



Importance of Soil Organic Matter

Soil Quality = S. O.M.

Agricultural and Environmental perspective

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Soil quality is...

“fitness for use”



Soil Organic Matter is important...

[http://www.youtube.com/watch?
feature=player_embedded&v=ToKavHhu4PE](http://www.youtube.com/watch?feature=player_embedded&v=ToKavHhu4PE)

Why is soil organic matter important?

Management that enhances s.o.m. will...

- Benefit Cropland, Rangeland and Forestland Productivity
- Reduce soil erosion and associated environmental and economic costs
- Improve water and nutrient use efficiencies
- Improve water and air quality
- Improve Wildlife Habitat
- Overall ensures that the resource is sustained for Future Use

SOIL FUNCTIONS

- ✘ Maintaining biodiversity and productivity
- ✘ Regulating water (Runoff vs. Infiltration)
- ✘ Filtering and buffering
- ✘ Nutrient cycling
- ✘ Structural support

Cropland



▪ Regulating water (Runoff vs. Infiltration)

INHERENT VERSUS DYNAMIC SOIL QUALITY

× Inherent soil quality

+ Results from natural soil forming processes

× Dynamic soil quality

+ Changes due to human use and management

Andisol from The Big Island



Oxisol from Oahu



Management of Dynamic soil Properties

Impacts on soil Health

Cropland



SOIL SURVEY OF
**Islands of Kauai, Oahu, Maui,
Molokai, and Lanai,
State of Hawaii**

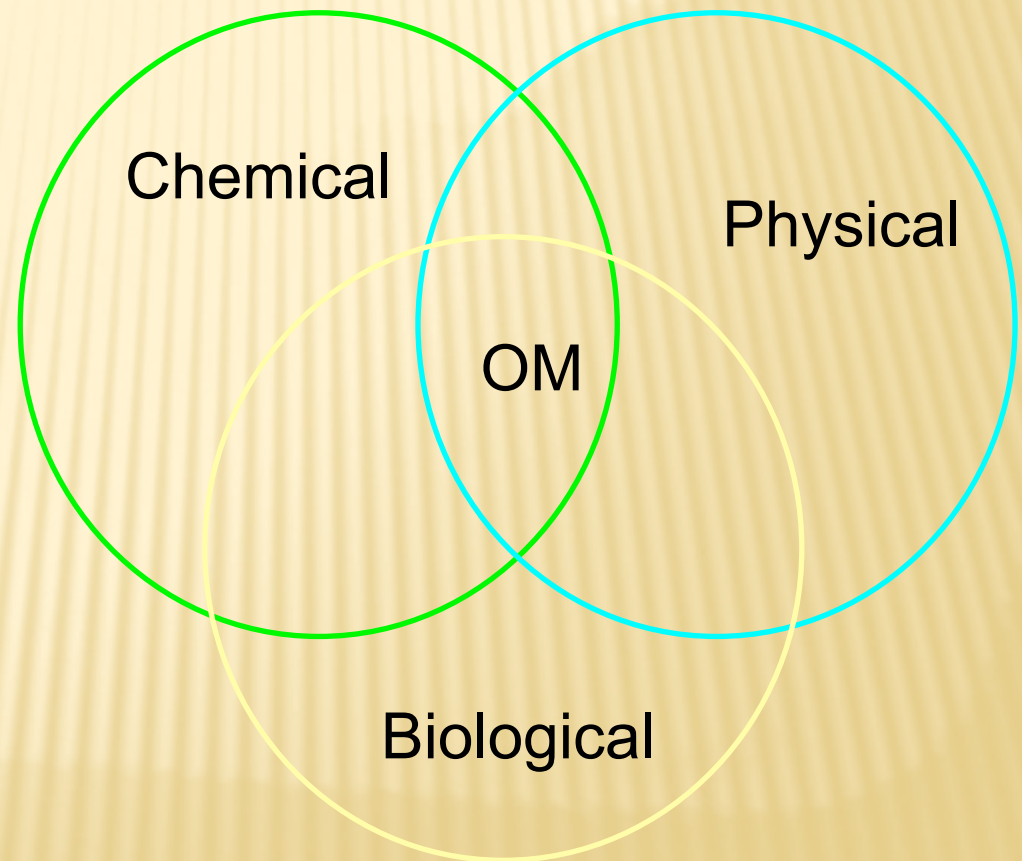


United States Department of Agriculture
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in cooperation with
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SOIL QUALITY INDICATORS

- ✘ Physical
- ✘ Chemical
- ✘ Biological
- ✘ Organic Matter



Soil Organic Matter

Single Most Important Indicator of Soil Quality



Soil Organic Matter

- **Physical**

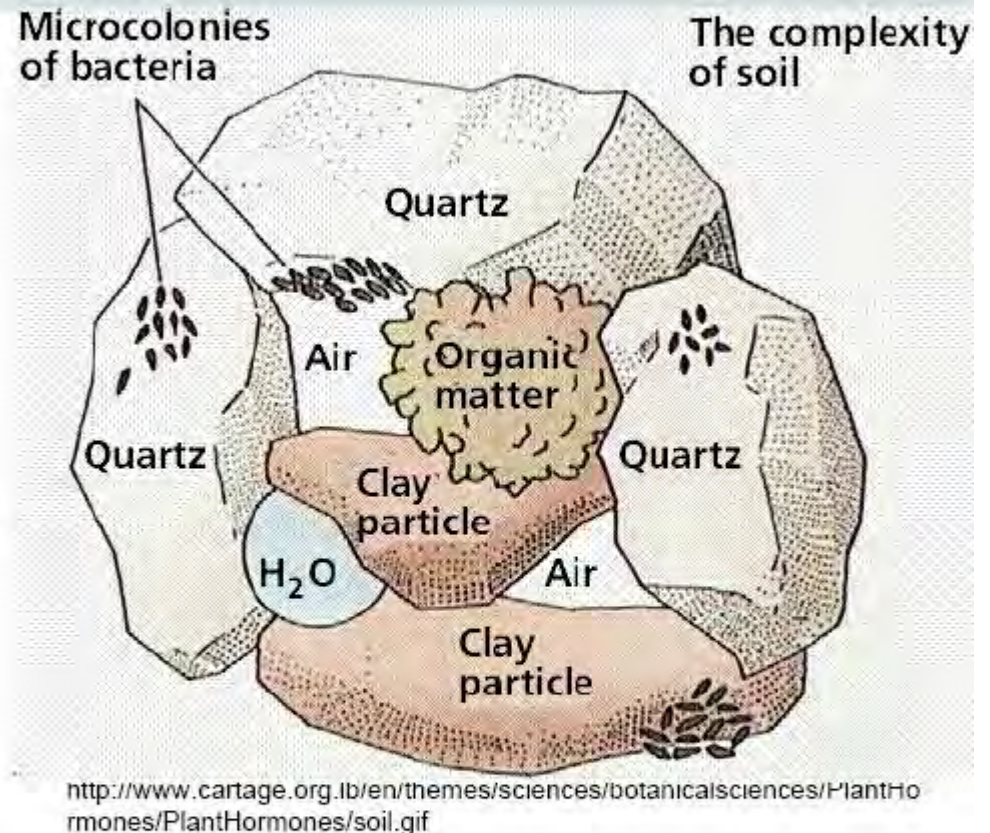
- Improves aggregation
- Improves water holding capacity (surface area)

- **Chemical**

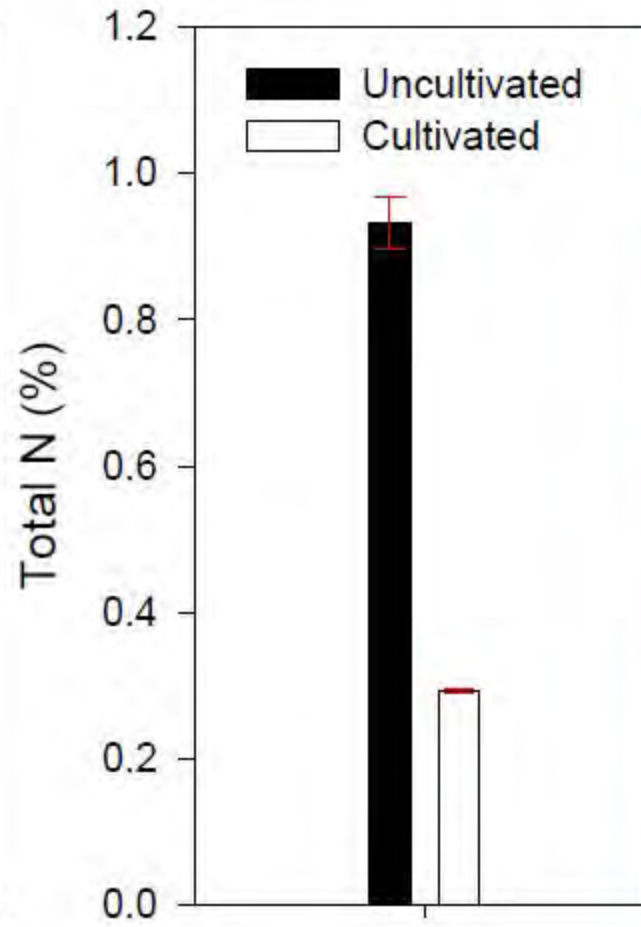
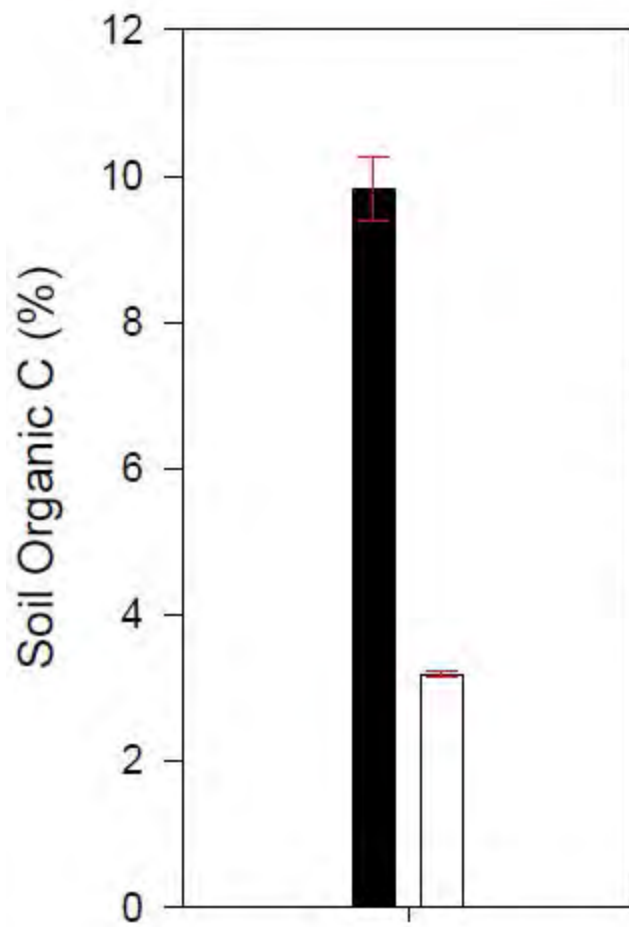
- Increases nutrient availability (N & P cycling, solubility)
- Increases CEC
- Buffers against pH changes

- **Biological**

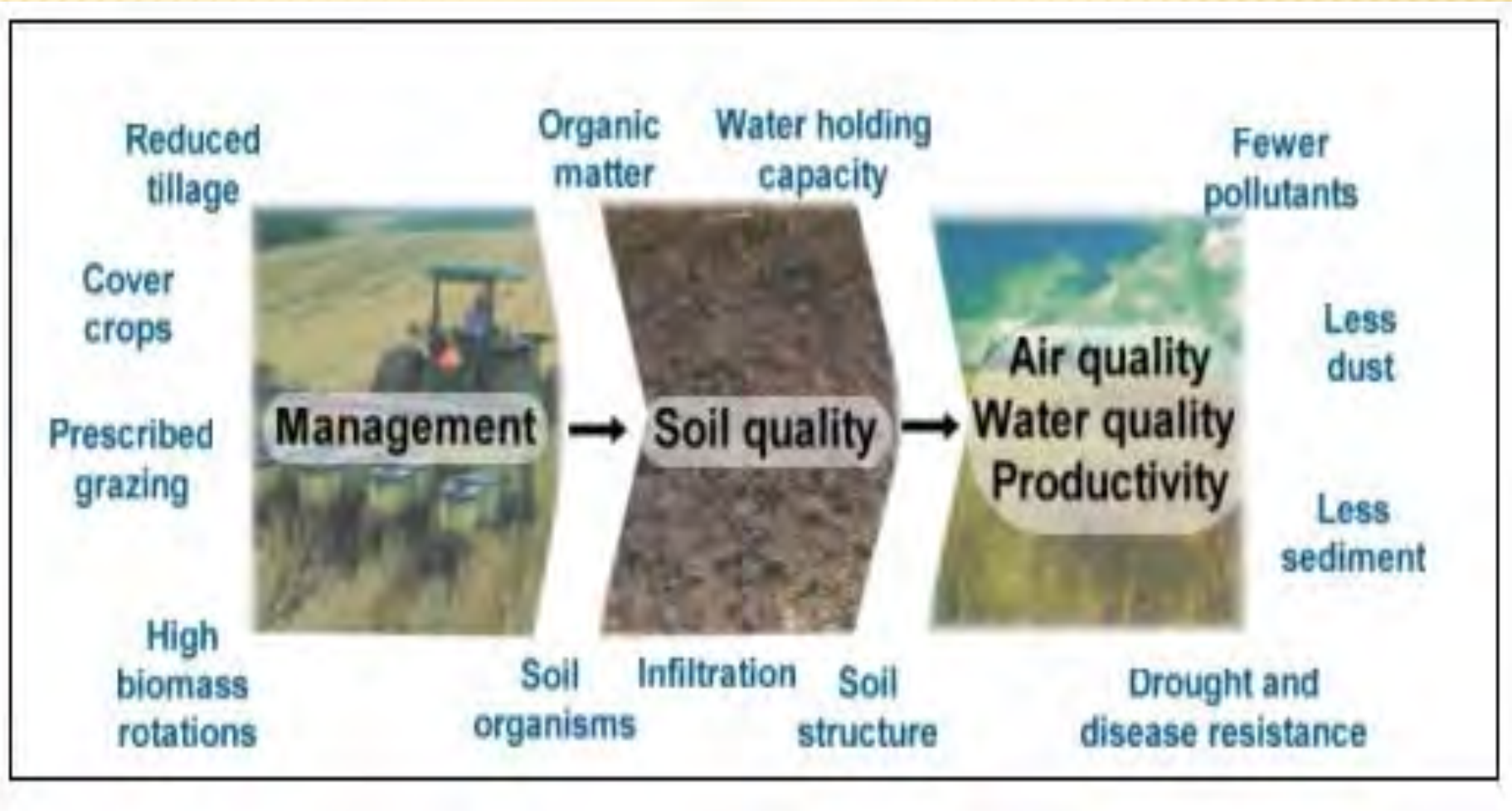
- Increases microbial diversity
- N fixation (rhizobia), P availability (mycorrhiza)
- Increases pathogen suppression



Management Effects



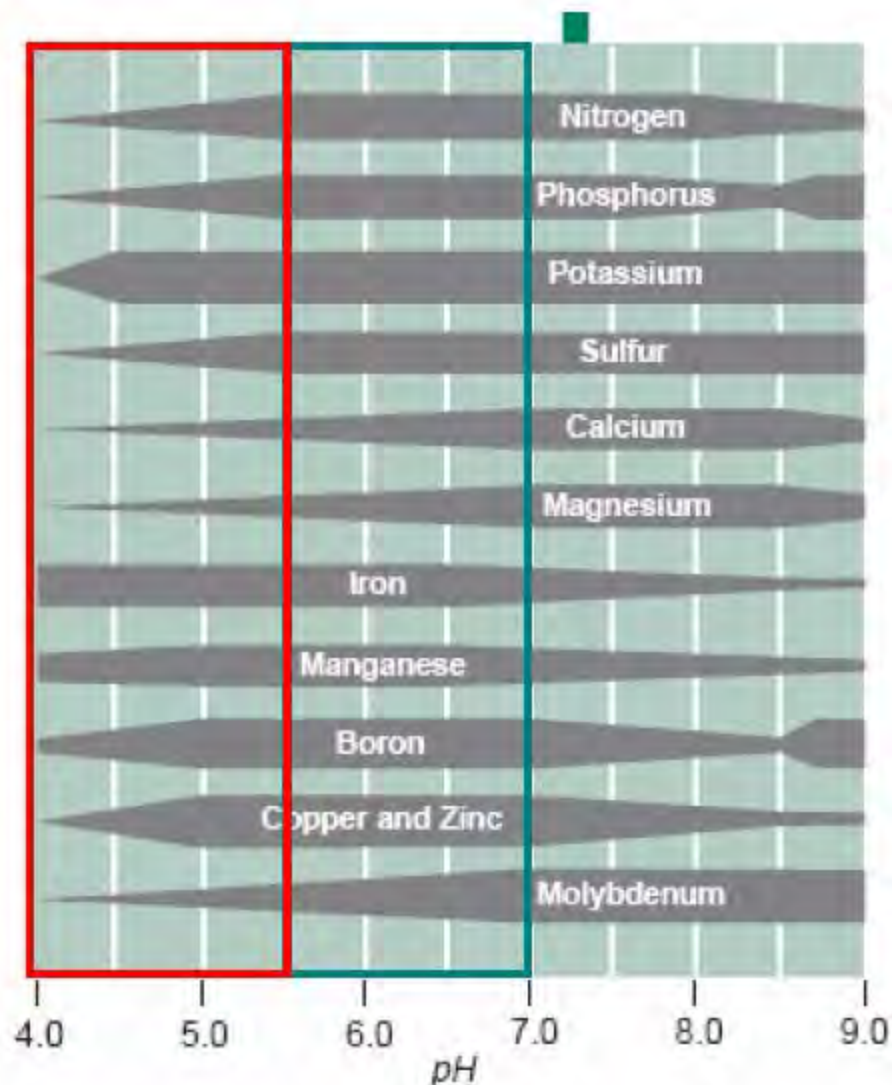
BEST MANAGEMENT PRACTICES INCREASES ORGANIC MATTER



CHEMICAL SOIL QUALITY INDICATORS



Soil pH and Nutrient Availability



- Soil pH controls nutrient solubility
- Ideal range 6.0-6.5
- CEC decreases at low pH
- P fixation increases at low pH

Cation Exchange Capacity

Cation Exchange Capacity

1. Clay surfaces

- Smectite: $80 - 100 \text{ cmol}_c\text{kg}^{-1}$
- Kaolinite: $3 - 15 \text{ cmol}_c\text{kg}^{-1}$
- Al/Fe oxides: $0 \text{ cmol}_c\text{kg}^{-1}$

2. Organic matter

- Humus: $200 \text{ cmol}_c\text{kg}^{-1}$

Kula = high CEC



Keahua = moderate CEC



Haiku = low CEC



PHYSICAL SOIL QUALITY INDICATORS





Compacted zone

Aggregate stability



Soil Aggregates

Example of well aggregated soil



**Oxisol with poor aggregates
After excessive tillage**

Aggregate Stability



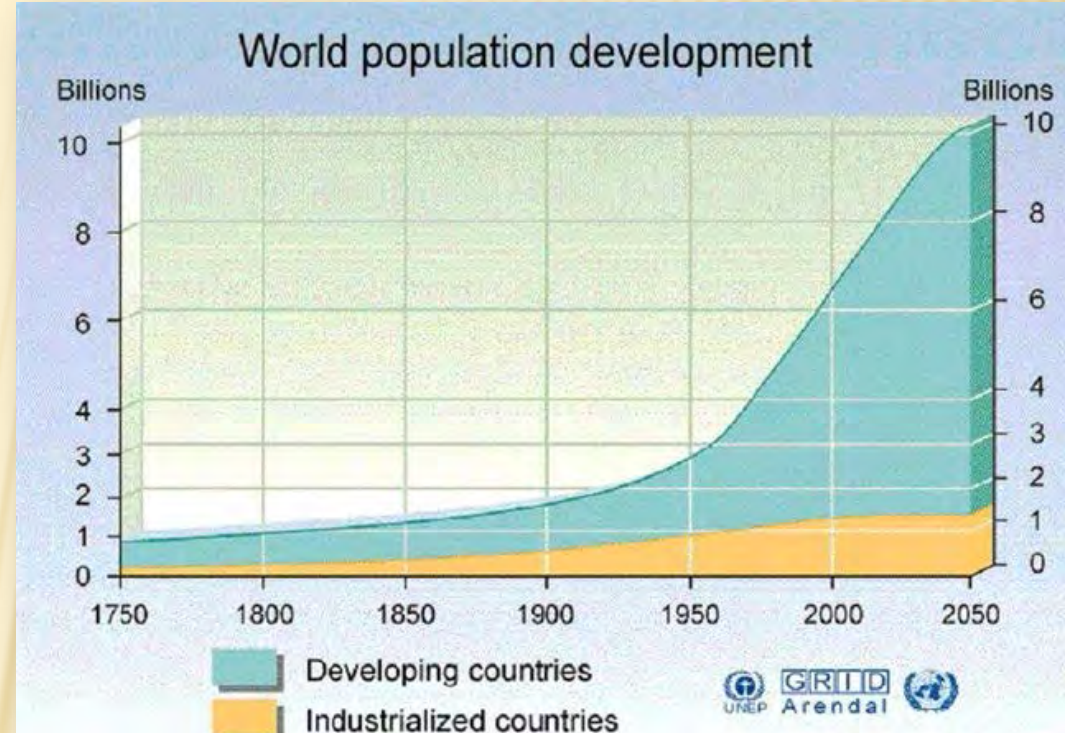


Earthworms and Casts

Biological Indicators

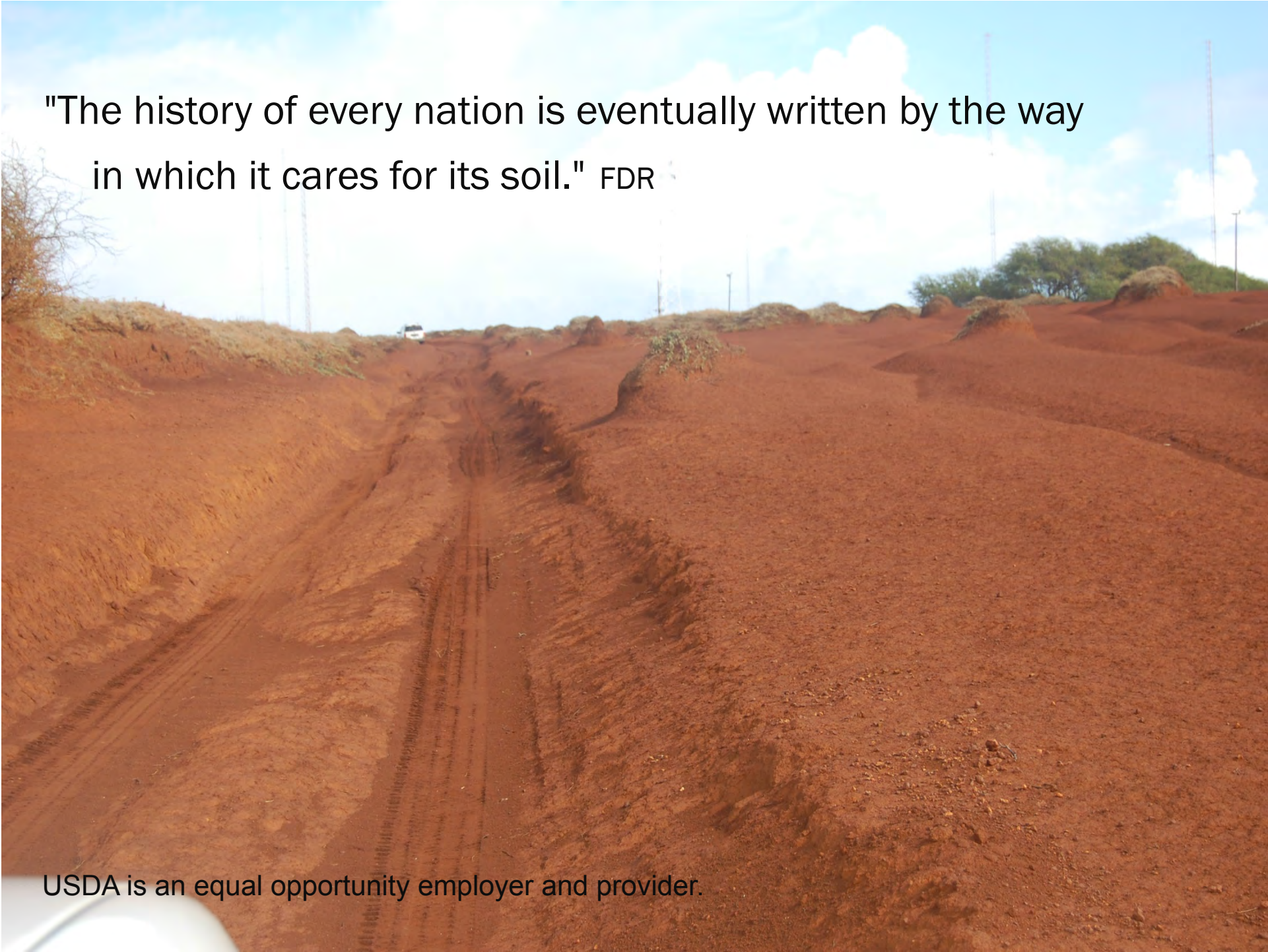
Food for thought...

World population is estimated to reach 9.1 billion by 2050. To sustain this level of growth, we will need to produce as much food in the **next 40 years** as we have in the **past 500 years**.



**SO, WHAT'S SOIL
HEALTH/O.M.**

**“GOT TO DO WITH IT?”
Everything.**



"The history of every nation is eventually written by the way
in which it cares for its soil." FDR

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