

## **Bulk Density**

### **What It Is and Why It Is Important**

#### **All About Bulk Density**

Bulk density is a measurement of the weight of soil of a known volume. It can help us understand soil compaction and the amount of pore space in the soil.

#### **How to Calculate Bulk Density**

Bulk density is measured by taking the oven dried weight of a known volume of soil and dividing it by its volume. The measurement is recorded in grams per centimeter cubed ( $\text{g/cm}^3$ ) or  $\text{kg/m}^3$  (if you receive a report in  $\text{kg/m}^3$  you can convert to  $\text{g/cm}^3$  by dividing by 1000 or moving the decimal 3 places to the left). The higher the value – the more compacted the soil, and the harder it is for roots to penetrate. The following slide is a short table of bulk density values to look for based on soil texture:

Soil Texture	Ideal Bulk Density for Plant Growth	Bulk Density that Affects Root Growth	Bulk Density that Restricts Root Growth
Sand, Loamy Sand	<1.60g/cm <sup>3</sup>	1.63g/cm <sup>3</sup>	>1.80g/cm <sup>3</sup>
Sandy Loam, Loam	<1.40g/cm <sup>3</sup>	1.63g/cm <sup>3</sup>	>1.80g/cm <sup>3</sup>
Sandy Clay Loam, Clay Loam	<1.40g/cm <sup>3</sup>	1.60g/cm <sup>3</sup>	>1.75g/cm <sup>3</sup>
Silt, Silt Loam	<1.40g/cm <sup>3</sup>	1.60g/cm <sup>3</sup>	>1.75g/cm <sup>3</sup>
Silt Loam, Silty Clay Loam	<1.40g/cm <sup>3</sup>	1.55g/cm <sup>3</sup>	>1.65g/cm <sup>3</sup>
Sandy Clay, Silty Clay, Clay Loam	<1.10g/cm <sup>3</sup>	1.49g/cm <sup>3</sup>	>1.58g/cm <sup>3</sup>
Clay (<45% clay)	<1.10g/cm <sup>3</sup>	1.39g/cm <sup>3</sup>	>1.47g/cm <sup>3</sup>

#### **In an Ideal Situation, What Is the Makeup of Soil?**

Ideal soil is roughly half pore spaces (mix of air, available water and unavailable water) and half soil (majority of minerals and organic material). This type of soil has good gas exchange (good aggregate of the soil).

#### **Why Is Bulk Density Important?**

It is of vital importance to understand the bulk density of the soil into which you are planting. This will give you an idea of:

- How easily the plants can penetrate the ground
- The soil's ability to hold moisture and soil biology
- Whether or not anaerobic conditions are likely to exist/occur