



Soil Health Principles and Practices in Organic Farms

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Soil Health Definition

Soil Health is the Continued Capacity of the Soil to Function as a Vital Ecosystem that Sustains Plants, Animals and Humans



This is an ideal soil; however, in our soil, proportions are changing due to intensive Ag practices causing:

- Soil erosion
- Organic matter depletion,
- Compaction
- Disappearing soil life



Soil Depth in Walsh County, North Dakota

1960	34 inches
2014	15 inches

A 56% Loss

Soil Organic Matter Levels

1960	8%
2014	< 3%

A 62% Loss

DOMINANT FARMING SYSTEMS: POOR SOIL HEALTH...?



Photos: Bianca Moebius-Clune

Soil Health Principles To Support High Functioning Soils



Image courtesy of Barry Fisher, NRCS-SHD

Organic Agriculture and Soil Health Principles



Organic Agriculture and Soil Health Principles



Three of the four Soil Health Principles applied





Tillage can cause:

- Soil organic matter loss
- Air pollution
- Reduce Aggregate stability
- Reducing soil biology
- Increase evaporation
- Increase runoff



Russell Ranch, UC Davis, 1993 – 2001; long-term farming system evaluation



Agro-chemical based –no cover crop - representative of typical California Central Valley system



Intermediate system – Fertility from Winter Legume Cover Crop (WLCC) and some supplemental inorganic fertilizers; occasional pesticides and herbicides



Managed according to USDA guidelines – WLCC and organic fertility from composted poultry manure

Russell Ranch, UC Davis, 2002 – 2008; long-term farming system evaluation

• Farming Systems

• Tillage Practices



STANDARD TILLAGE

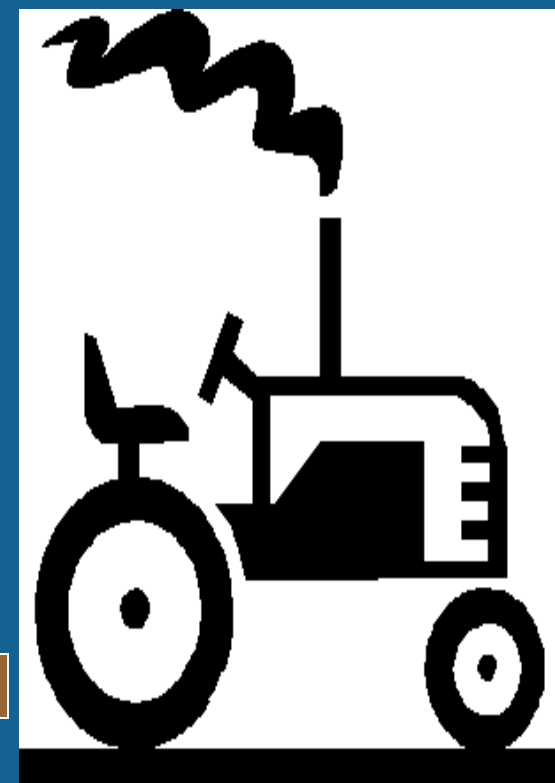
CONSERVATION TILLAGE

STANDARD TILLAGE

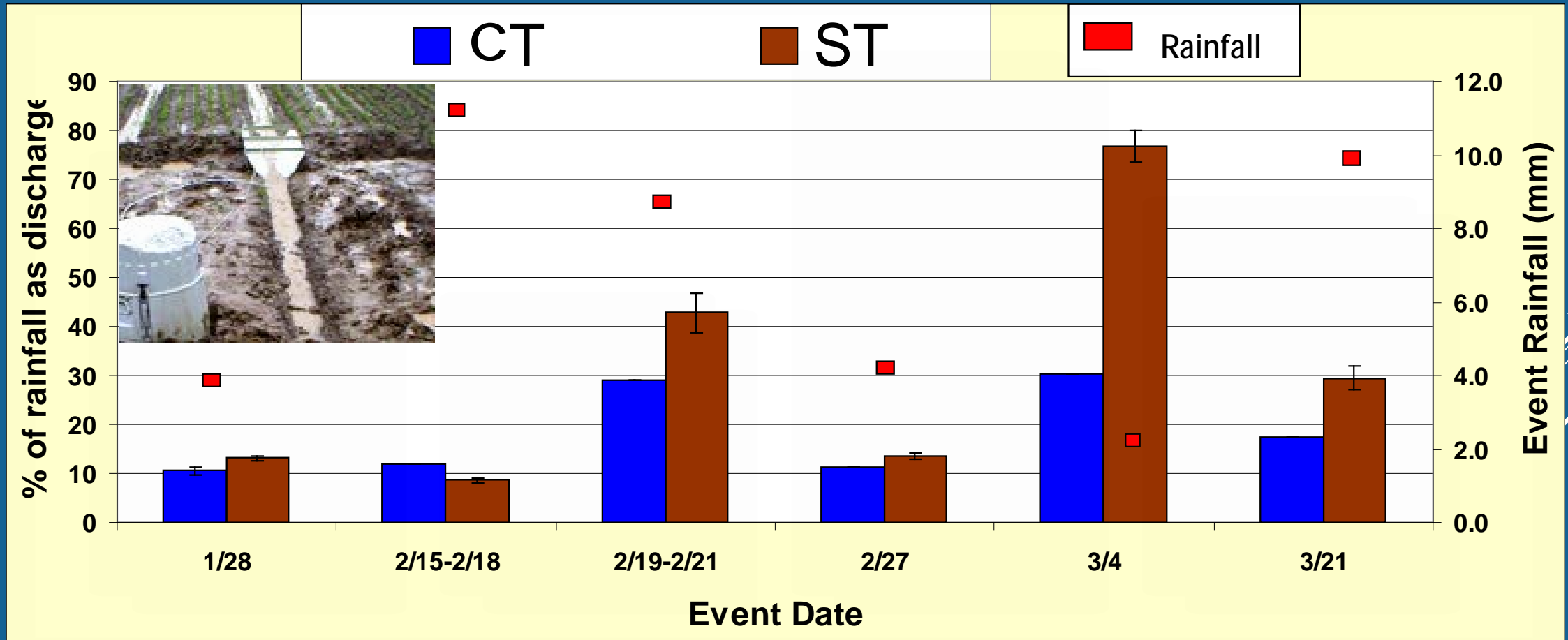
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STANDARD TILLAGE

CONSERVATION TILLAGE



Runoff as a % of Rainfall in Organic Systems

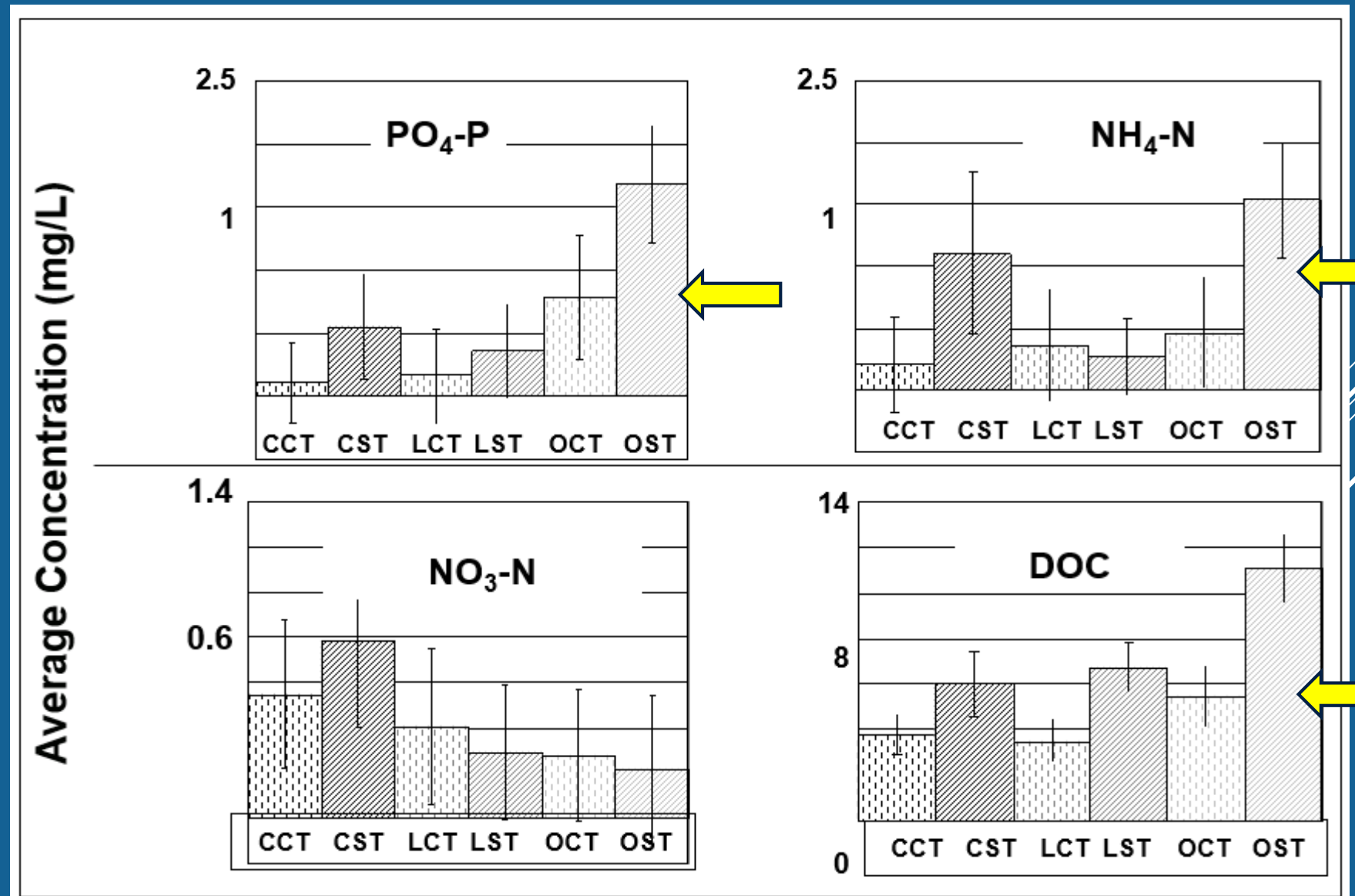


Nutrient Concentrations in Runoff

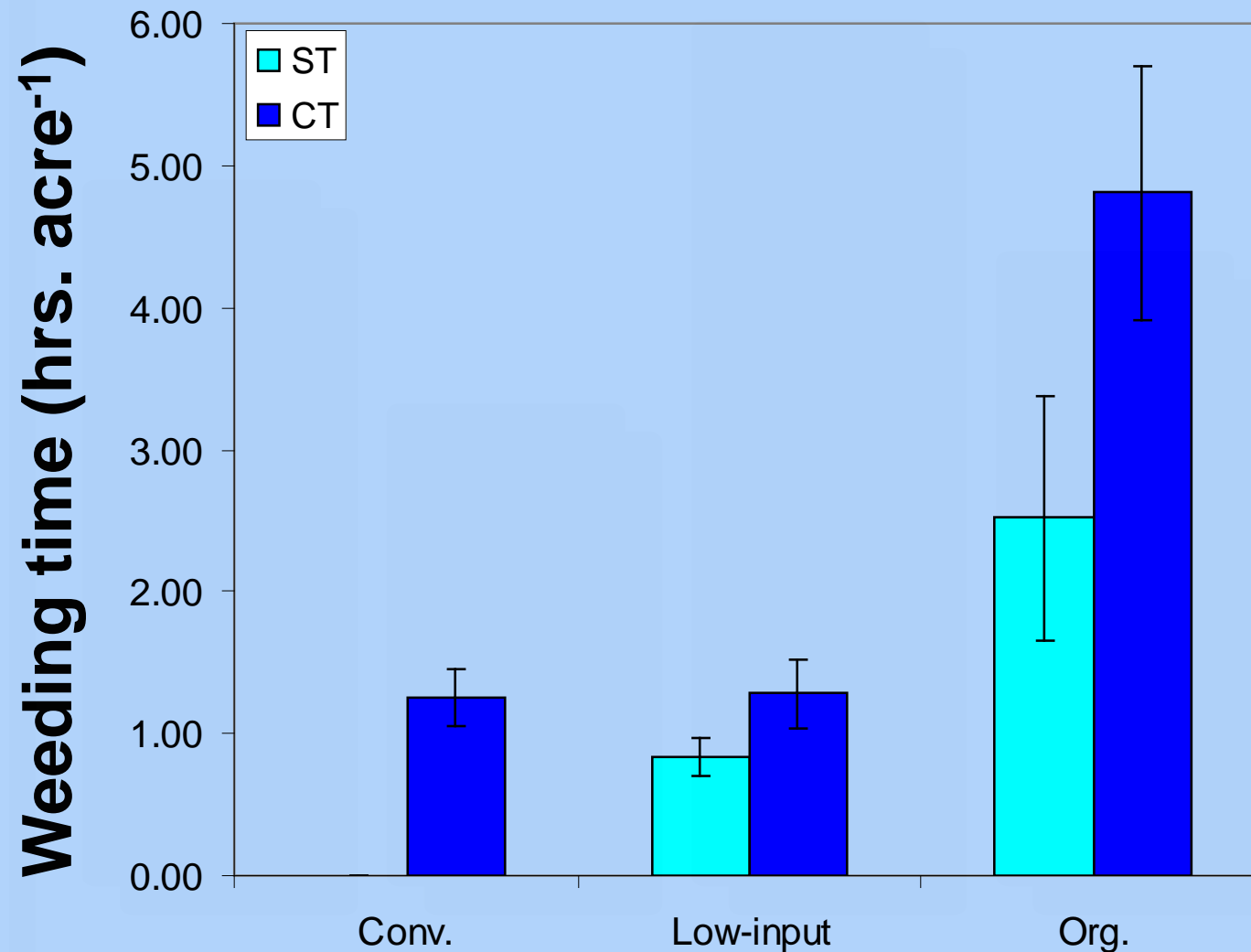
CCT=Conventional-conservation tillage
CST= Conventional-Standard tillage

LCT= Low-input -Conservation Tillage
LST= Low-input -Standard Tillage

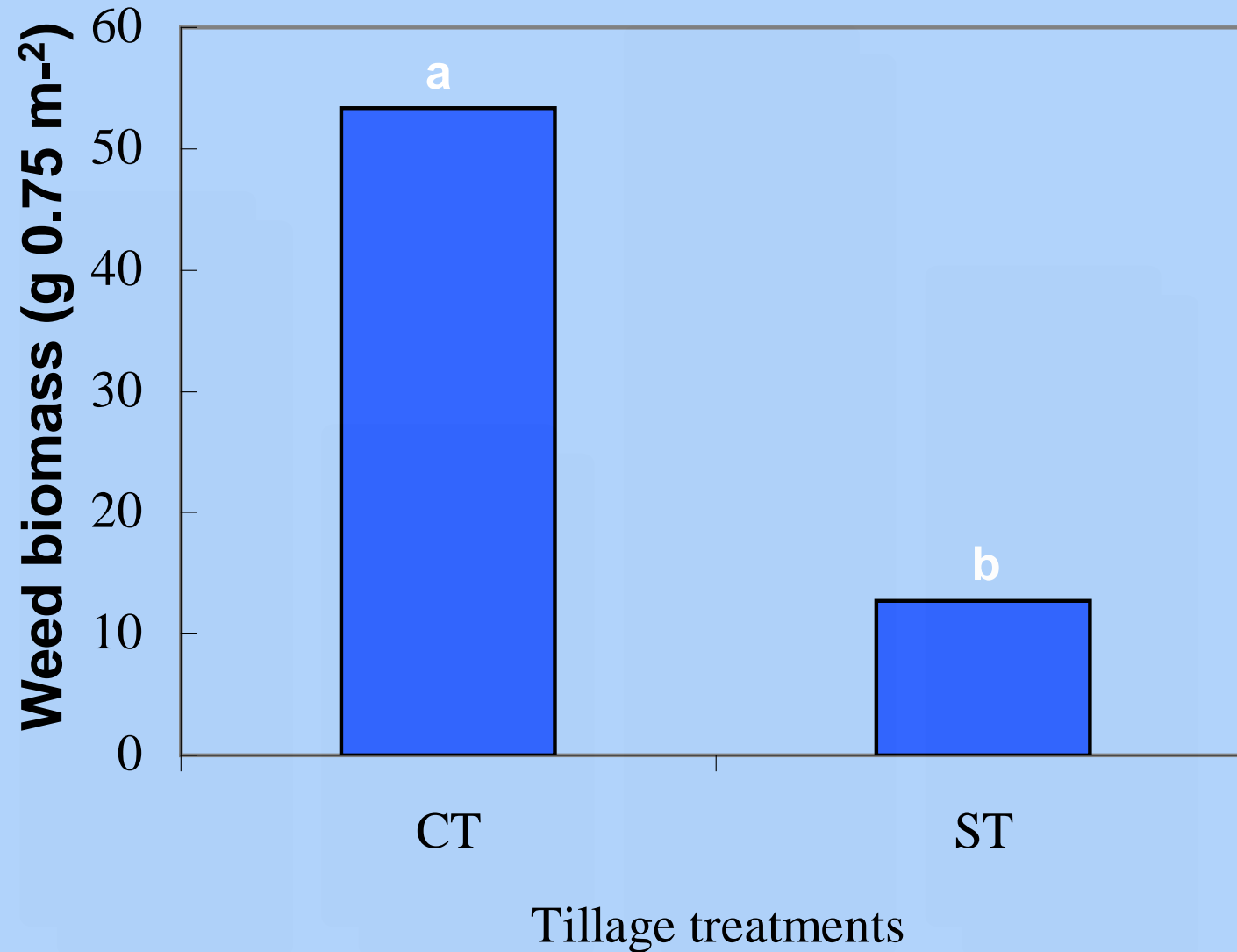
OCT= Organic-Conservation tillage
OST= Organic-Standard tillage



Weeding Time in Different Farming Systems in two tillage Practices



Weed Biomass in Conservation (CT) and Standard Tillage (ST) in Organic System



A Nationwide Survey of Organic farmers:

- ▶ **Weed management** is by far the greatest obstacle, much more frequently cited than:
 - ▶ Pest or disease control;
 - ▶ Soil fertility;
 - ▶ Cost of inputs;
 - ▶ Marketing; or
 - ▶ Organic certification.

Agricultural Management Practices and Soil Health

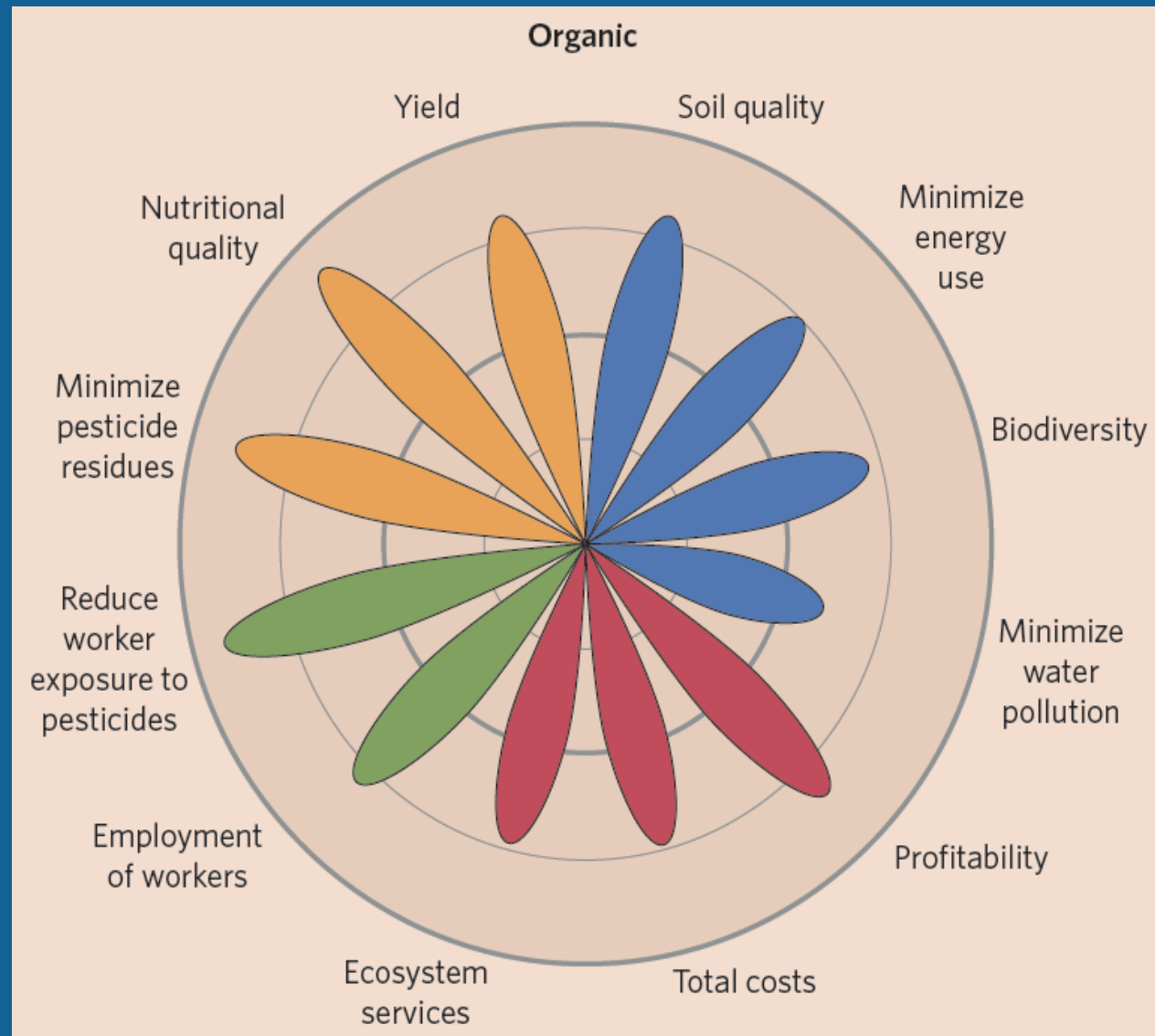
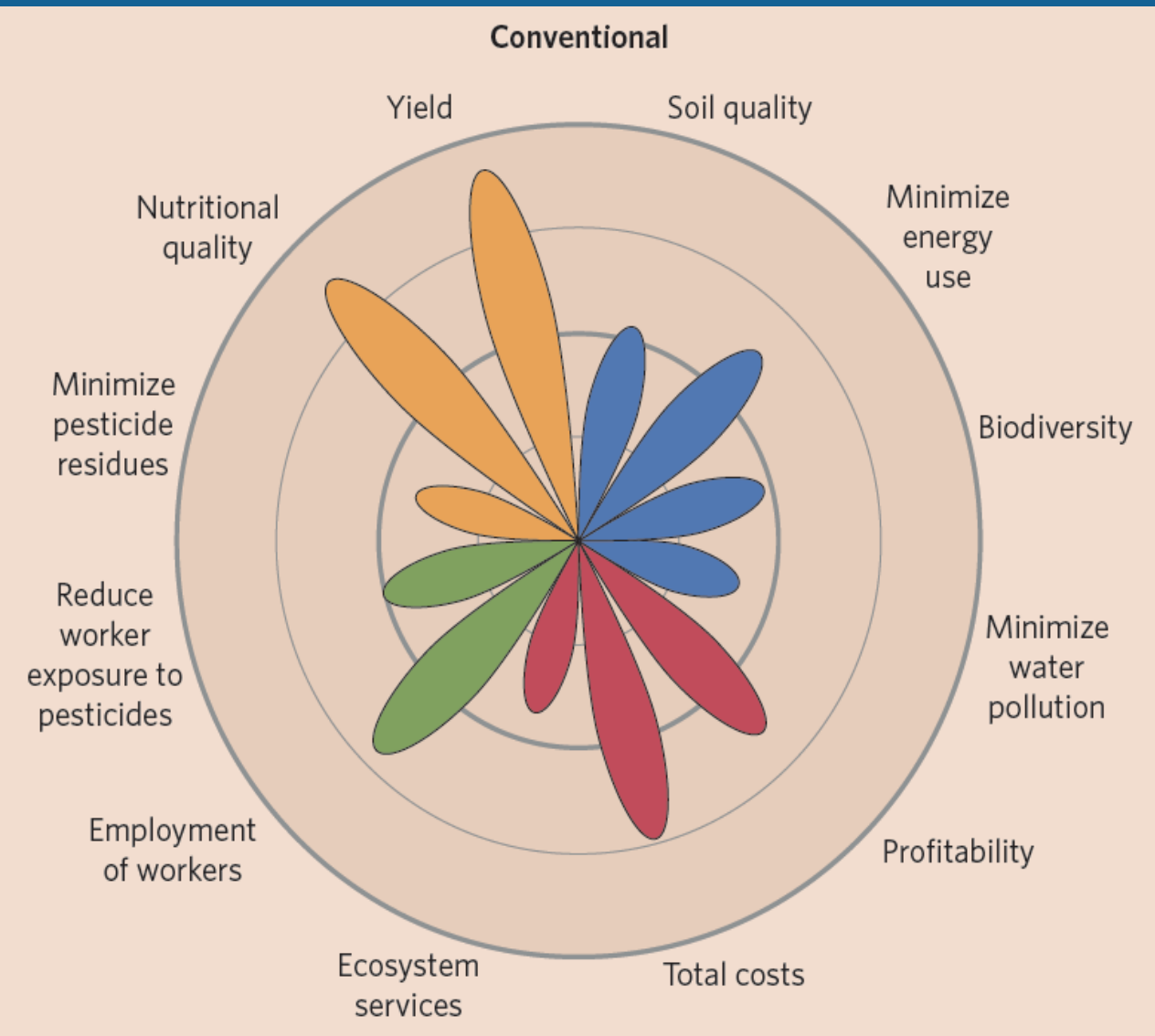
Choose practices that feed the soil organisms and protect their habitat (soil aggregate)

Tend to Reduce Soil Health	Tend to Promote Soil Health
Aggressive tillage	No-till or conservation tillage
Annual/seasonal fallow	Cover crops; Relay crops
Mono-cropping	Diverse crop rotations
Annual crops	Perennial crops
Excessive inorganic fertilizer use	Organic fertilizer use (manures)
Excessive crop residue removal	Crop residue retention
Broad spectrum fumigants/pesticides	Integrated pest management
Broad spectrum herbicides	Weed control by mulching, cultivation

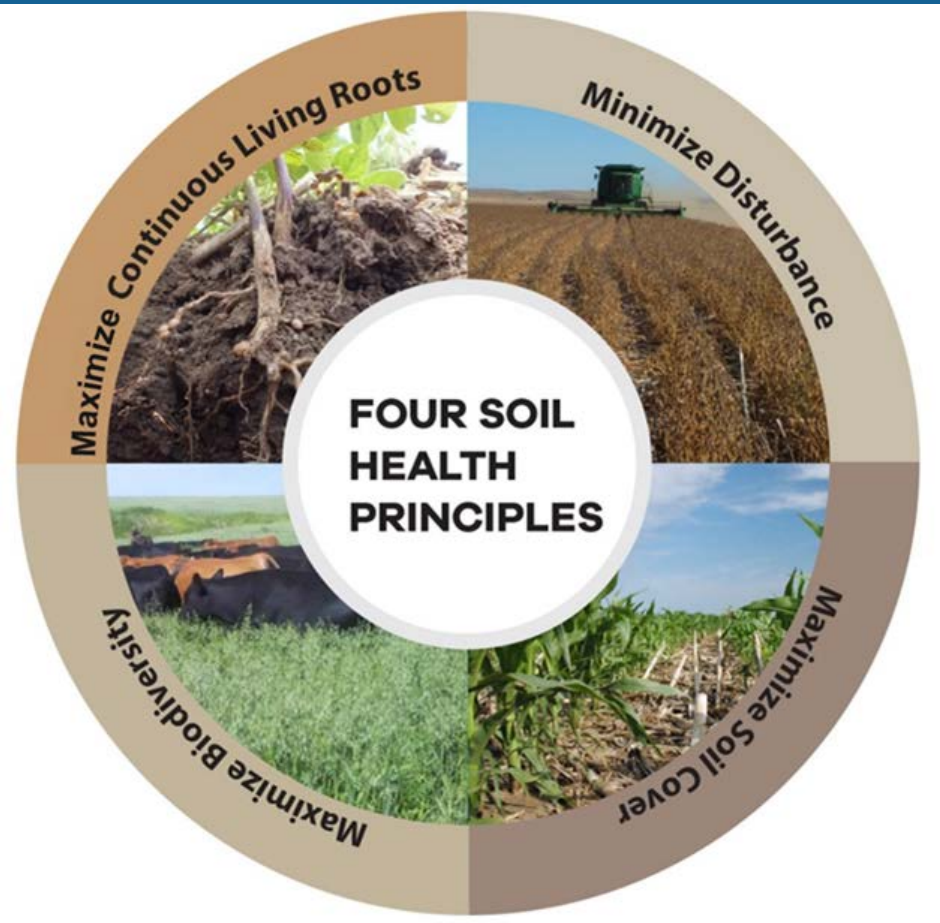




Conventional vs. Organic: Areas of Sustainability



Conclusion



- A systems approach is needed for successful organic farming systems that use all four soil health principles
- <http://www.conservationswebinars.net/webinars/residue-and-tillage-management-in-organic-farming-systems-western-states>

Thank You



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