

## **SOILS**

Soil is the basic natural resource that supports all life on earth's surface. Its thickness varies from a few centimeters to a few meters on earth's surface, but takes millions of years for its formation. Knowledge of soils is fundamental to well being of the present generation and the prosperity to come.

Soil survey is essential a study and mapping of soil as they occur in nature. This involves the systematic examination, description, identification, classification, correlation and finally mapping the geographic distribution of different soil in the landscape. Thus soil surveys provide basic information on soils for planning development programmes.

A soil survey describes the characteristics of the soils, classifies them, plots the boundaries of the soils on an appropriate base map and makes predictions about the behavior of the soils. This information collected in a soil survey helps in the development of optimum land use plans and evaluates and predicts the effects of land use on the environment.

### **Major Soils**

As part of the detailed soil survey conducted by Department of Soil Survey and Soil Conservation, Govt. of Kerala, 12 series were identified and mapped on the project area viz. Mudakkal, Kuttichal, Manickal, Vembayam, Amaravila, Nedumangad, Palode, Vilappil, Thonnakkal, Trivandrum, Aryancode and Vamanapuram

Mudakkal soils are alluvial, in origin and are found in the banks of rivers and flood plains Low land series viz. Kuttichal, Manickal, Vembayam and Amaravila are colluvio - alluvial in origin. The soils seen in the made up paddy fields are classified as Miscellaneous land type as they have no uniform character. The major upland soil series is Nedumangad which is distributed in an area of 4472.78 ha (56%) followed by Trivandrum series (1216.49 ha, 15.23% of TGA). The Nedumangad soil series with a solum thickness of 90 to 150cm is very dark brown to pale brown in colour, very strongly acidic and have a surface texture of gravelly sandy clayey loam to gravelly sandy clay. These soils are developed in Khondalite rocks. Pebbles and stones are found distributed in the sub surface region. These soils are well drained with moderate to moderately slow permeability. These soils have medium fertility & moderate to good water holding capacity. These soils occur in rolling topography with normal to excessive relief and the soils are generally gravelly. Optimum soil conservation measures and proper soil

management with judicious application of fertilizers with irrigation will enhance crop production.

The other upland soil series identified and mapped in the project area are Palode, Vilappil, Thonnakkal, Aryancode and Vamanapuram series.

The occurrence of soil series and their extent are listed below.

Table: Distribution of soil series

Sl. No	Name of Soil Series	Occurrence	Area (ha)	%
1	Mudakkal	River bank of midlands	79.59	1.00
2	Kuttichal	Very gently sloping region valleys of midlands and midup lands	50.07	0.63
3	Manickal	Very gently sloping narrow valleys of midlands	175.81	2.20
4	Vembayam	Very gently sloping valleys of lowlands	122.30	1.53
5	Amaravila	Very gently sloping valleys of lowlands	209.48	2.62
6	Nedumangad	Low hill ranges of the midlands	4472.78	56.07
7	Palode	Step to very steeping sloping lands of midlands and midup lands	520.85	6.52
8	Vilappil	Moderately steep hill slopes of Midlands and miduplands	116.16	1.45
9	Thonnakkal	Moderately steep side slopes of midlands	49.93	0.63
10	Trivandrum	Low hills and laterate mounds in midland	1216.49	15.23
11	Aryancode	Low hill ranges of midlands	428.92	5.37
12	Vamanapuram	Low hill ranges of midlands	289.16	3.62
13	Miscellaneous	Gently sloping narrow valleys	223.71	2.80
14	River		30.36	0.38
<b>Total</b>			<b>7985.61</b>	<b>100.00</b>

**SOIL CHARACTERISTICS****Soil Depth**

The physical properties of the soil largely determine how best it can be made suitable for growing a particular crop, different species or types of crops. Some of the important soil properties are water holding capacity, permeability to water, aeration, plasticity, nutrient supplying ability, etc. they are influenced by the size, proportion, arrangement and mineral composition of the soil particles. The proportion of the four major components of the soil- inorganic or mineral particles, organic material, water and air vary substantially from place to place and with depth. So soil depth is an important parameter for agriculture development and according to the depth, the soils have been classified into:

1. Very Shallow - less than 25 cm
2. Shallow - 25-50 cm
3. Moderately shallow - 50-75 cm
4. Moderately deep - 75-100 cm
5. Deep - 100- 150 cm
6. Very deep - more than 150 cm

The table showing the distribution of soil depth in the six micro watersheds are given below:

Table: Distribution of soil depth in watersheds

Depth	4V10a	4V11a	4V11b	4V25a	4V26a	4V29b	Area in Ha	%
1	11.84				223.74	0.00	235.58	2.95
2	161.98	3.35			124.58	216.75	506.66	6.34
3	877.65	155.07	360.15	70.52	408.62	397.11	2269.12	28.42
4	474.46	8.61	314.61		45.84	1236.55	2080.07	26.05
5	151.33	7.37	51.26	300.93	951.35	1094.15	2556.39	32.01
6	31.26			27.31	21.01	4.14	83.72	1.05
M				30.84	112.54	80.33	223.71	2.80
River	14.25	1.19		10.48	4.44		30.36	0.38
	<b>1722.77</b>	<b>175.59</b>	<b>726.02</b>	<b>440.08</b>	<b>1892.12</b>	<b>3029.03</b>	<b>7985.61</b>	<b>100.00</b>

Source: Dept of Soil Survey & Soil Conservation, Govt. of Kerala

Note: M stands for Miscellaneous soils that have no uniform character

Out of the total area, 2556.39 ha (32.01 %) are covered by deep soils, 2269.12 ha (28.42 %) under moderately shallow soils and moderately deep soil is found in 2080.07 ha. moderately shallow, moderately deep and deep soil cover 82.48 % of the total project area. Shallow to very shallow soils having a depth less than 75 cm is found in 9.29 % of TGA (742.24 ha)

### Surface Soil Texture

A number of soil factors, the important of which are soil texture, moisture content and temperature modify delivery of ions to plant root surface by diffusion and mass flow. The finer the texture of the soil, the less rapid will be the movement of the soil texture and diffusion of ions through the water. Also, ions diffusing through soil moisture in clay soil are much more likely to be attracted to adsorption sites than on sandy soil.

The important texture classification of soil are (1) sandy, (2) loamy, (3) clayey. Sandy soils are very permeable and well drained; but are less water retentive and hence need more frequent irrigation for successful crop growth. The clayey soils can hold more moisture, but they have high wilting percentage. They are also subjected to water logging resulting in poor aeration and drainage. The moderately fine texture soils, the loams are the most suitable soils for crop growth, since they have the advantage of both sand and clay.

The various surface soil textures identified in the project area and their spatial extent is given below:

Table: Distribution of surface soil texture

No.	Texture	Area in Ha	Percentage
1	clay	516.48	6.47
2	gravelly clay	32.71	0.41
3	gravelly clay loam	3689.60	46.20
4	gravelly loam	2469.85	30.93
5	sandy clay	239.72	3.00
6	sandy loam	333.88	4.18

7	clay loam	148.68	1.86
8	sandy clay loam	94.06	1.18
9	loam	83.66	1.05
10	gravelly sandy clay loam	122.90	1.54
11	Miscellaneous	223.71	2.80
12	River	30.36	0.38
<b>Total</b>		<b>7985.61</b>	<b>100.00</b>

Source: Dept of Soil Survey & Soil Conservation, Govt. of Kerala

Note: M stands for Miscellaneous soils that have no uniform character

The major soil texture of the project area constitutes that of gravelly clay loam texture which covers an area of 3689.60 ha (46.20%). Generally loam soils occurs in 2469.85 ha (30.93%). These surface soil texture covers the major area in all the six watersheds. Ten different soil textures are identified and mapped.

The table showing the distribution of surface soil texture in the six watersheds are given below:

Table: Distribution of surface soil texture in watersheds

Texture	4V10a	4V11a	4V11b	4V25a	4V26a	4V29b
clay	94.25	5.86	30.28		4.28	381.81
gravelly clay	32.71					
gravelly clay loam	790.66	73.73	451.59	176.84	794.86	1401.92
gravelly loam	702.55	92.15	223.16	151.29	757.92	542.78
sandy clay	23.50			14.66		201.56
sandy loam	64.85	2.66	20.99	27.16	46.56	171.66
clay loam					0.51	148.17
sandy clay loam				3.54		90.52
loam				25.27	58.39	
gravelly sandy clay loam					112.62	10.28
Miscellaneous				30.84	112.54	80.33
River	14.25	1.19		10.48	4.44	
	<b>1722.77</b>	<b>175.59</b>	<b>726.02</b>	<b>440.08</b>	<b>1892.12</b>	<b>3029.03</b>

Source: Dept of Soil Survey & Soil Conservation, Govt. of Kerala

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### Soil Erosion

Soil erosion is the process of detachment and displacement of soil particles from land surface. This mainly occurs by natural erosion on the geologic erosion and through accelerated as soil erosion. The accelerated erosion is caused by the unscientific cultivation practices, heavy grazing and destruction of tree cover. The major factors influencing erosion are the rainfall, wind, type of soil, slope of the land, ground cover/ land use pattern and human factors.

Four major erosion classes are mapped in the project area

- 1 – slight
- 2 – moderate
- 3 – severe
- 4 - very severe

The majority of the area is under moderate erosion class. An area of 3552.16 ha (44.48 % of TGA) is under this class and an area of 2905.13 ha is under moderate erosion class. Nearly 500 ha area is having slight erosion, which use the low lying fields in the project area.

The table showing the distribution of soil erosion in the six watersheds are given below:

Table: Distribution of soil erosion in watersheds

Erosion	4V10a	4V11a	4V11b	4V25a	4V26a	4V29b	Area (in Ha)	%
1	149.00	8.52	51.26	14.66	27.05	248.13	498.62	6.24
2	502.23	7.47	314.62	49.37	274.56	1756.88	2905.13	36.38
3	883.46	155.06	360.14	334.73	1091.83	726.94	3552.16	44.48
4	173.83	3.35			381.70	216.75	775.63	9.71
M				30.84	112.54	80.33	223.71	2.80
River	14.25	1.19		10.48	4.44		30.36	0.38
	<b>1722.77</b>	<b>175.59</b>	<b>726.02</b>	<b>440.08</b>	<b>1892.12</b>	<b>3029.03</b>	<b>7985.61</b>	<b>100.00</b>

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