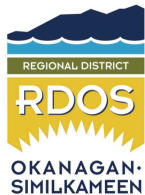


FARM IRRIGATION FACT SHEETS

SET 4: SOIL BY HAND FEEL

Know Your Soil's Texture,
Moisture Content, Infiltration
Rate, & Water Storage



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Living Lands Agroecology, 2023

Know Your Soil

SOIL “BY HAND”

Get a feel for your soil.

Every irrigation decision depends on the soil, from how water should be applied, to how much, how often, and how fast

The materials, structures, and life in a soil all affect how it absorbs and stores water, and how roots drink from those stores.

But we don't have to be soil scientists to irrigate well. Simple “*hand-feel*” **tests** can get us close enough. In the next four sheets we'll answer:

1. What's the soil's **texture**?
2. How **moist** is it?
3. How quickly does it **absorb** water?
4. How much water can it **store**?

SOIL SPONGE

The same soil properties help absorb *and* store water.

Good soil is a sponge with lots of air spaces water can travel through, *and* lots of areas for water to cling onto by surface tension.

Imagine soil microscopically: In general, the more “complex” the soil, the better.

SOIL REALITY

Live with your soil texture.

Soil texture — the balance of sand, silt, clay — and how rocky your soil is, and how it changes in layers, are fundamental soil properties. There's not much you can do to change that.

So the next few pages ask: ***What is soil texture, and how do I work with the soil I've got?***

In the meantime, every soil can be “built” or “improved” by adding roots, mulch, and soil life.


SOIL REMEDIATION

Grow roots, mulch (or munch) plants, and encourage worms.

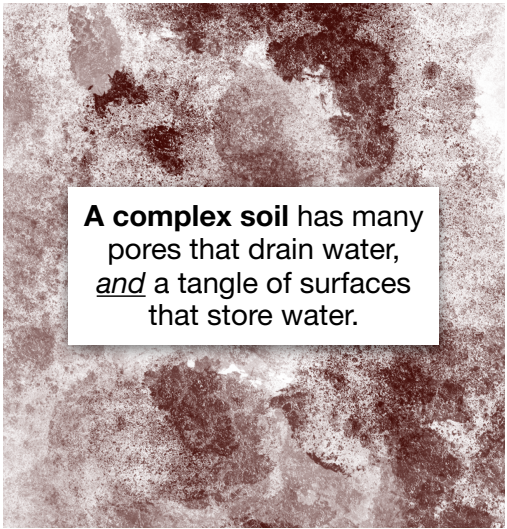
Adding life to your soil helps most problems, whether water runs off a compact soil, or runs right through a coarse soil and leaves little behind.

Diverse, healthy soil life — roots, fungi, bacteria, microfauna, worms, etc — glue together unruly tangles of soil particles that ***drain better and store more water and air*** than a lifeless soil.


At the microscopic level, these complicated, sticky shapes have lots of surface area to cling to water, fine pores to let air and water through, and a strong grip on each other to resist erosion.



A compact soil has small, disconnected pores, so water isn't well absorbed and little is stored.

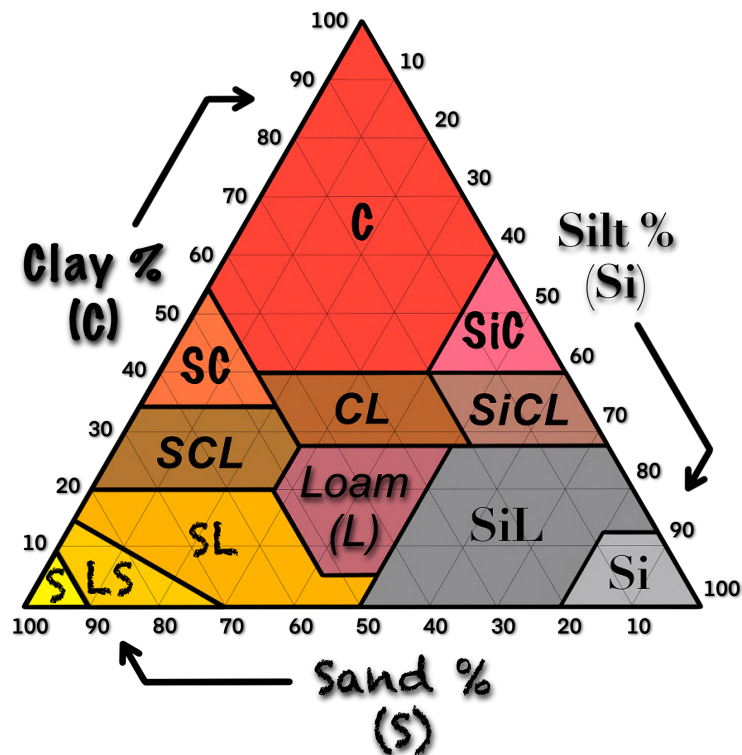


A complex soil has many pores that drain water, and a tangle of surfaces that store water.



A coarse soil has huge pores, but very little surface area, so water drains right through.

Texture



NO RIBBON (crumbles) — SANDS

NO BALL: SAND — S

BALL HOLDS: LOAMY SAND — LS

SHORT RIBBON (less than 1") — LOAMS

LOG ONLY: SANDY LOAM — SL

THREAD (bends crack): LOAM — L

THREAD BENDS (no cracks):

SILT or SILTY LOAM — Si or SiL

MED. RIBBON (1" to 2") — CLAY LOAMS

Thread molds to curve and is...

GRITTY: SANDY CLAY LOAM — SCL

A BIT GRITTY: CLAY LOAM — CL

SMOOTH: SILTY CLAY LOAM — SiCL

LONG RIBBON (more than 2") — CLAYS

1" RING CRACKS: SANDY CLAY — SC

1" RING, NO CRACKS:

CLAY or SILTY CLAY — C or SiC

TEXTURE BY HAND

Moisten a handful of soil, knead it, and test its limits.

Before all else, know your soils' textures — sand, silt, clay — and how much rock and gravel there is in the full profile of your plants' **"effective roots"**.

1. Use a screen with 2mm holes (10 Mesh, 0.08") to **sieve out gravel and rock**. These "coarse fragments" would wreck the hand-feel test. *A/so*, these rocks **hold almost no water at all**.
2. Start the "hand-feel test" by adding just enough water to a handful of soil to **knead it into a ball**: Does the ball hold together or fall apart?
3. With the ball in one hand, use your thumb and forefinger to **pinch out a ribbon**: How long is it before it breaks?
4. Can you roll the ball to **make a fat log**? Or roll the log into a **thin thread**? Does it crack? Can you bend it? Make it into a **one-inch ring**?

Use the **flow chart (left)** to get the soil's texture.



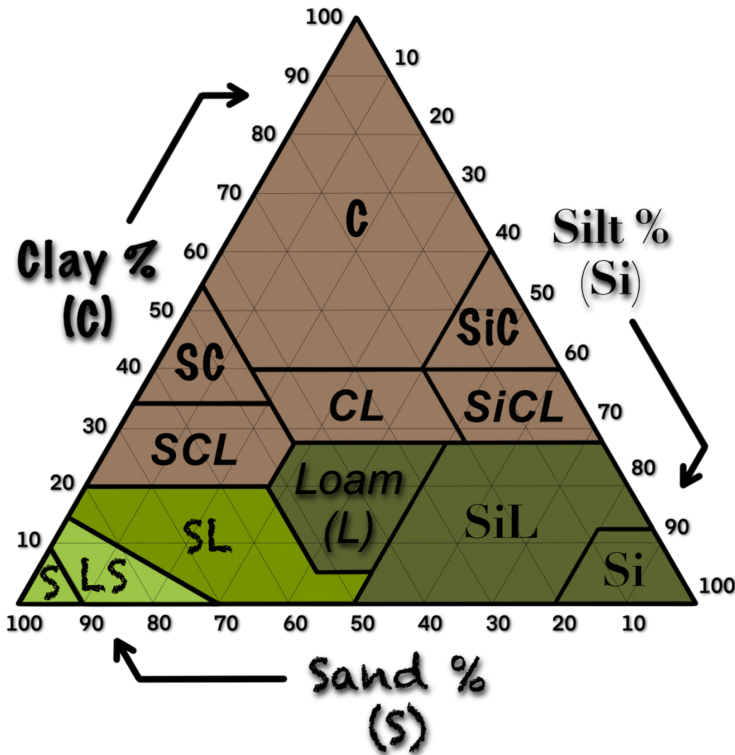
DIG HOLES!

Where do the roots go?

Effective roots occupy the soil densely and harvest the majority of the plant's water and nutrients. **How deep are your plants' roots?**

Dig holes to check. While you're there, identify the **textures and depths of the soil layers**.

Moisture



SHOULD I IRRIGATE?

You can feel whether it's time.

Stress-free, plants can only access **about 50%** (or less) of the moisture stored in a soil.

For drip irrigation (or to avoid any stress at all) it's **best to stay above 75% moisture**.

Feel the soil and use this chart to help you decide if it's time to irrigate.

First, dig a hole as deep as the "effective" roots go. Identify the texture of each layer as you dig down. Texture affects the moisture test.

Now, **squeeze a handful into a ball...**

...open your hand and look.

Does the ball hold together? Is it light or dark? Is there a wet outline left on your hands?

If it's a clay, can you "ribbon" it between thumb and forefinger?

Soil Texture				
Water Storage	SAND	SANDY LOAM	LOAM & SILT	CLAY & CLAY LOAM
> 100% Saturated	Free water from a ball...			
	... that is bounced	... that is kneaded	... that is squeezed	... on its surface
100% Field Capacity	Very Dark Wet outline on hand			
75% - 100% Ideal	Dark			
	Weak ball		Pliable ball, slicks easily	Ribbons well, slicks
50% - 75% Sufficient	Medium Dark			
	No ball	Balls but falls apart	Balls, slicks a bit	Balls and ribbons
25% - 50% Stressed	Light			
	No ball		Crumbly but balls	Balls (poor ribbon)
0% - 25% Wilting Point	Loose Flows through fingers		Powdery & crusty	Hard & cracks

Infiltration

TEXTURE & INFILTRATION

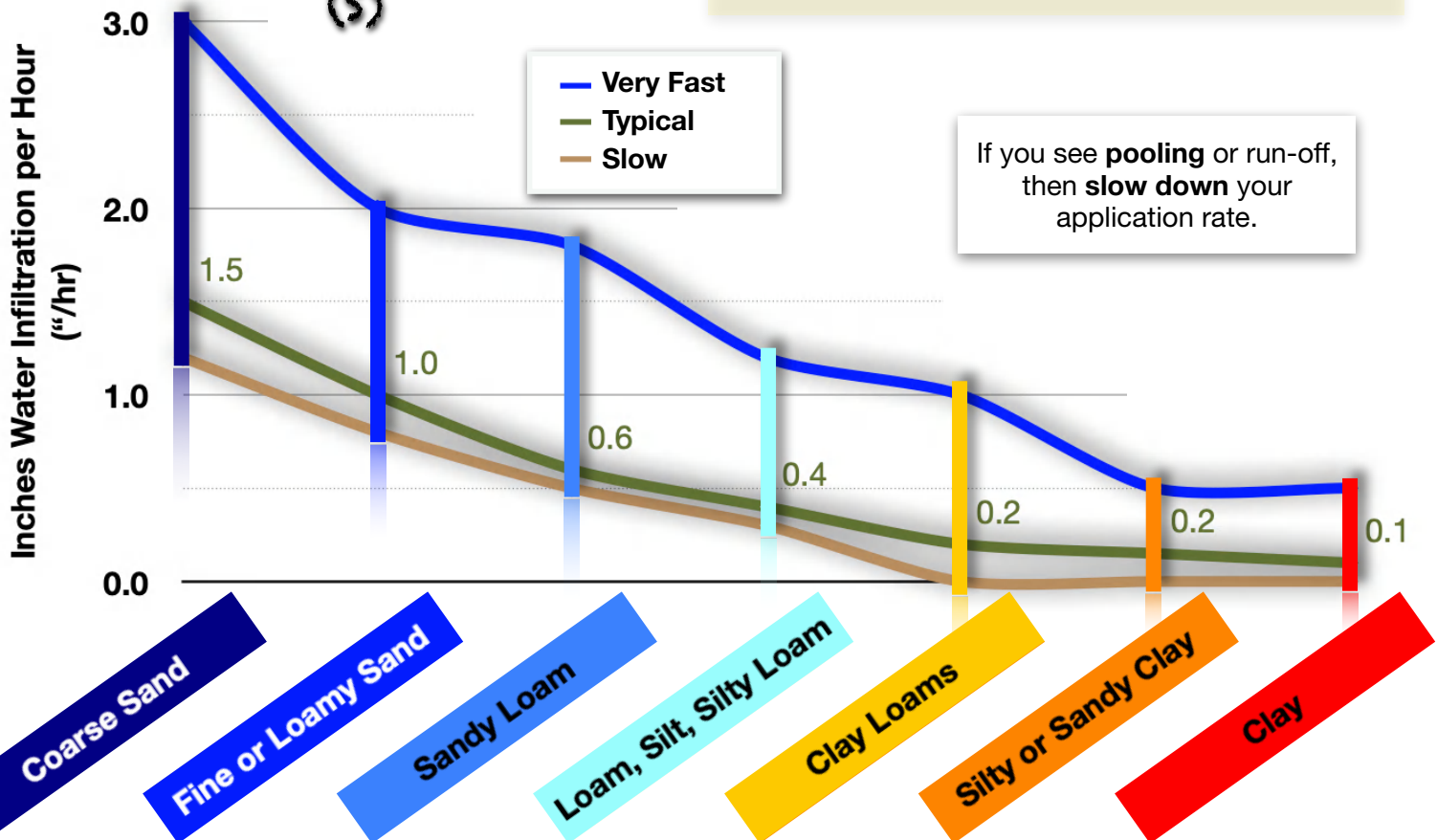
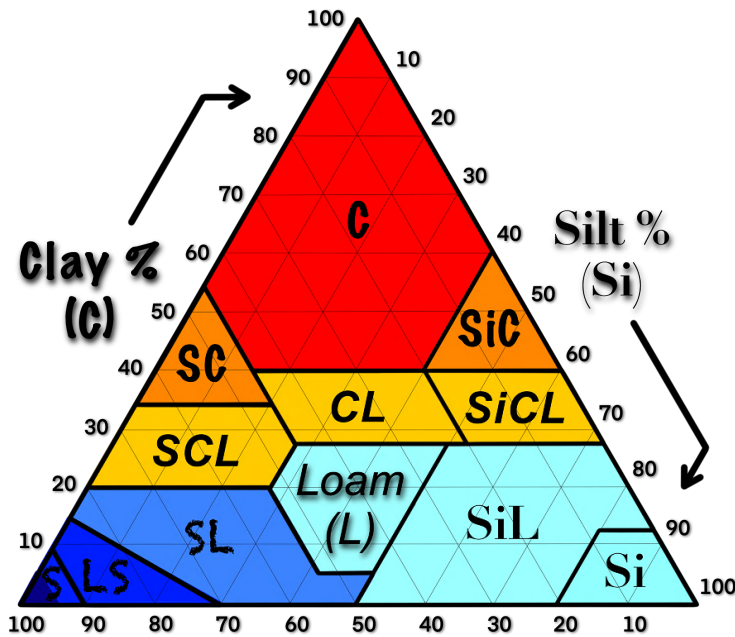
How quickly does water get in?

If you irrigate faster than your soil can absorb the water, excess runs off and causes problems.

What's too fast?

The graph below helps you make a **guess based solely on the soil's texture**, but a lot of other factors also affect infiltration.

Water beads off dry, fine soils, while moist soils absorb water more easily. A wet soil that is draining poorly can't absorb much water. Roots, soil life, and loose soils help water get in.

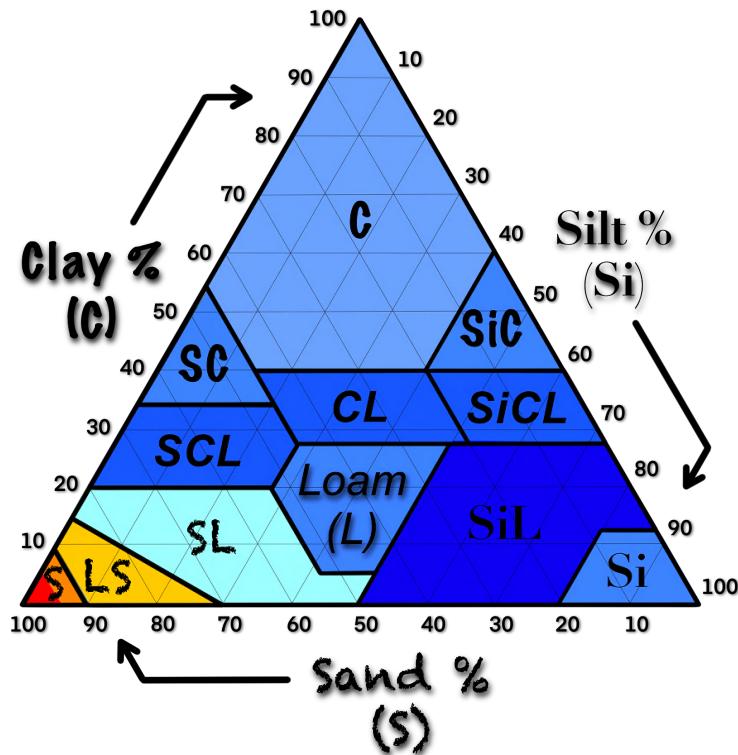


Short "pulses" sink in faster.

Water applied over a brief period is absorbed more quickly by most soils. Run-off or pooling can sometimes be solved with **shorter, more frequent irrigation cycles**.

15 minutes	2.5 times faster absorption than usual.
30 minutes	2 times faster...
90 minutes	1.5 times faster...
120 minutes	1.25 times faster...

Storage



Rocks bigger than 2mm don't hold much water, so if a soil is half gravel, it holds half as much water.

TEXTURE & STORAGE

How much "plant available" water can a soil store?

Coarse soils can't store much water, but what's there is easily available to plants. **Fine soils**, such as clays, store lots more, but also hold on to that water more tightly, so less is available.

The graph below roughly estimates how much water is available based on soil texture.

The **blue line** gives the "**max**" inches of stored water in a foot deep of a healthy, airy soil. The "min" dashed line is for a soil with poor structure.

The **green lines** show how many inches of that stored water are **available stress-free** to plants.

