Food Water Wellness Foundation

Soil Context as a Decision Tool

Questions and a Decision Matrix

What Do I Do When I Go Home?

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REGENERATIVE AGRICULTURE:

- **Systems Approach**
- **Dynamic, Innovative, Integrated, Intensive**
- **Soil Regeneration via Recarbonization**
- **Photosynthesis – Carbon Flow/Costs**

Photosynthesis – most efficient form of solar energy conversion to chemical energy in the bonds between carbon atoms or carbon atoms and other atoms.

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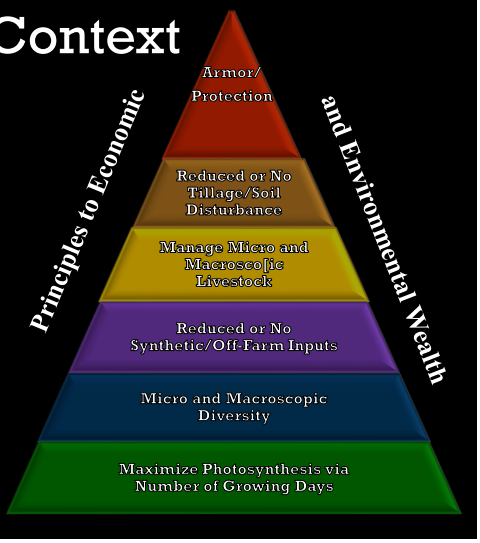
BROWN REVOLUTION

Eco-Functional Intensification

System Context

- Optimize landscape use
- Maximize efficiencies
- Not more but less
- Multiple enterprises
- Everything costs
- Redistribute risk
- Nutrient density



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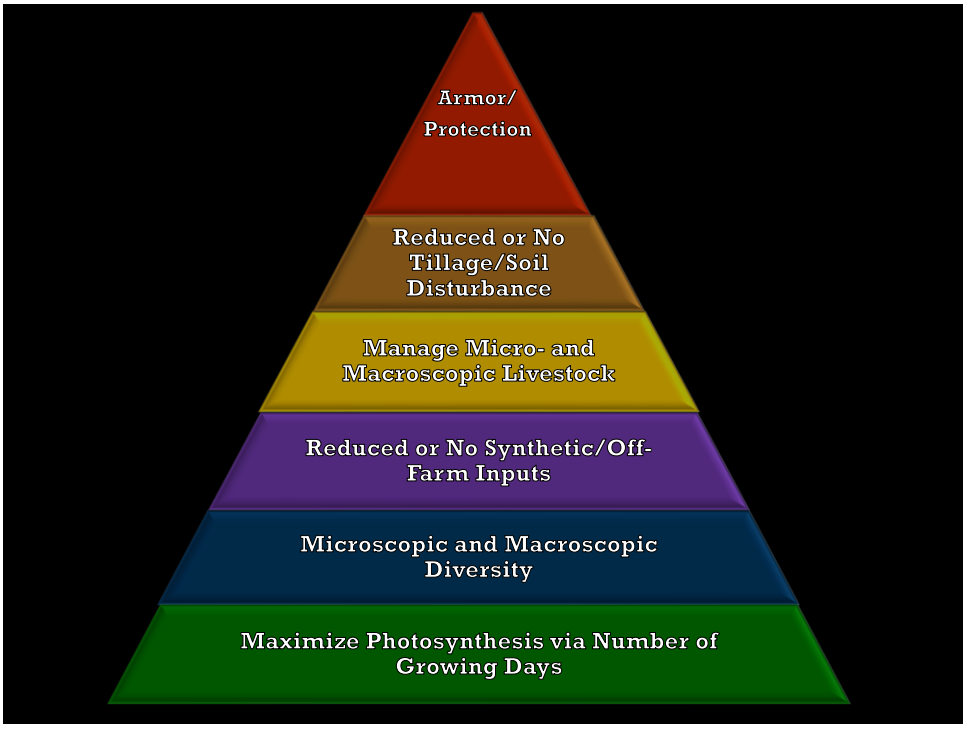

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TREAT SOIL LIKE YOU'RE SUPPOSED TO TREAT YOURSELF

- Eat small meals throughout the day (be a grazer).
- Eat a diverse diet.
- Exercise but don't over exercise – FIST (Frequency, Intensity, Scale, Timing).
- Protect your body from injury, radiation, temperature extremes, etc. (armor).

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Tool and/or Practice Decision Maker

Not Should I but Why

- How – practices and tools
- What are the consequences
- When is it going to be most affective or have the least negative consequences?
- Where?

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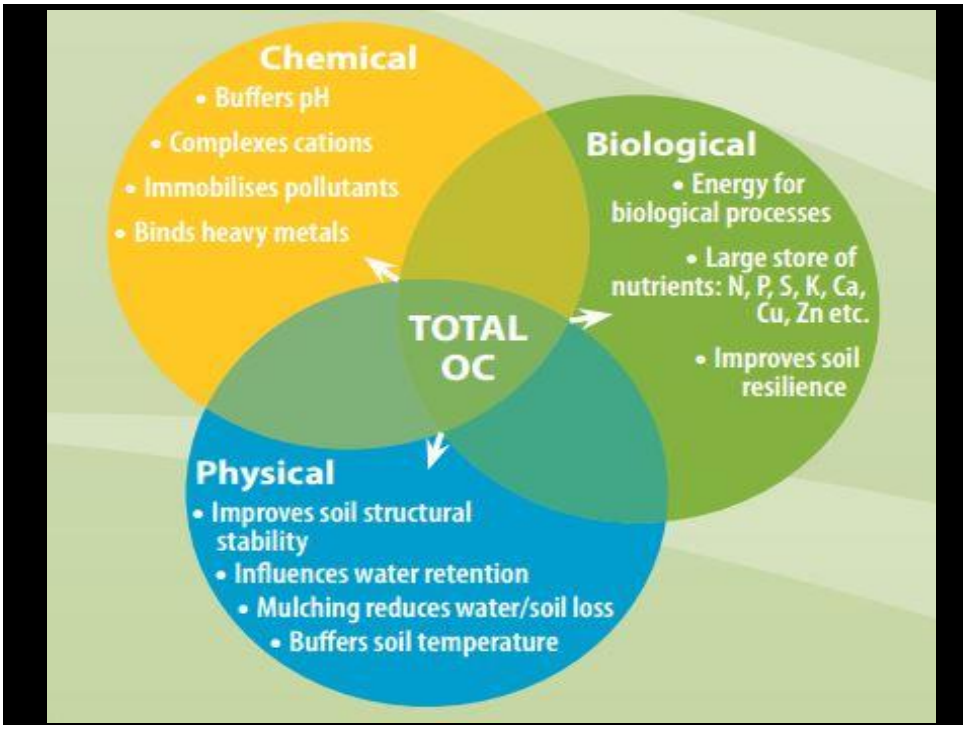
Chemical
• Buffers pH
• Complexes cations
• Immobilises pollutants
• Binds heavy metals
Biological
• Energy for biological processes
• Large store of nutrients: N, P, S, K, Ca, Cu, Zn etc.
• Improves soil resilience
TOTAL OC
Physical
• Improves soil structural stability
• Influences water retention
• Mulching reduces water/soil loss
• Buffers soil temperature

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Nutrients
Tillage
F I S T
Grazing
System Not Tools and Practices
F – Frequency
I – Intensity
S – Scale
T – Timing
Nitrogen
Diversity
Phosphorus
Crops
Pesticides

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F I S T
System Not Tools and Practices

F – Frequency - # times tool or practices used

I – Intensity – amount of force needed

S – Scale – volume, concentration, or type

T – Timing – most effective or least destructive

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F I S T Matrix
Five Whys
Carbon Flow Context

Issue					
Tool or Practice		Frequency	Intensity	Scale	Timing
	Trade-Offs/ Carbonomics				
	Recovery Plan/ Recarbonization /Chaos				

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F I S T Matrix
Five Whys

Issue	Weeds			
Tool Choice	**Deep Tillage**			
Trade-Offs/ Carbonomics	Frequency (number of times tool is used in a season)	Intensity (amount of force to be effective)	Scale (total volume of soil impacted)	Timing (when is most effective)
Positives				
Negatives				

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Issue	Weeds			
Tool Choice	**Deep Tillage**			
Trade-Offs/ Carbonomics	**Frequency**	**Intensity**	**Scale**	**Timing**
Positives	Prevents several in-season tillage passes; Prevents herbicide use; Fiscal costs are limited to equipment, fuel, and labor	Choosing an implement and tractor speed to be effective and not very destructive	Effective weed termination with deep tillage	Perennial weeds most impacted at weakest growth times; Labor needs at a low stress time
Negatives	Tillage may destroy aggregates and rip apart fungal hyphae; Multiple passes needed to be effective	Implement or speed needed for weed termination may be destructive to soil physical structure and biology	Deep tillage may more destructive; Although the implement being used goes deep into the soil is the volume of soil impacted more or less than a surface shredding such as rototilling	Impacts microbes if done at high growth periods

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Issue	Weeds			
Tool Choice	**Herbicide(s)**			
Trade-Offs/ Carbonomics	**Frequency**	**Intensity**	**Scale**	**Timing**
Positives	Prevents the use of tillage and/or herbicides		New application tools, chemistry, and genetics may reduce the amount needed	When most effective
Negatives	Fiscal costs compared to other tools; Efficacy may be limited and require increased frequency of use or additional tools	May negatively impact soil biology and physical structure	New chemicals or chemical combinations may be needed	Impacts on cash crops, labor, expenses, and soil biology and physical structure

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Issue	Weeds			
Tool Choice	**Poly-, Inter-, Companion, or Cover Cropping**			
Trade-Offs/ Carbonomics	**Frequency**	**Intensity**	**Scale**	**Timing**
Positives	Prevents the use of tillage and/or herbicides	Crop choice may provide benefits - enhance nutrient cycling and soil physical, chemical, and biological activity for cash crop	Rooting depth and architecture may be positive; Leaf size and architecture needs to be a part of plant selection	When most effective
Negatives	Fiscal costs include seeds and field operations – planting; Efficacy may be limited and require increased frequency of use	Crop choice may have negative impacts on nutrient cycling soil and/or cash crop – too much nitrogen in the system, compaction, water use, etc.	Rooting depth and architecture may negatively impact water use and chemistry; Leaf shading is a concern	Impacts on cash crops, labor, and expenses

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Issue	Weeds			
Tool Choice	**Grazing/ Haying/ Mowing – Plant Biomass Removal**			
Trade-Offs/ Carbonomics	**Frequency**	**Intensity**	**Scale**	**Timing**
Positives	Prevents the use of tillage and/or herbicides; Provides another potential income source; May add nutrients	Potential nutrient source; Add carbon; May alter soil temperatures	Potential nutrient source; May increase rooting depth; Add carbon; May improve soil compaction	Flexible timing may help with nutrients and water use
Negatives	May export some carbon and nutrients; Efficacy may be limited	Animal choice, animal units, and/or grazing days may be destructive; Mowing implements impact carbon flows	May cause surface compaction	Impacts on labor, expenses – animals, fencing, water, and labor; and soil biology and physical structure

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F I S T
Recovery Plan/ Recarbonization

Issue	Weeds			
Tool Choice	**Herbicide(s)**			
Trade-Offs/ Carbonomics	**Tillage**	**Herbicides**	**Cropping**	**Grazing**
Recovery Plan/ Recarbonization / Chaos	Offset soil carbon and soil structure losses and negative impacts on microbial community via cropping and/or grazing	Offset soil carbon and soil structure losses and negative impacts on microbial community via cropping and/or grazing	Assess plant species impacts on nutrient cycling and water use, including crop stressors and new weed pressures and respond with grazing or enhancing plant diversity	Overgrazing as a termination tool needs to offset soil carbon losses via cropping and/or additional grazing; If grazing is used continuously then you need to insert chaos into grazing plan; Choose plants to address any compaction issues caused by grazing

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A Nation that Destroys its Soil, Destroys Itself.

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