SOIL TEXTURE BY FEEL

Start

Place approximately 2 tsp. soil in palm. Add water dropwise and knead soil to break down all aggregates. Soil is at proper consistency when plastic and moldable, like moist putty.

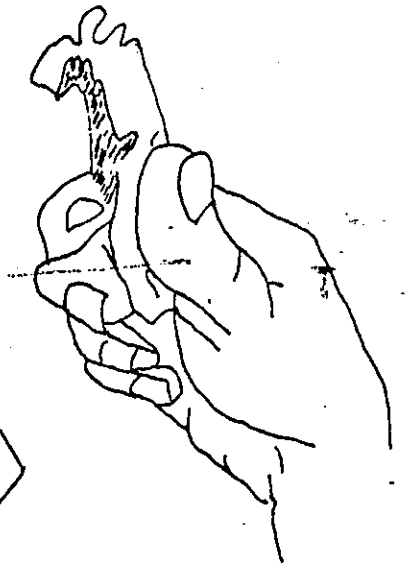
Add dry soil to soak up water.

Is soil too wet? Yes / No → SAND

Is soil too dry? Yes / No

Does soil remain in a ball when squeezed? No / Yes

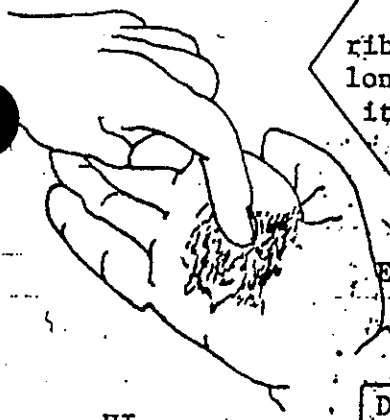
Place ball of soil between thumb and forefinger, gently pushing the soil with thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow the ribbon to emerge and extend over forefinger, breaking from its own weight. Does soil form a ribbon? No → LOAMY SAND / Yes



Does soil make a weak ribbon < 1" long before it breaks? No / Yes

Does soil make a medium ribbon 1-2" long before it breaks? No / Yes

Does soil make a strong ribbon > 2" or longer before it breaks? Yes



Excessively wet a small pinch of soil in palm and rub with forefinger

Yes

Does soil feel very gritty? Yes → SANDY LOAM / No

Neither gritty nor smooth predominately? Yes → LOAM / No

Does soil feel very smooth? Yes → SILT LOAM

Yes

Does soil feel very gritty? Yes → SANDY CLAY LOAM / No

Neither gritty nor smooth predominately? Yes → CLAY LOAM / No

Does soil feel very smooth? Yes → SILTY CLAY LOAM

Yes

Does soil feel very gritty? Yes → SANDY CLAY / No

Neither gritty nor smooth predominately? Yes → CLAY / No

Does soil feel very smooth? Yes → SILTY CLAY

HI

% SAND

LO

% CLAY

HI

Adapted from: Thien, Steve J. 1979. A flow diagram for teaching texture-by-feel analysis. Journal of Agronomic Education 8:54-55

Usually, it is helpful to wet the sample to estimate plasticity and stickiness more accurately. The way a wet soil "slicks out" gives a good idea as to the amount of clay present. Sand particles are gritty, whereas silt has a floury or talcum powder-like feel when dry, and is only moderately plastic and sticky when wet. Determining the soil texture in the field requires skill and experience, but good accuracy can be obtained if the field men frequently check against laboratory results or reference samples.

The soil must be well moistened and rubbed between the fingers for proper determination of the textural class by feel. The following guidelines are provided below for the determination of the basic soil texture classes in terms of field experience and feel:

(1) **Sand:** Individual grains can be seen and felt readily. Squeezed in the hand when dry, this soil will fall apart when the pressure is released. Squeezed when moist, it will form a cast that will hold its shape when the pressure is released, but will crumble when touched.

(2) **Sandy loam:** Consists largely of sand, but has enough silt and clay present to give it a small amount of stability. Individual sand grains can be seen and felt readily. Squeezed in the hand when dry, this soil will fall apart when the pressure is released. Squeezed when moist, it forms a cast that will not only hold its shape when the pressure is released, but will withstand careful handling without breaking. The stability of the moist cast differentiates this soil from sand.

(3) **Loam:** Consists of an even mixture of the different sizes of sand, silt, and clay. It is easily crumbled when dry and has a slightly gritty, yet fairly smooth feel. It is slightly plastic. Squeezed in the hand when dry, it will form a cast that will withstand careful handling. The cast formed on moist soil can be handled freely without breaking.

(4) **Silt:** Fine powdery soil with flour or talcum feel when textured. Individual grains can be seen but not felt when textured. Normally not found in pure form but mixed with fine sands and clay.

(5) **Silt loam:** Consists of a moderate amount of fine grades of sand, a small amount of clay, and a large quantity of silt particles. Lumps, in a dry, undisturbed state, appear quite cloddy, but they can be pulverized readily; the soil then feels soft and floury. When wet, silt loam runs together and puddles. Either dry or moist, casts can be handled freely without breaking. When a ball of moist soil is pressed between thumb and finger, it will not press out into a smooth unbroken ribbon, but will have a broken appearance.

(6) **Clay loam:** A fine-textured soil that breaks into clods or lumps, which are hard when dry. When a ball of moist soil is pressed between the thumb and finger, it will form a thin ribbon that will break readily, barely sustaining its own weight. The moist soil is plastic and will form a cast that will withstand considerable handling.

(7) **Clay**: A fine-textured soil that breaks into very hard clod or lumps when dry, and is plastic and unusually sticky when wet. When a ball of moist soil is pressed between the thumb and finger, it will form a long ribbon.

Non-mineral soils are not part of the textural triangle. They include:

(1) **Muck**: The terms "peat" and "muck" are often used synonymously. The two are distinguished on the basis of degree of decomposition of the original organic plant remains. Muck is a dusk, light-weight, soft, structureless material containing very few identifiable plant remains. Some mineral soils material may be noticeable when texturing, but should not dominate the soft, spongy feel of the muck. Muck generally comprises the well decomposed surface material of swamps and wet depressions. It ranges from a few inches to several feet thick.

(2) **Marl**: Consists of fresh water deposits of calcium carbonate. In color, it ranges from dull brownish to almost white. When dry, it has a chalky feel and when wet, slimy. Many times the shells of mollusks can be observed in the marl. Bits and pieces of shells can give marl a gritty feel.

A more accurate and fundamental method is used by the U.S. Department of Agriculture (USDA) for the naming of soils based on the mechanical analysis in the laboratory. Figure 5 is a guide for the USDA soil texture when the proportions of sand, silt, and clay have been determined in the laboratory. It also can serve as a guide to the field determination or the interpretation of texture once the textural class name is known.

d. **Significance of Different Texture Classes** - The texture of a soil horizon is, perhaps, its most nearly permanent characteristic. Soil structure can be quickly modified by management as can the nutrient content. Soil texture then is one of the principle properties of soil that affects the potential use and limitations of the soils for different uses. First and foremost, the textural class name connotes the proportion of sand, silt, and clay in the soil sample. Therefore, as a person uses the soil survey maps and interpretations, s/he can infer from the class name what proportion of sand, silt, and clay is in the soil in the area s/he is concerned with. This, in turn, can be interpreted in terms of the permeability, shrink-swell potential, available moisture capacity, infiltration rate, bearing capacity, shear strength, and other similar properties and qualities that are useful in determining suitability of soils for potential uses.

3. Soil Structure: While texture undoubtedly has a great importance in determining certain properties of a soil, it is evident that the particular type of soil structure must exert considerable influence on soil qualities and use. The importance of soil structure in soil classification, soil productivity, and use can scarcely be overemphasized. The capability of any soil for the growth of plants in its response to management for many uses depends as much on its structure, as on its texture, permeability or fertility. It is at once apparent that soil conditions and characteristics such as water movement, heat transfer, aeration, bulk density, and porosity will be much influenced by structure.

FIGURE 4

SOIL TEXTURAL CLASS NAMES AND APPROXIMATE PERCENT OF SAND, SILT & CLAY.

GENERAL TERMS	BASIC SOIL TEXTURAL CLASSES	COMPOSITION		
		SAND percent	SILT percent	CLAY percent
Coarse Textured Soils	SANDS [1] Coarse sand Sand Fine sand Very fine sand	+85	-15	-10
	LOAMY SANDS [1] Loamy coarse sand Loamy sand Loamy fine sand Loamy very fine sand	70-90	-30	-15
Moderately Coarse Textured Soils	SANDY LOAMS [1] Coarse sandy loam Sandy loam Fine sandy loam Very fine sandy loam	43-85	-50	-20
Medium Textured Soils	LOAM SILT LOAM or SILT	23-52 20-50 - -	28-50 50-80 50-80 +80	7-27 12-27 -12 -12
Moderate Fine-textured Soils	CLAY LOAM SANDY CLAY LOAM SILTY CLAY LOAM	20-45 45-80 -20	15-53 -28 40-73	27-40 20-35 27-40
Fine-textured soils	SANDY CLAY SILTY CLAY CLAY	45-65 -20 -45	-20 40-60 -40	35-55 40-60 +40

\+ = more than
\- = less than

1 The proportion of various size sand particles determines the name of these textural classes.

FIGURE 5

GUIDE FOR USDA SOIL TEXTURAL CLASSIFICATION.

(Using Materials Less Than in 2.0 mm. in Size. If Approx. 20% or more of the soil material is larger than 2.0 mm the texture term includes a modifier Example: gravelly sandy loam

Example of Use: A soil material with 35% clay, 30% silt and 35% sand is a clay loam.