



M.S.SWAMINATHAN
SCHOOL OF
AGRICULTURE

ASAC 1101 (2-1-0)

FUNDAMENTALS OF SOIL SCIENCE

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PRACTICAL MANUAL



Shaping Lives... Empowering Communities...

MSSSoA

EX No.3**DETERMINATION OF BULK DENSITY BY CORE SAMPLER METHOD**

Bulk density is the ratio of mass of oven dry soil to its bulk volume

$$\rho_b = M_s/V_t$$

Whereas, particle density $\rho_p = M_s/V_s$

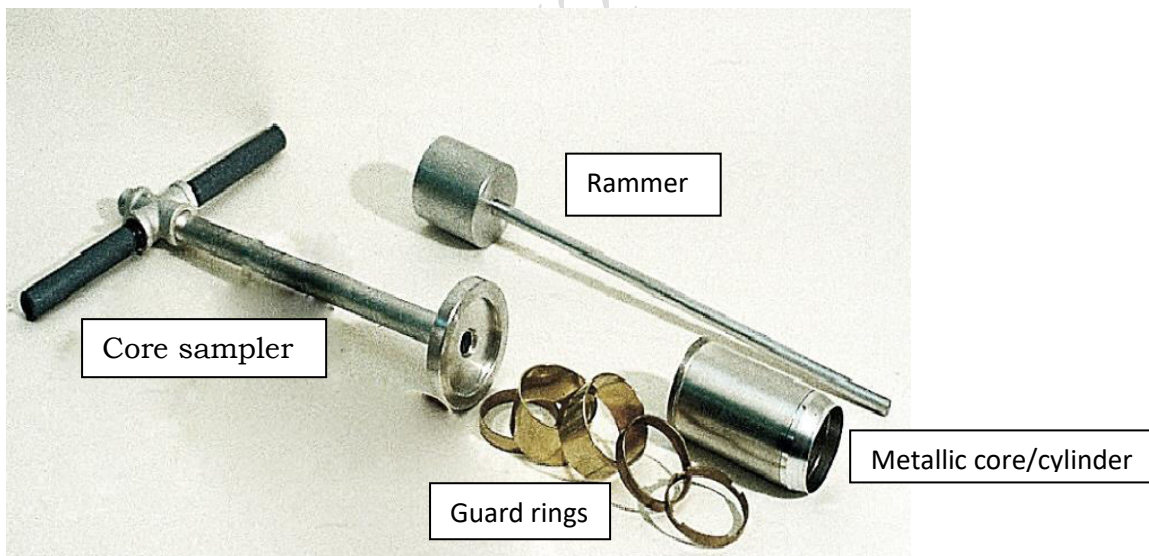
- Aim:**
- 1.To determine the bulk density of the soil using core sampler
 - 2.To calculate % moisture content and % pore space

Principle:

A metallic core of known volume is driven into the soil and undisturbed soil sample is taken. The soil sample is weighed after oven drying the soil. The volume is calculated from the core dimensions used for drawing the sample. By substituting the values in formula bulk density is calculated.

Apparatus required:

Core sampler, hammer, balance, oven, aluminum boxes, and knife/khurpi

**Procedure:**

- Smoothen the surface or remove the loose surface soil, where bulk density is to be determined.
- Drive the metallic core into the soil using a small hammer.
- Carefully remove the core containing soil sample by excavating soil from the sides, using a pick axe or crow bar.

- Trim the protruding soil with the knife on either side of the core.
- Transfer the sample from the core to the pre-weighed aluminum box.
- Dry the soil in oven at 105°C for 24 hours, cool it and determine oven-dry weight of the sample.
- Measure inner dimensions i.e. radius and depth of the core and find its volume.

Precautions

- Core should be driven straight (non-inclined) into soil.
- Core should be driven gently to avoid shattering or compaction of soil.
- Always use dent-free cores.

Calculation:

Weight of empty aluminum box	= w_1 g
Weight of empty aluminum box + fresh soil	= w_2 g
Weight of empty aluminum box + oven dry soil	= w_3 g
Weight of fresh soil	= $(w_2 - w_1)$
Weight of oven dry soil	= $(w_3 - w_1)$
Weight of moisture/ mass wetness (w)	= $(w_2 - w_3)$
Volume of soil in core/cylinder (v)	= $\pi r^2 h$
Bulk density (on moist basis)	= $\frac{(w_2 - w_1)}{v}$
Bulk density (on dry basis)	= $\frac{(w_3 - w_1)}{v}$
% moisture	= $\frac{(w_2 - w_3)}{(w_3 - w_1)} \times 100$
% solid space	= $\frac{\text{Bulk density}}{\text{Particle density}} \times 100$
% pore space	= 100 - % solid space
Volume wetness (θ)	= Bulk density x Mass wetness

Rating:

Textural class	Bulk density (Mg/m ³)		Pore space
	Ideal for plant growth	Restricts root growth	
Sandy soil	1.6-1.8	>1.8	40
Loam	1.4-1.6	>1.6	47
Silt loam	1.3-1.6	>1.6	50
Clay	1.1-1.4	>1.4	58

Result:

	Sample 1	Sample 2
Soil type		
BD (Mg/m^3)		
% moisture		
W (g)		
θ (cm^3)		
% pore space		

Comments :

Sample 1: Given _____ soil sample is favourable for/restricts root growth

Sample 2: Given _____ soil sample is favourable for/restricts root growth