



Louisiana Agricultural Technology & Management Conference

Paragon Casino Resort, Feb. 14-16, 2018

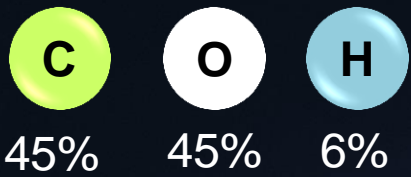
Soil Properties and Basic Soil-Plant Relationship

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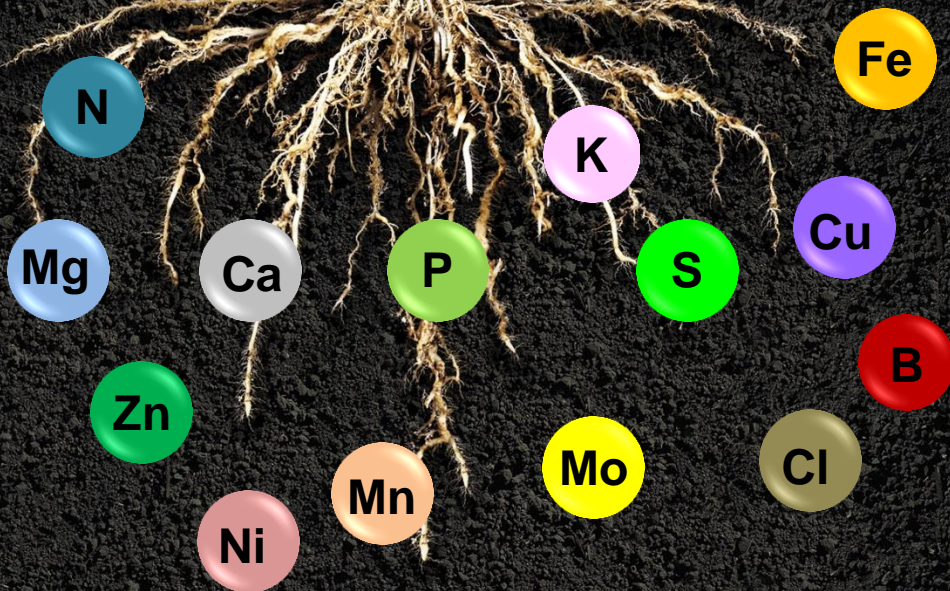




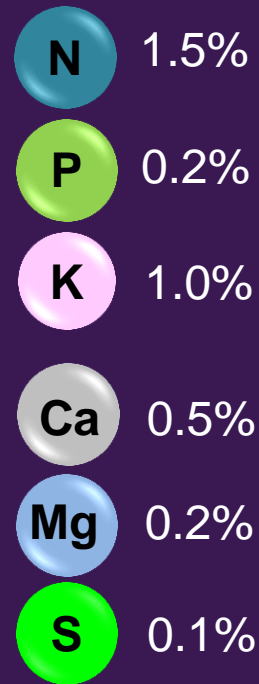
Non-Mineral Essential Nutrients



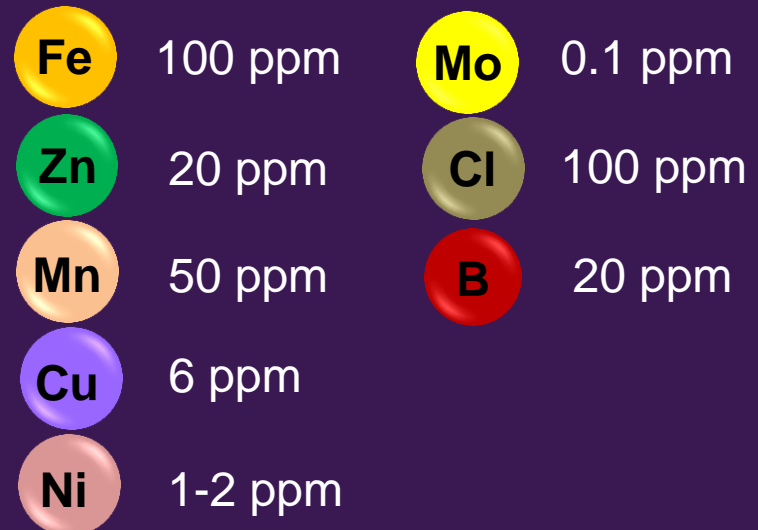
Mineral Essential Nutrients



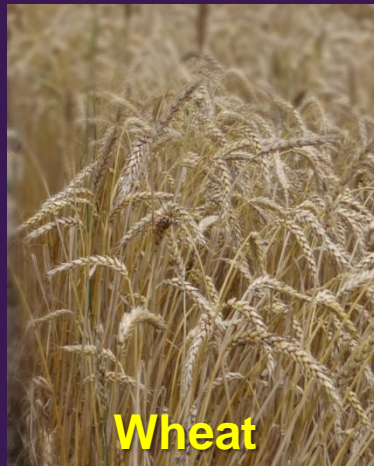
Macronutrients



Micronutrients



Crop Nutrient Removal



Wheat

100 bushel



Soybean

60 bushel



Sugarcane

40 tons



Rice

200 bushel

N (lbs) 120

198

80

114

P (lbs) 48

44

48

60

K (lbs) 29

7

140

32

Nutrient Uptake Removal

- Crop species

< 1.5 ft.	1.6-3.0 ft	3.1-6.0 ft	>6.0 ft.
Vegetables	Small grains	Corn	Cotton
Turf	Annual legumes	Sorghum	Sugar beets
Berries	Soybeans	Perennial grasses	Alfalfa
	Potatoes	Biennial clovers	Sunflower

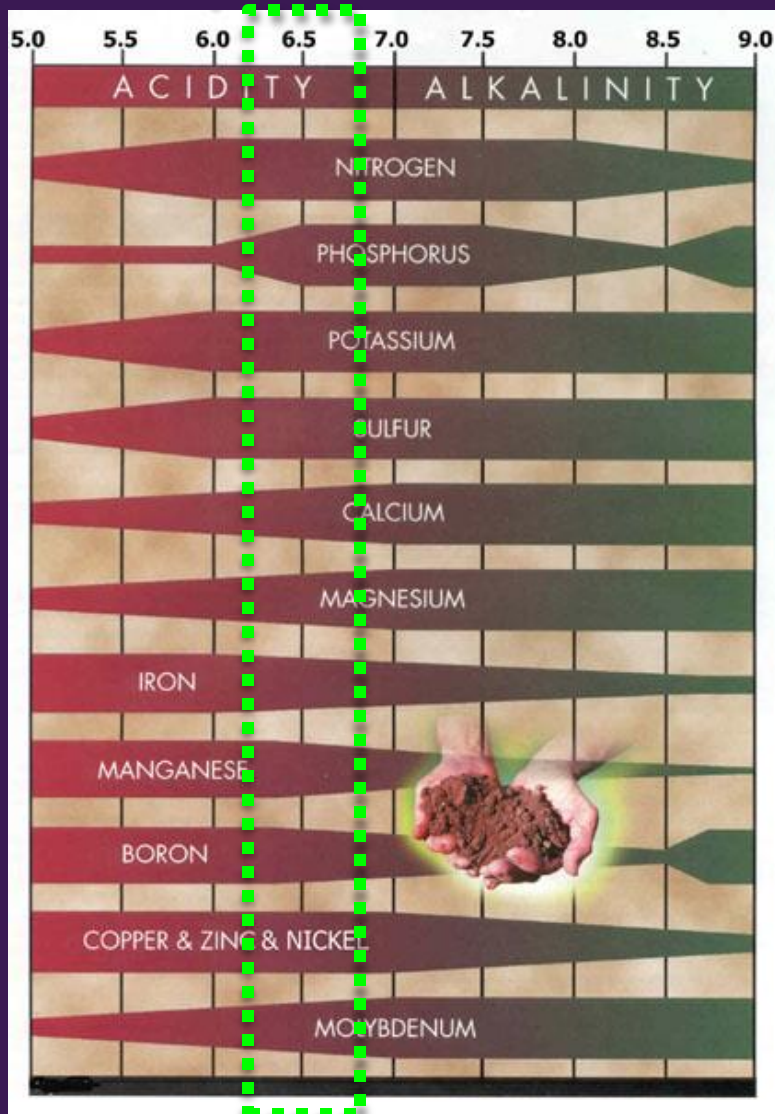
Nutrient Uptake Removal

- Soil factors (e.g. soil texture, organic matter content, pH)
- Climatic factors (e.g. moisture, temperature)

Nutrient Availability (Indicators of Soil Fertility)

- Soil pH
- Cation exchange capacity
- Organic matter content

Soil pH



Soil pH Affects Microbial Activity

- Near neutral pH (pH>6.0) – enhances transformation processes in the soil driven by bacteria
 - Rhizobium – nitrogen fixation
 - Nitrobacter and nitrosomonas – N transformation
- Acidic (pH<6.0) – dominant microorganism in fungi
 - Mycorrhizae – increase root surface area
 - Participates in decomposition process of organic material

Soil Composition



Mineral 45%

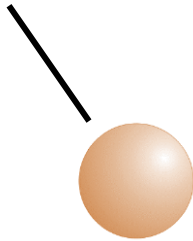
Organic matter 5%

Air 20-30%

Water 20-30%

Mineral (45%)

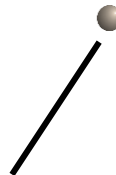
SILT – 0.05 to 0.002 mm



SAND – 2.0 to 0.05 mm

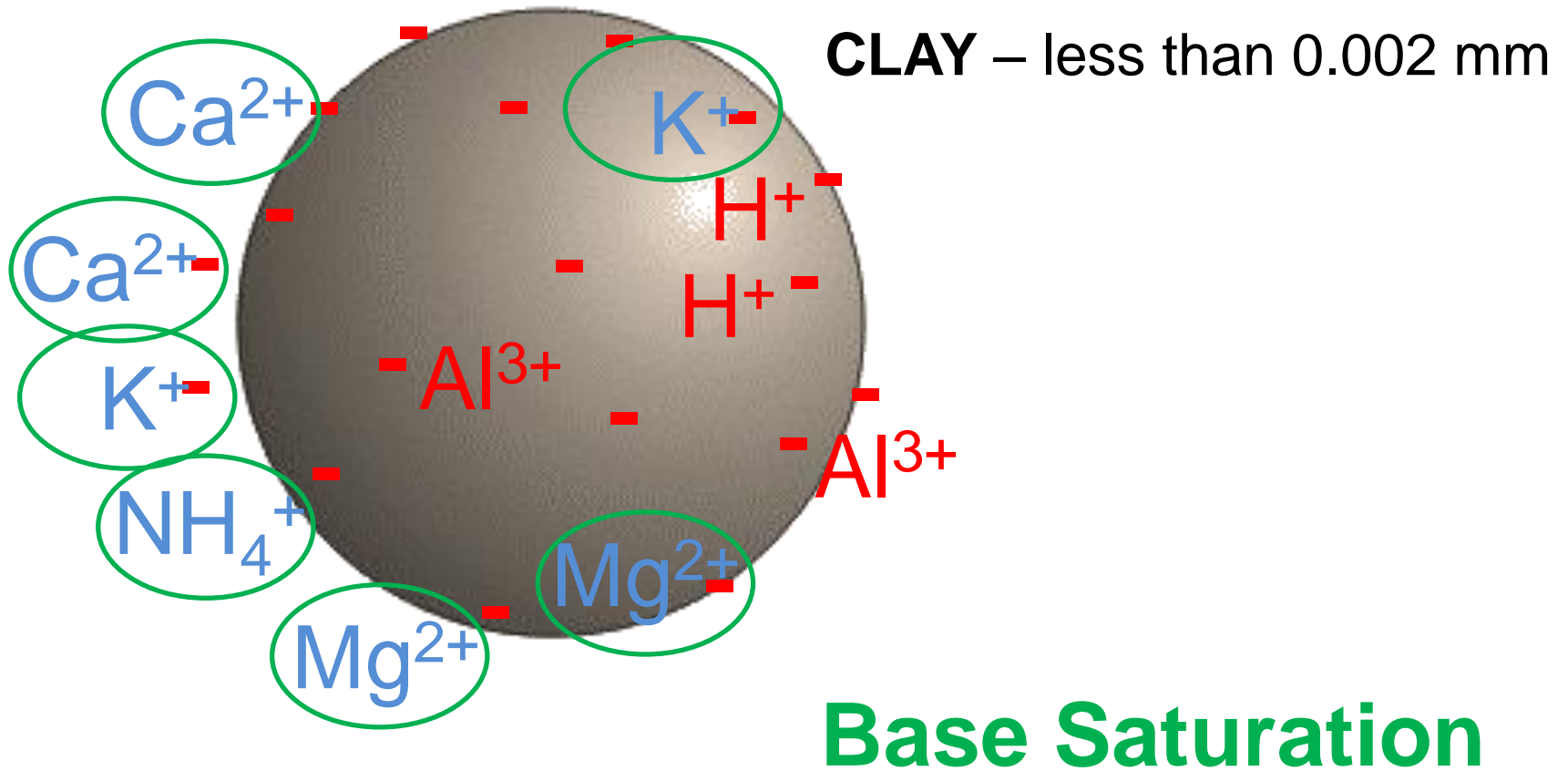


CLAY – less than 0.002 mm

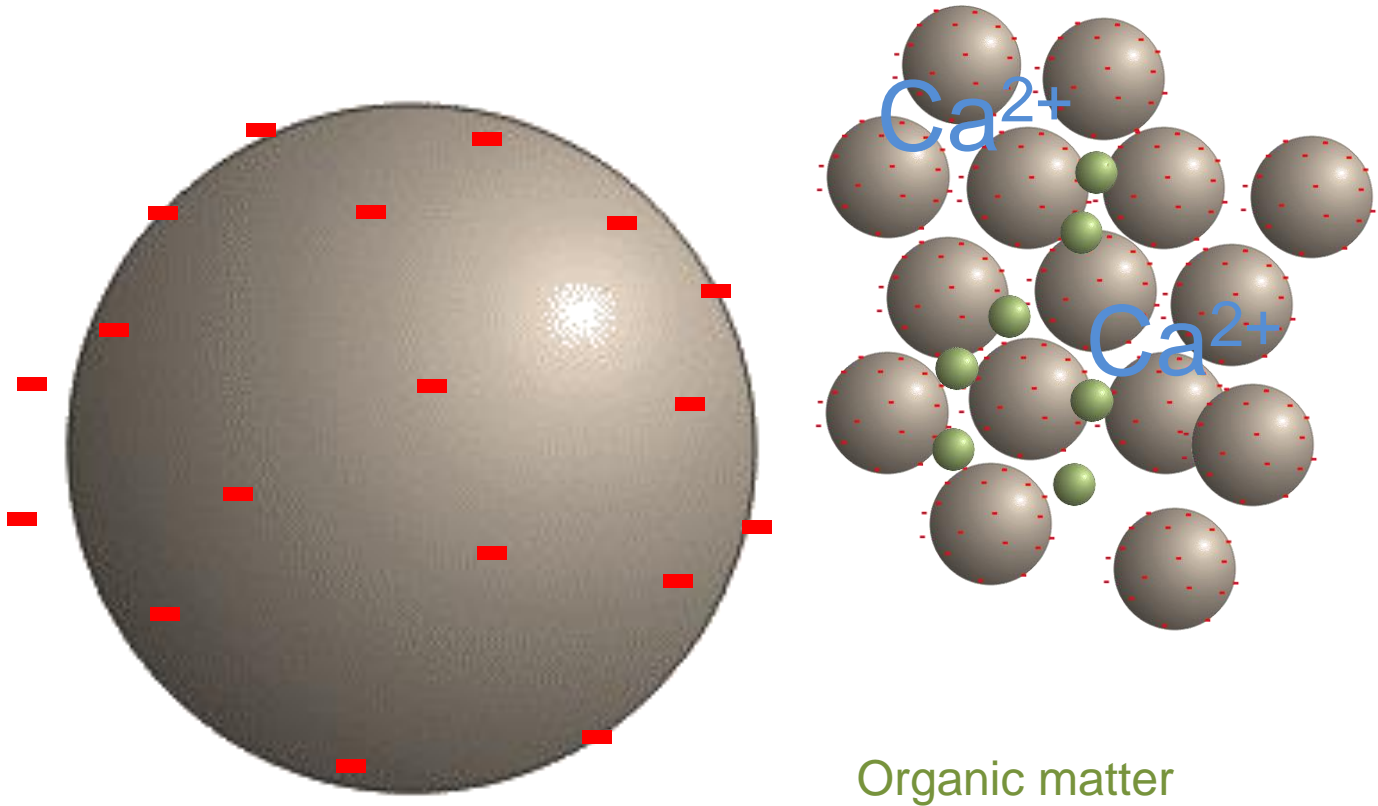


Mineral (45%)

Cation Exchange Capacity



Mineral (45%)



Soil Structure



Granular



Blocky

1 inch



Platy

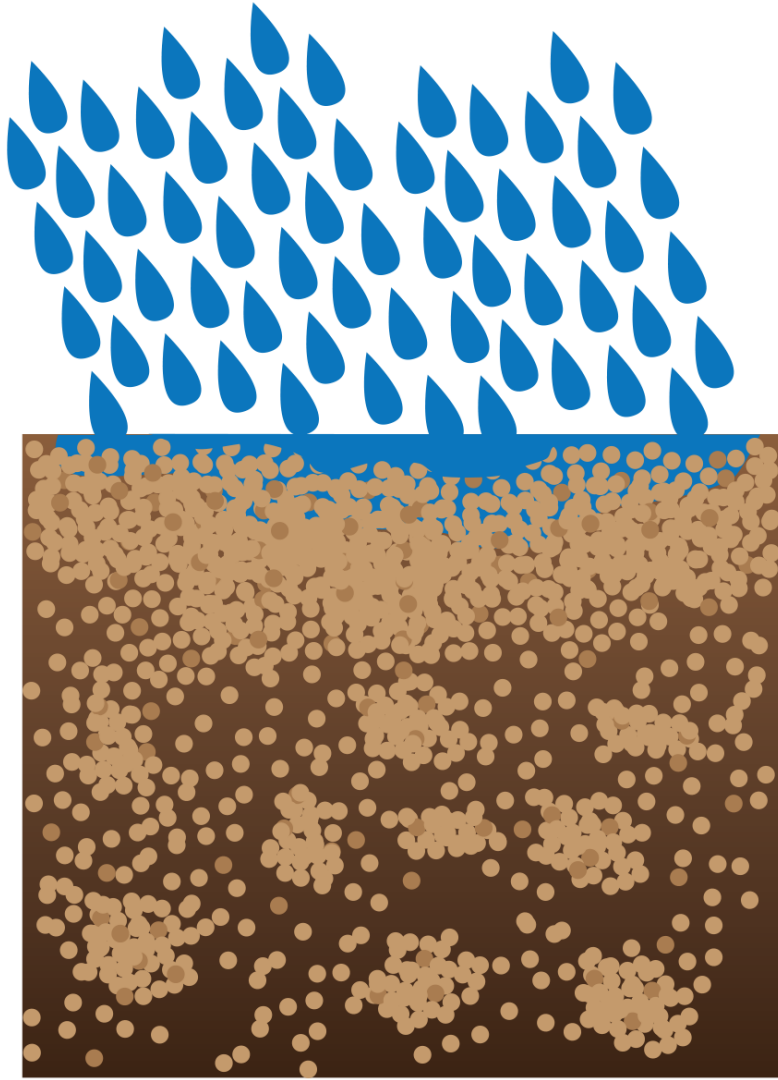


Massive

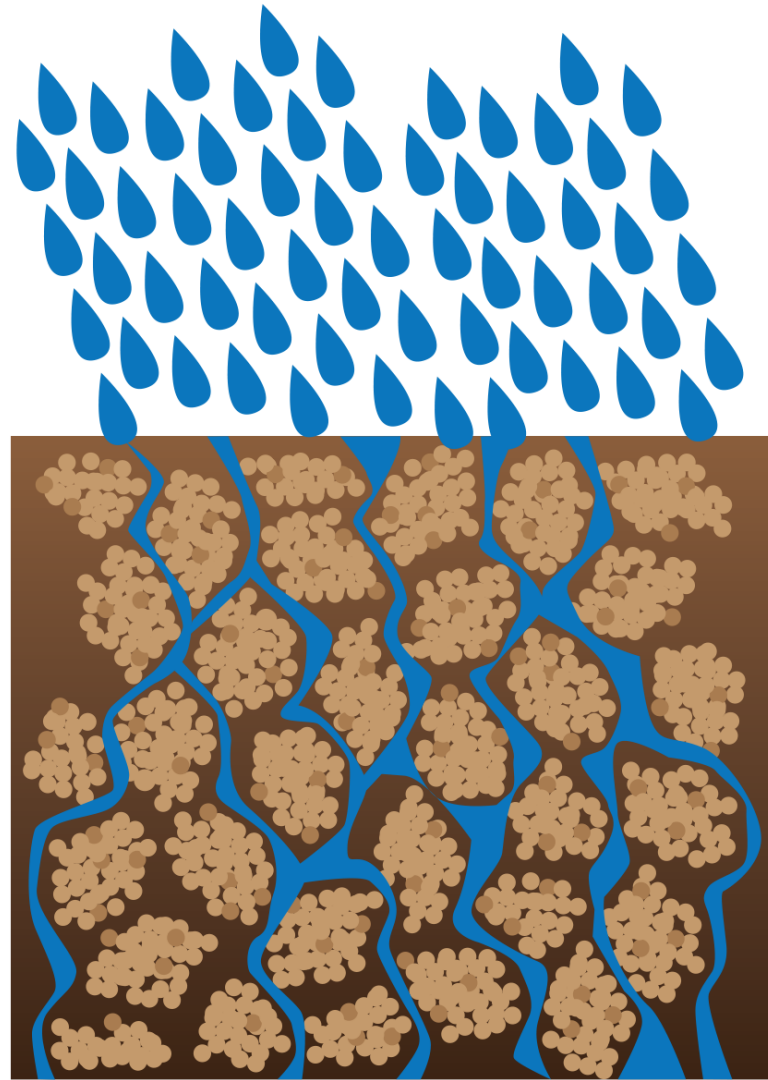


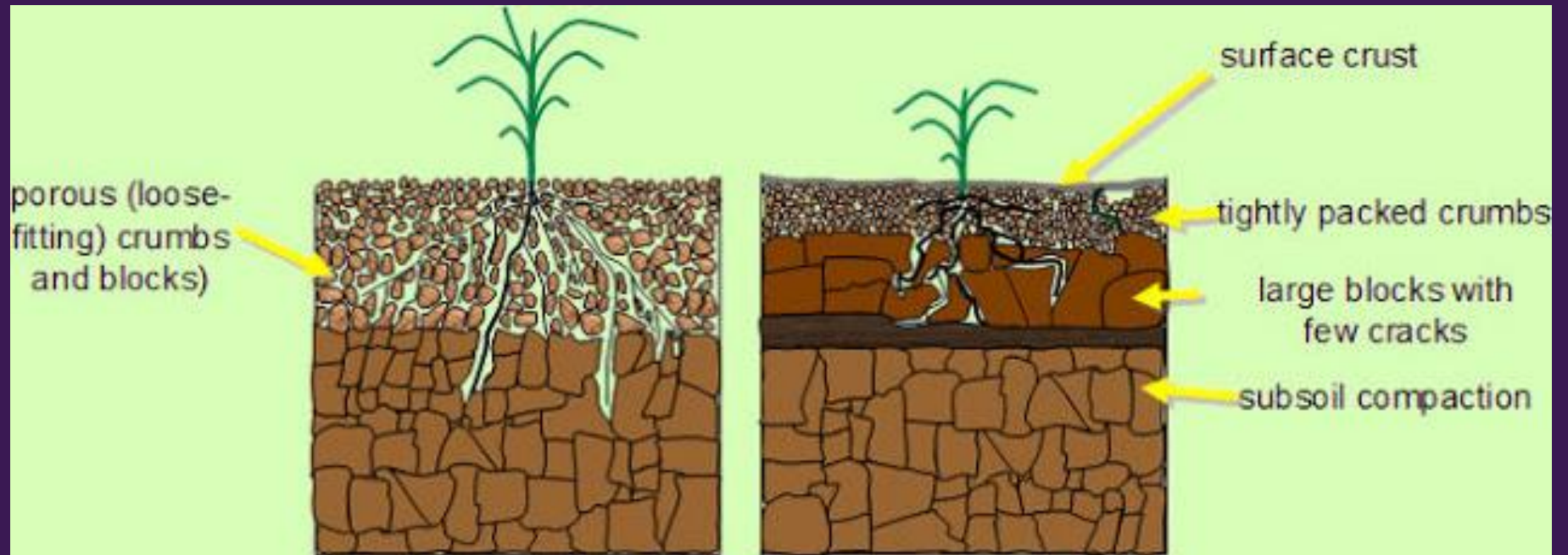
Single grain

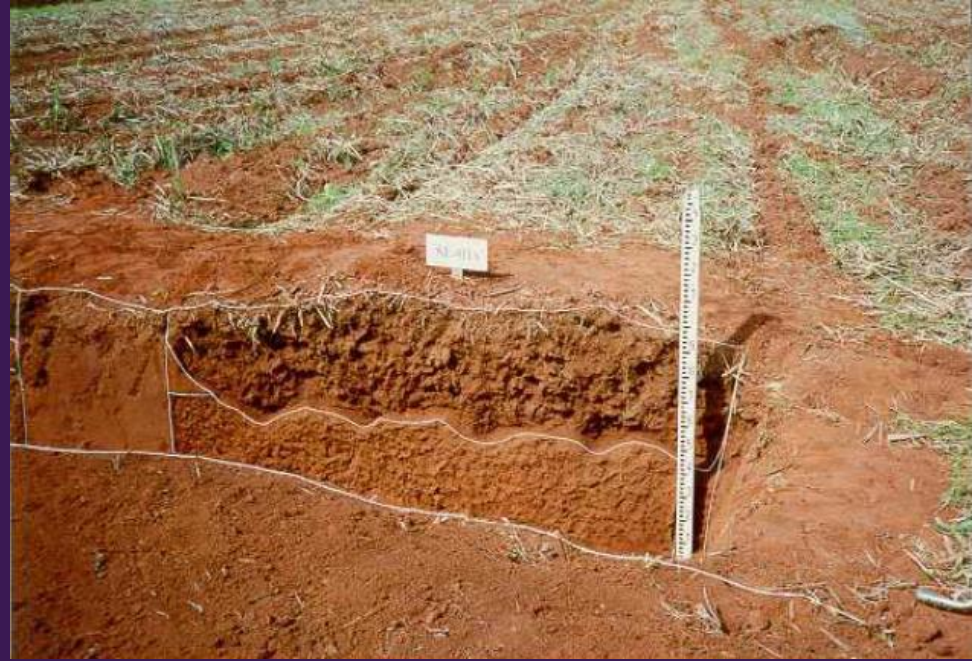
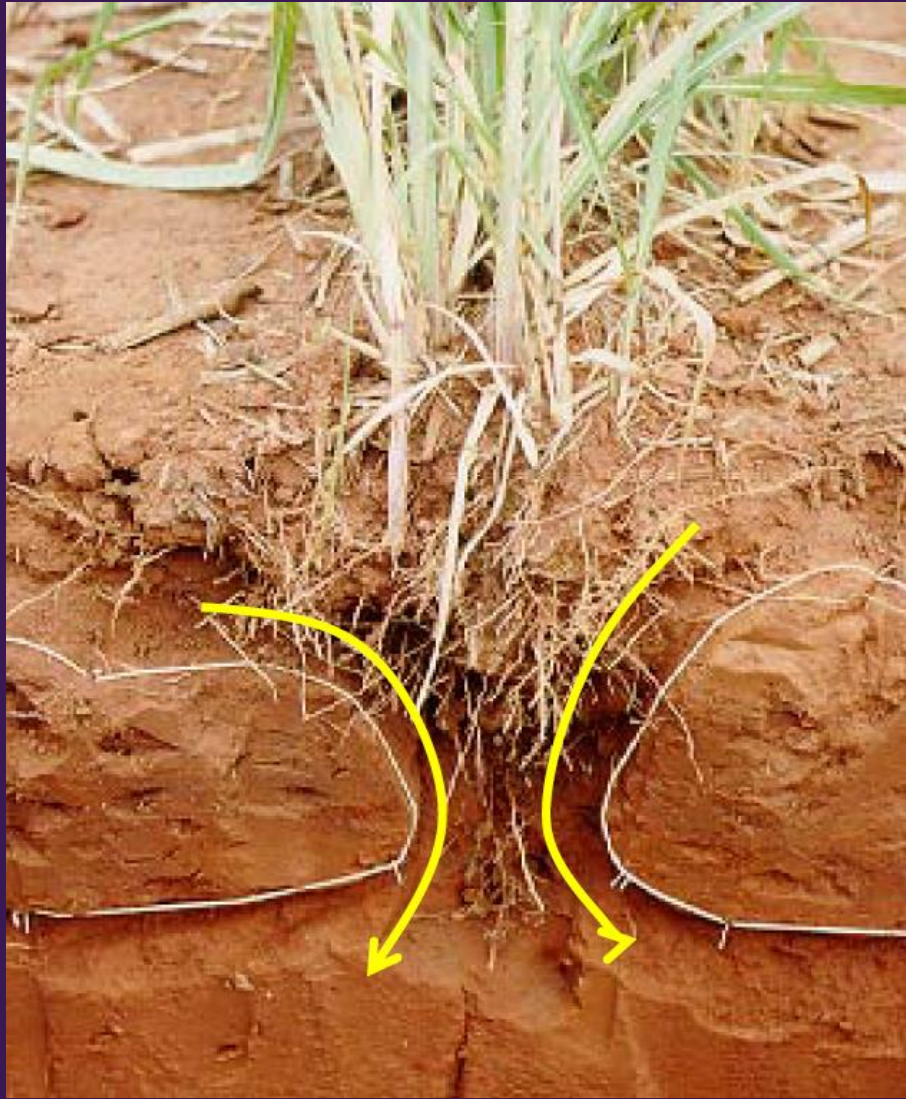
Dispersed soil



Flocculated soil







Soil Organic Matter

- Denote all organic constituents in the soil, including undecayed plant and animal tissues, their partial decomposition products, and the soil biomass.
- Importance of SOM
 - High water holding capacity
 - Retains and provides nutrients (high CEC)
 - Stabilize soil aggregates



Use of green manures

Animal wastes and compost application

Availability to Subsequent Crop

- C:N ratio of cover crop biomass
(high lignin and fibrous – slower)
- Soil factor
 - pH
 - Nutrient availability
 - Organic matter content
- Climate

Know Your Soil = nutrient-related problem

Soil Conditions	Potential Deficient Nutrients
Very light-textured soil	Macronutrients, silicon, some micronutrients (e.g. Zn)
Soils with poor structure, drainage	Nitrogen, Mn and Fe toxicity
Acidic soil	Micronutrient toxicity, Mo deficiency Ca, Mg, and K deficiency
Alkaline soil or high pH soil	Micronutrient deficiency, Mo toxicity
Extremely high organic matter content (Histosols)	Micronutrient deficiency, silicon
Extremely low organic matter content	Micronutrient deficiency,
Saline-sodic Soil	Na and Cl toxicity

Thank You!

