



Schiros, *Roots*

Soil health

principles and practices

Dean Moberg
USDA – NRCS
Hillsboro



USDA-NRCS

- SCS, 1935.
- NRCS, 1994.
- SWCD's.



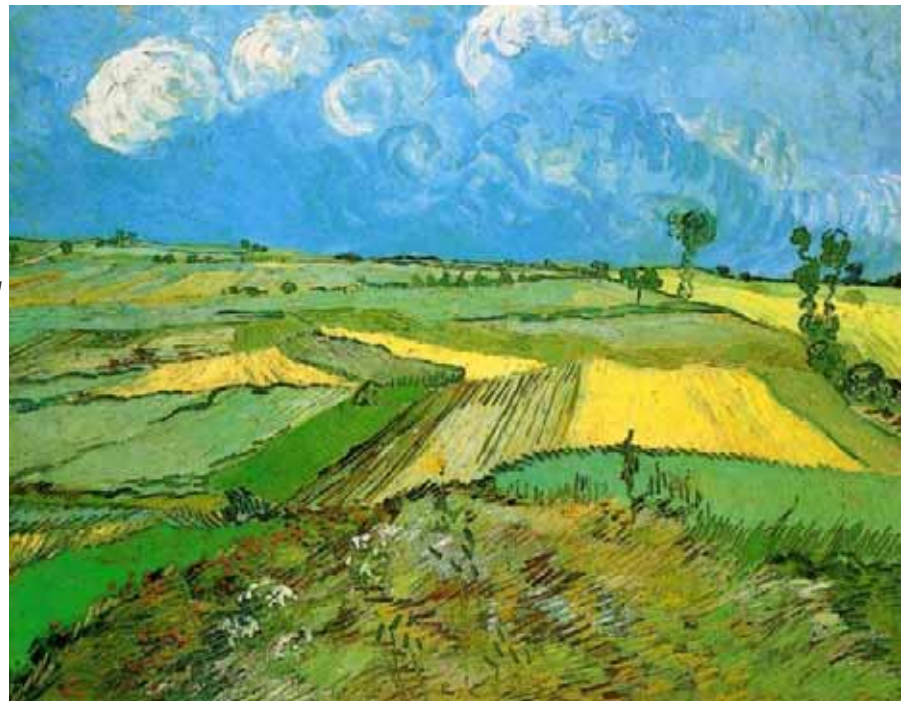
Soil health (NRCS)

- *High performing and productive.*
- *Reduce production costs and increase profit.*
- *Protects natural resources.*
- *Increase efficiencies.*



Soil health (Dean)

The ability of a soil to help landowners achieve reasonable goals without spending too much money or messing up the environment.



Van Gogh, *Wheat Fields at Auvers*

Soil health

-three aspects

- Physical.
- Chemical.
- Biological.



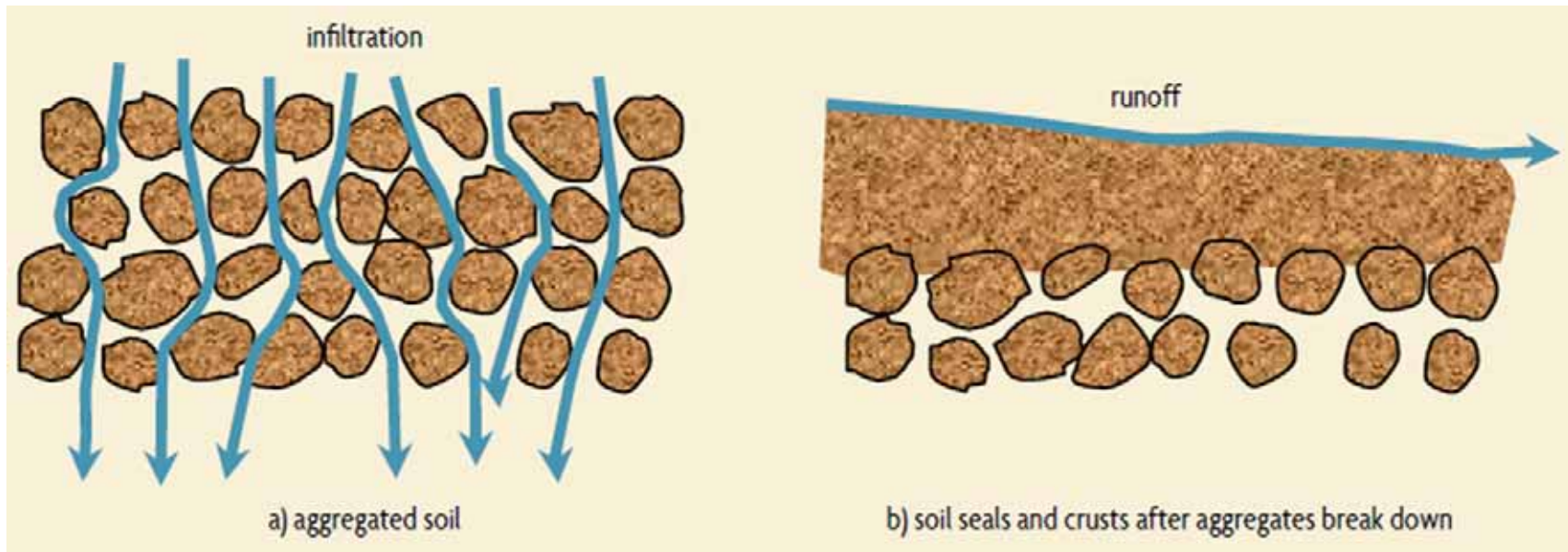
Soil health

-physical (“tilth”)

- Improve root growth.
- Increase water and air infiltration.
- Decrease erosion.
- Improve vehicle stability / traction.

Physical soil health

-demo aggregate stability



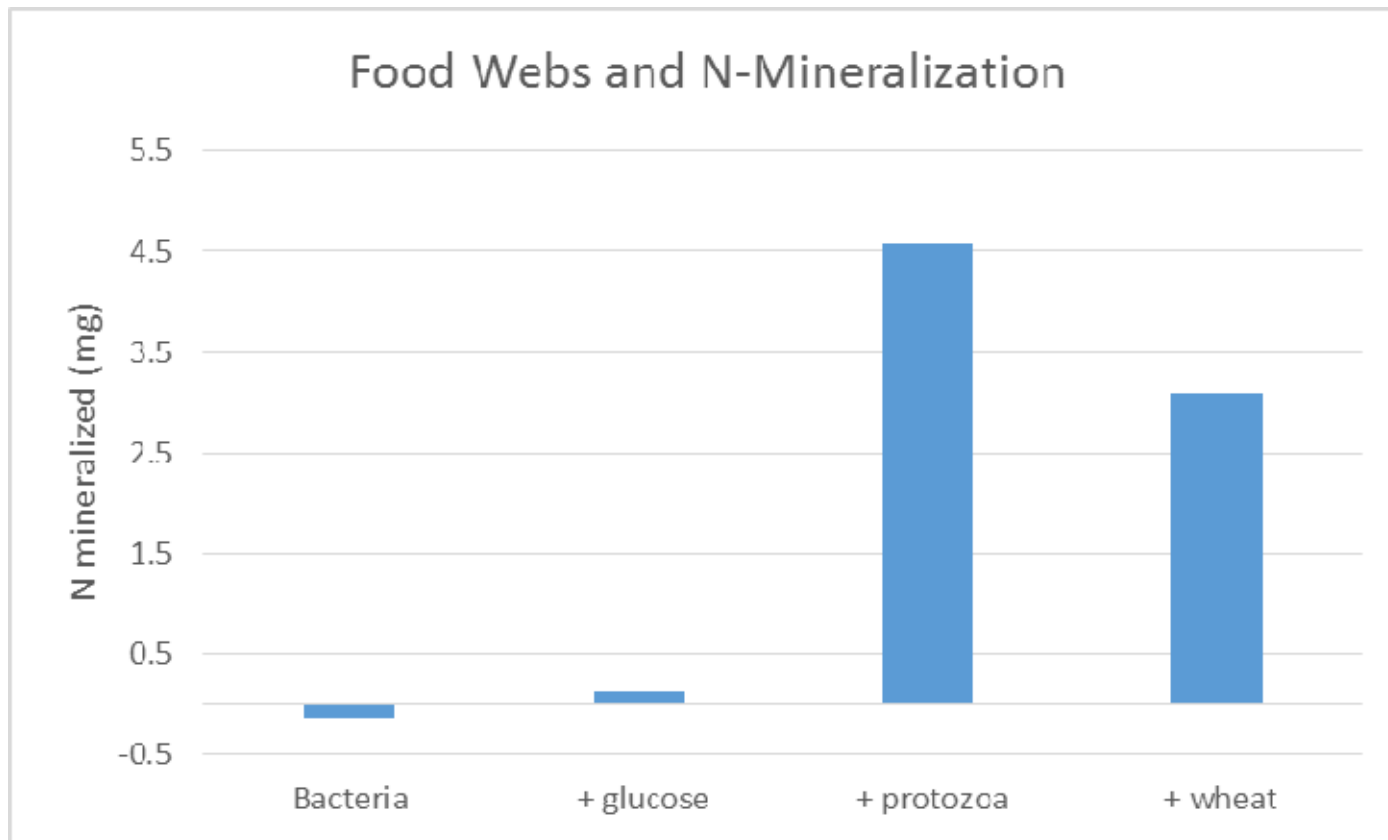


Soil health

-chemical

- Nitrogen conservation.
- Increased cation exchange capacity.
- Carbon sequestration.

Chemical soil health -nitrogen research

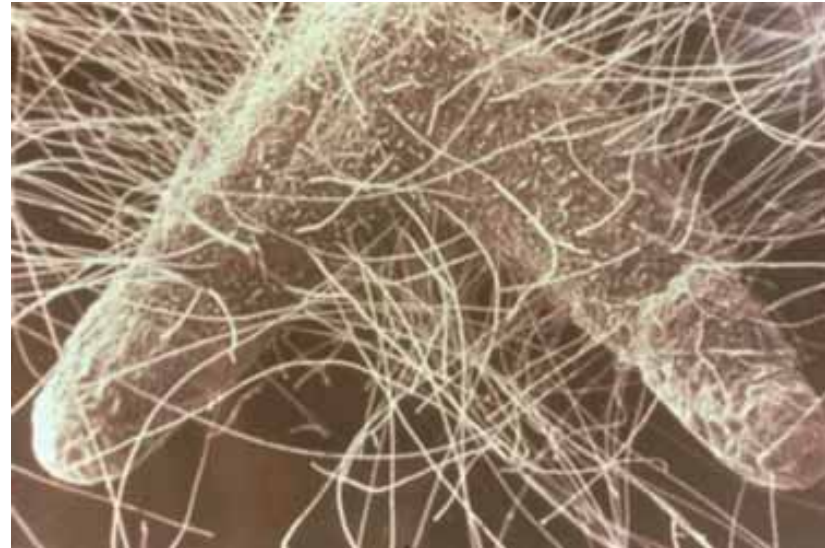


Clarholm (1984)

Soil health

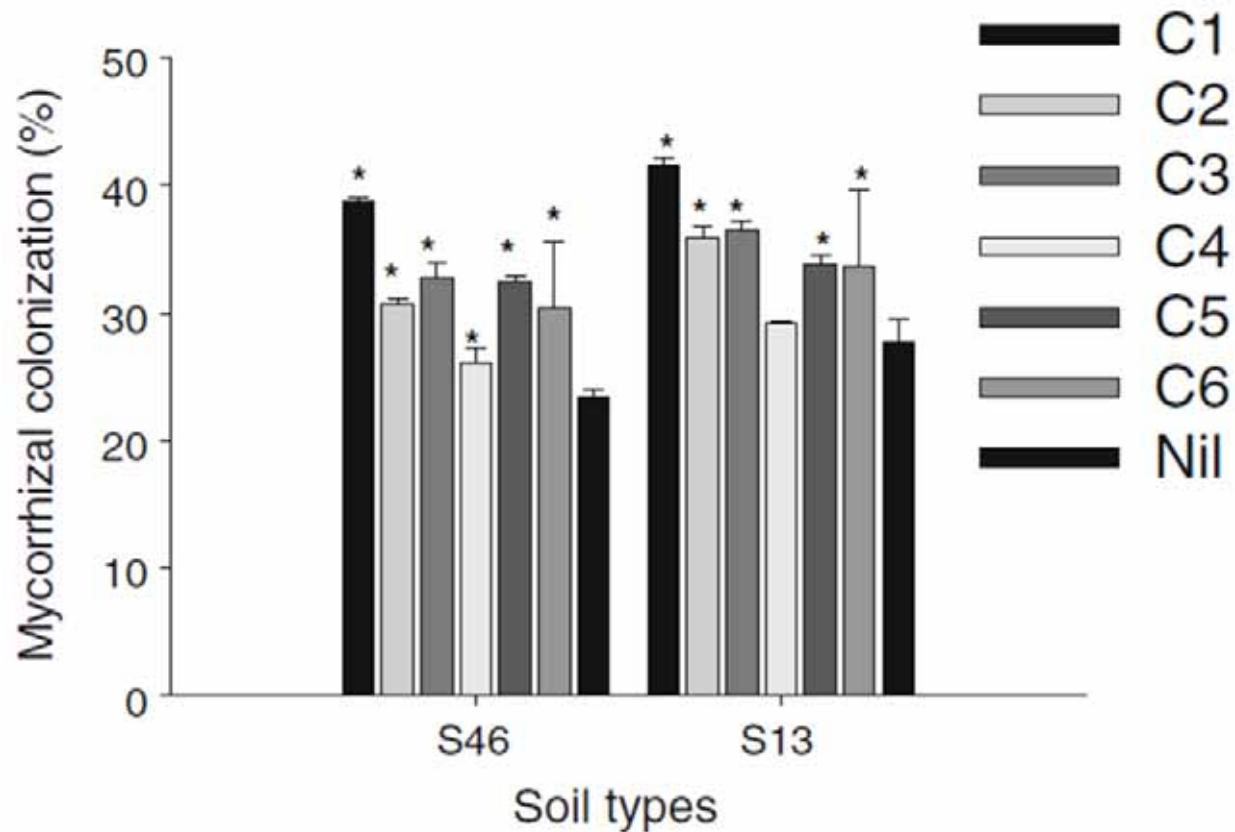
-biological

- Mycorrhizae
- Disease / weed / insect suppression
- Biodiversity
- The future



Biological soil health

-compost/mycorrhizae



Soil health principles

- Minimize soil disturbance
- Keep ground covered
- Diverse plant growth year-round



Minimize soil disturbance

- rotate with perennial grass



Minimize soil disturbance

-fewer trips, less aggressive tools

Operation	STIR
Chisel plow	53
Disk chisel	65
Offset disk 12"	78
Moldboard plow 10"	81

Minimize soil disturbance

-less compaction

- Avoid compaction:
 - Lighter equipment.
 - Larger tires, proper inflation
 - Use travel lanes
 - Fewer trips
 - Avoid soils at Field Capacity



Keep soil covered

-crop residues



Keep soil covered

-mulch, compost, manure



Diverse plant growth year-round -perennial covers



Diverse plant growth year-round -annual covers



Cover Crop Chart

GROWTH CYCLE

A = Annual
B = Biennial
P = Perennial

PLANT ARCHITECTURE

Y = Upright
* = Upright-Spreading
~ = Prostrate

RELATIVE WATER USE

☁ = Low
💧 = Medium
💧 = High

----- COOL ----- WARM -----

-- GRASS -- BROADLEAF -- GRASS --

A	BARLEY											A	AMARANTH	A	FOXTAIL MILLET				
A	OAT	A/B	CANOLA	A/B	CAMELINA							A	BUCKWHEAT	A	PEARL MILLET				
A	WHEAT	A/P	MUSTARD	A	PHACELIA	A	FIELD PEA	A	BERSEEM CLOVER	A/B	VETCH	A	SUNNHEMP	A	CLUSTER BEAN	A	QUINOA	A	PROSO MILLET
A	CEREAL RYE	A	RADISH	A	FLAX	A	LENTIL	A	CRIMSON CLOVER	P	BIRDSFOOT TREFOIL	A	CHICKPEA	A	FAVA BEAN	P	CHICORY	A	GRAIN SORGHUM
A	TRITICALE	B	TURNIP	A	KALE	A	LUPIN	B/P	RED CLOVER	A/B	SWEET CLOVER	A	COWPEA	A	MUNG BEAN	A	CUCURBITA	A	SUDAN GRASS
A	ANNUAL FESCUE	B	BEET	A	SPINACH	A/P	MEDIC	P	WHITE CLOVER	P	SAINFOIN	A/P	FENUGREEK	A	SOYBEAN	A	SAFFLOWER	A	TEFF
P	SALINE TOLERANT	A/B	CARROT	A/B	CHARD	P	ROUNDHEAD LESPEDEZA	P	KURA CLOVER	P	ALFALFA	P	PIGEONPEA	A/P	PEANUT	A	SUNFLOWER	A	CORN

----- LEGUME -----

V 2.0. March 2015

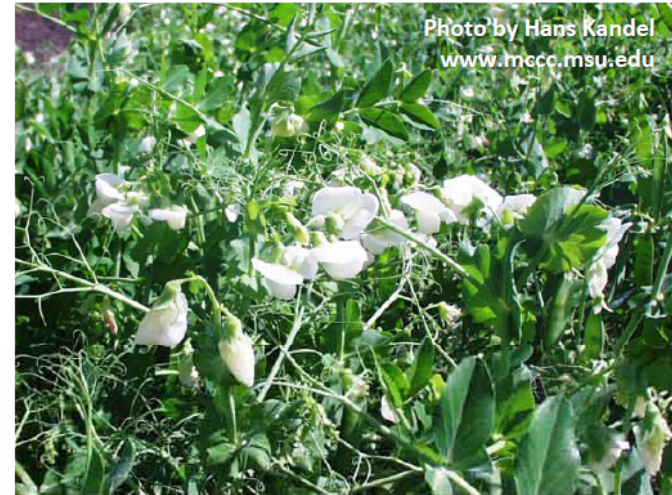
◆ [Additional Information](#)

Search for "cover crop periodic table"

Field pea

(*Pisum sativum arvense* L.)

- Cool Season, broadleaf
 - Annual
 - Legume (N fixation)
 - Upright plant architecture (vine)
 - Low water use
 - Poor salinity tolerance
 - Seeding depth: 1 – 3 inches
 - Crude protein: hay 14%, grain 24%, silage 15%
 - C:N ratio: leaf 13-25, stem 27-83, root 17-27
 - Forms arbuscular mycorrhizal associations
 - Flowers attract pollinators
- ◆ *View table for known crop sequence effects*





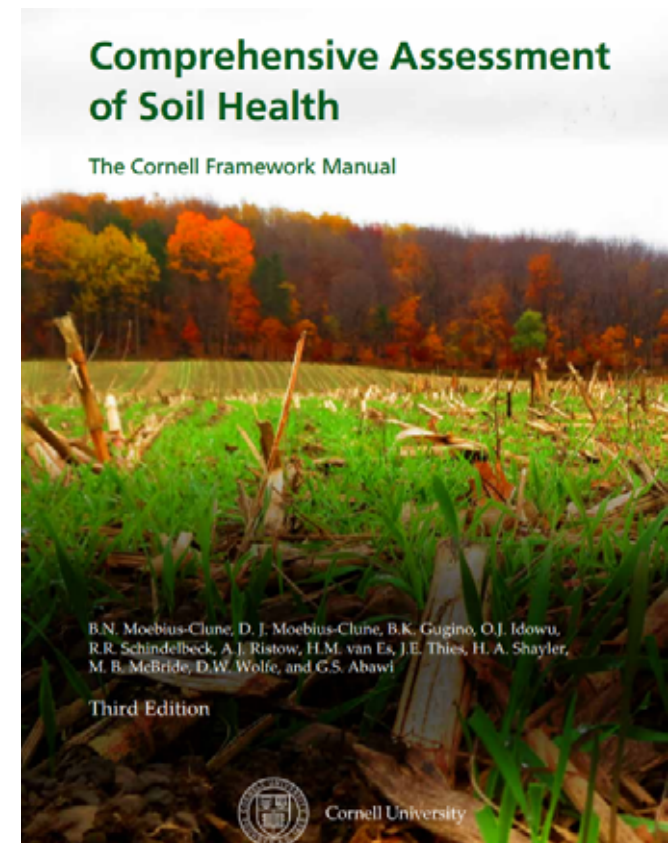
USING COVER CROPS IN OREGON

EM 8704 • January 1998
\$5.50

Free online – excellent resource

For more info

- OSU Oregon soil health
- Cornell soil health
- NRCS soil health
- *Building Soil for Better Crops* by Magdoff and Van Es (2009)





Van Gogh, *The Sower*

And justice for all

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees and applicants for employment on the bases of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, or all or part of an individual's income is derived from any public assistance program, or protected genetic information in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

Questions?

