Soil Health in Orchards: An Introduction

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SOIL HEALTH

Definition

"Capacity of a soil to function within ecosystem boundaries to:

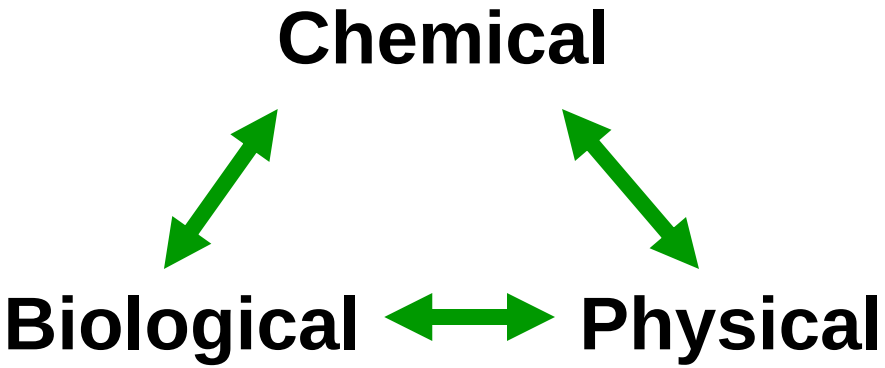
- **sustain biological productivity**
- **Maintain environmental quality**
- **promote plant and animal health."**

Not a soil property, but a value based on human needs.

Soil health and quality are used interchangeably

(Doran and Parkin, 2004)

Soil Health



- Dynamic interplay of 3 aspects
- Short-term and long-term changes
- Influenced by environment (climate, geology, plants)
- Influenced by human activity (erosion, fertilization, irrigation, plants)

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Soil Health Reference Point

Current System	Native Ecosystem	Reference Point
Dryland wheat (KS)	Prairie	Prairie
Rainfed corn (WI)	Temperate forest	Pasture ?
Paddy rice (Asia)	Tropical rainforest	??
Irrigated potatoes (ID)	Shrub-steppe	Pasture ?
Orchard (Yakima)	Shrub-steppe	??

Finding the appropriate reference point for orchard soil health is a challenge. For wheat in Kansas, the native prairie is a good reference point. Often a pasture is used as a reference for many field crops. Is this suitable for an orchard?

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Carbon – the key ingredient

Carbon (C), the basis of Soil Organic Matter, which affects:

Physical – bulk density, aggregate stability, water-holding capacity

Chemical – cation exchange capacity, nutrient release

Biological – energy source for microbes, base of the soil food web, nutrient turnover, soil-borne diseases

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Soil Biology

The last frontier ?

The ultimate black box ?

Microbe - Microbe

Microbe - Macrofauna

Microbe - Plant

New tools allow us to look at soil microbial DNA and RNA to understand who is there and what they are doing.

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Good Bets for Soil Health

- Reduce tillage, stop erosion, maintain soil structure
- Keep the soil covered
- Maintain adequate C, N inputs
- Promote diversity, rotate crops
- Monitor soil moisture to avoid excess

Mini Tatura Trellis on M.9
Washington


A mulch created on the tree row by simply mowing existing grass in the alley onto the tree row. Conserves water, reduces weed pressure, enhances soil organisms.
(H. Huntley)


White Clover
Fall-planted Oriental mustard
Cover crops planted in the tree row to evaluate potential weed control and influence on soil health


Alfalfa (Lucerne) – May 11
A dedicated legume crop such as alfalfa can be planted in the drive alley to provide a nitrogen source internal to the orchard. It can be mowed and blown on the tree row or left in place, depending on nitrogen need.

Lots of Questions

How should we measure / monitor soil health in orchards?

Is there an ideal soil health for tree fruits?

Does organic matter matter?

What's the relation between soil quality and fruit quality?

(Photos: USDA-ARS)