The 15 bar moisture was low in the surface and increased with depth. These phenomena might be due to increase in the finer fractions down the depth.

**Sonnepuram series:** The soils of these series are light brown to dark reddish brown, sandy loam to sandy clay loam in texture. The infiltration rate was moderate. The bulk density increased with depth. The subsoil had good aggregation properties. The soil was neutral with no salt problems.

**Kalamangalam series:** The soils are dark grayish brown to dark brown with sandy loam to sandy clay loam texture, fineness being increasing with depth. The infiltration rate was poor probably due to high water table and saturated conditions of the profile. The soil was neutral without any salt problem and well aggregated with moderate aeration.

**Krishnagiri series:** The soils are grayish brown to brown with sandy clay loam to clay loam texture. The aggregate stability index and 15 bar moisture decreased with depth.

**Dharmapuri series:** The soils are very dark gray to very dark grayish brown. The surface layer was clay loam with very poor infiltration rate and very negligible hydraulic conductivity. The bulk density was normal in the surface which increased very gradually with depth. The aggregate stability index and 15 bar moisture showed increase in the subsoil.

**Harur series:** The soils are dark gray to very dark grayish brown. The hydraulic conductivity was moderate in the surface layer and decreased with depth, due to increasing clay texture. The 15 bar moisture content which increased with depth confirmed the above inference. The 15 bar moisture, aggregate stability and stability index increased with depth.

**Toppur Series:** This soil is dark brown to reddish brown and medium textured ranging from

sandy loam to sandy clay loam, neutral to alkaline, well drained calcareous colluvial occurs in the foot of the hills as sediments in the Toppur ghats. The infiltration rate was moderate. The hydraulic conductivity of the surface soil was high and decreased with depth upto 68cm and

increased thereafter. The bulk density was higher at lower layers. The 15 bar moisture increased with depth.

**Other soil series:** Mariampatti, Sulakkarai, Natam and Jayapuram series constituted 0.2 to 0.4

Table.1. Physical properties of soil profiles-Dharmapuri District

Sl.No		Depth (cm)	I.R. (cm/hr)	B.D. (g/cc)	HC (cm/hr)	T.P. (%)	NCP (%)	SI	AS (%)
1.	Vannapatty (Nallampalli village)	00-16	12.4	1.54	15.7	44.5	9.4	14.9	34.3
		16-38		1.67	3.2	45.9	16.2	29.8	56.9
2.	Housr (Zuzuvadi village)	00-20	6.9	1.49	12.8	39.2	11.2	29.5	35.5
		20-33		1.51	7.2	46.0	20.3	39.3	62.8
		33-74		1.70	6.8	49.5	18.5	52.3	72.2
		74-105		1.74	6.8	52.2	19.4	50.3	71.7
3.	Mattagiri (Mattagiri village)	00-17	3.6	1.60	8.2	47.0	19.9	25.3	45.4
		17-35		1.66	4.8	48.9	19.3	56.0	75.9
		35-62		1.72	5.0	51.4	22.9	62.0	80.8
		62-99		1.63	5.2	41.7	20.7	64.5	84.3
4.	Salem (Chinnabelagondappalli village)	00-16	4.8	1.53	7.4	43.4	16.6	20.7	37.6
		16-30		1.60	5.7	54.2	22.1	50.07	77.6
		30-65		1.58	5.2	53.9	21.6	62.3	81.2
		65-110		1.64	5.4	55.8	20.4	60.7	77.4
		110-135		1.66	4.8	56.4	19.1	61.9	79.9
5.	Sonnepuram (Sonnepuram village)	00-15	8.6	1.42	8.6	35.4	14.1	18.4	33.0
		15-49		1.67	5.8	54.2	19.9	63.0	81.6
		49-52		1.70	6.2	52.8	14.6	66.0	80.5
6.	Kelamangalam (Belagondapalli village)	00-18	1.6	1.58	4.8	46.4	15.7	29.8	48.2
		18-76		1.68	3.4	50.3	18.8	47.7	70.8
7.	Krishnagiri (krishnagiri)	00-14	2.1	1.35	5.7	49.9	16.2	28.5	41.0
		14-41		1.83	1.8	49.8	15.3	46.6	15.3
		41-65		1.64	1.5	54.7	14.5	21.7	14.5
8.	Mariampatti (Mariampatti village)	00-15	13.8	1.36	20.8	51.2	15.3	39.8	61.8
		15-60		1.51	18.4	52.8	19.4	36.1	58.4
9.	Sulakkarai (Onnakarai village)	00-15	14.6	1.39	21.3	40.9	12.6	16.8	32.1
		15-61		1.47	11.5	51.4	25.3	38.8	71.1
10.	Dharmapuri (Dharmapuri village)	00-20	0.6	1.42	0.1	55.6	21.6	63.9	79.3
		20-41		1.43	0.1	59.8	21.8	52.2	69.6
		41-76		1.46	2.9	58.2	25.6	65.4	80.4
		76-135		1.56	0.1	58.2	22.9	62.9	76.3

Sl.No	Depth (cm)	I.R. (cm/hr)	B.D. (g/cc)	HC (cm/hr)	T.P. (%)	NCP (%)	SI	AS (%)
11. Harur (Harur village)	00-18	4.6	1.18	10.2	61.5	18.9	58.0	14.6
	18-46		1.32	2.3	59.6	18.9	67.7	17.1
	46-79		1.45	3.4	60.1	16.7	67.6	10.8
	79-108		1.60	0.1	39.1	5.1	63.1	17.6
	108-140		1.52	0.8	40.2	4.8	60.8	19.1
12. Nattam (Naickenkottai village)	00-10	0.8	1.77	0.1	54.2	13.7	15.7	25.0
	10-41		1.62	0.2	63.1	9.7	14.3	28.2
	41-59		1.69	0.2	68.0	12.4	13.0	24.0
	59-120		1.62	0.2	70.4	7.5	11.7	22.1
13. Toppur (Goniharhalli village)	00-14	18.5	1.44	16.6	46.3	12.9	11.8	19.9
	14-37		1.41	11.5	54.8	17.0	50.5	67.6
	37-68		1.71	11.0	53.6	15.6	45.7	67.3
	68-115		1.69	10.0	49.3	12.4	36.9	61.9
14. Jayapuram (Pappireddipatti village)	00-17	3.6	1.67	5.3	54.8	16.2	55.5	58.3
	17-43		1.55	3.2	54.4	16.4	71.7	74.6
	43-75		1.53	3.8	55.8	15.1	64.6	70.6
	75-94		1.81	2.5	51.5	17.5	38.6	53.6

Note	I.R.	Equilibrium Infiltration Rate	N.C.P.	Non-Capillary Porosity
	B.D.	Bulk Density	S.I.	Stability Index
	H.C.	Hydraulic Conductivity	A.S.	Aggregate Stability
	T.P.	Total Porosity		

per cent of the total area. Marampatti and Sulkkarai series are dark grey to dark brown soils with sandy loam texture. These soil series showed high infiltration and hydraulic conductivity. In Jayapuram soil series the texture was clayey. Infiltration rate and hydraulic conductivity were moderately low and showed high subsoil bulk density. Nattam series are dark grayish brown to brown sandy clay loam soils with poor infiltration and hydraulic conductivity. The bulk density was high.

Summarising, impeded drainage conditions as indicated by poor hydraulic conductivity and low infiltration rate were noticed in Nattam, Dharmapuri series. High infiltration and hydraulic conductivity were observed in Sulkkarai and Mariampatti soil series. High subsoil bulk density was observed in Toppur, Krishnagiri, Nattam, Mattagiri and Jeyapuram series.

The rest of the series viz., Vannapatti, Hosur, Salem and Sonnepuram did not show any symptom of soil physical constraints.

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