



SOIL DOCTOR

Better Soil Better Crops Better Health

Build It and They Will Come ??

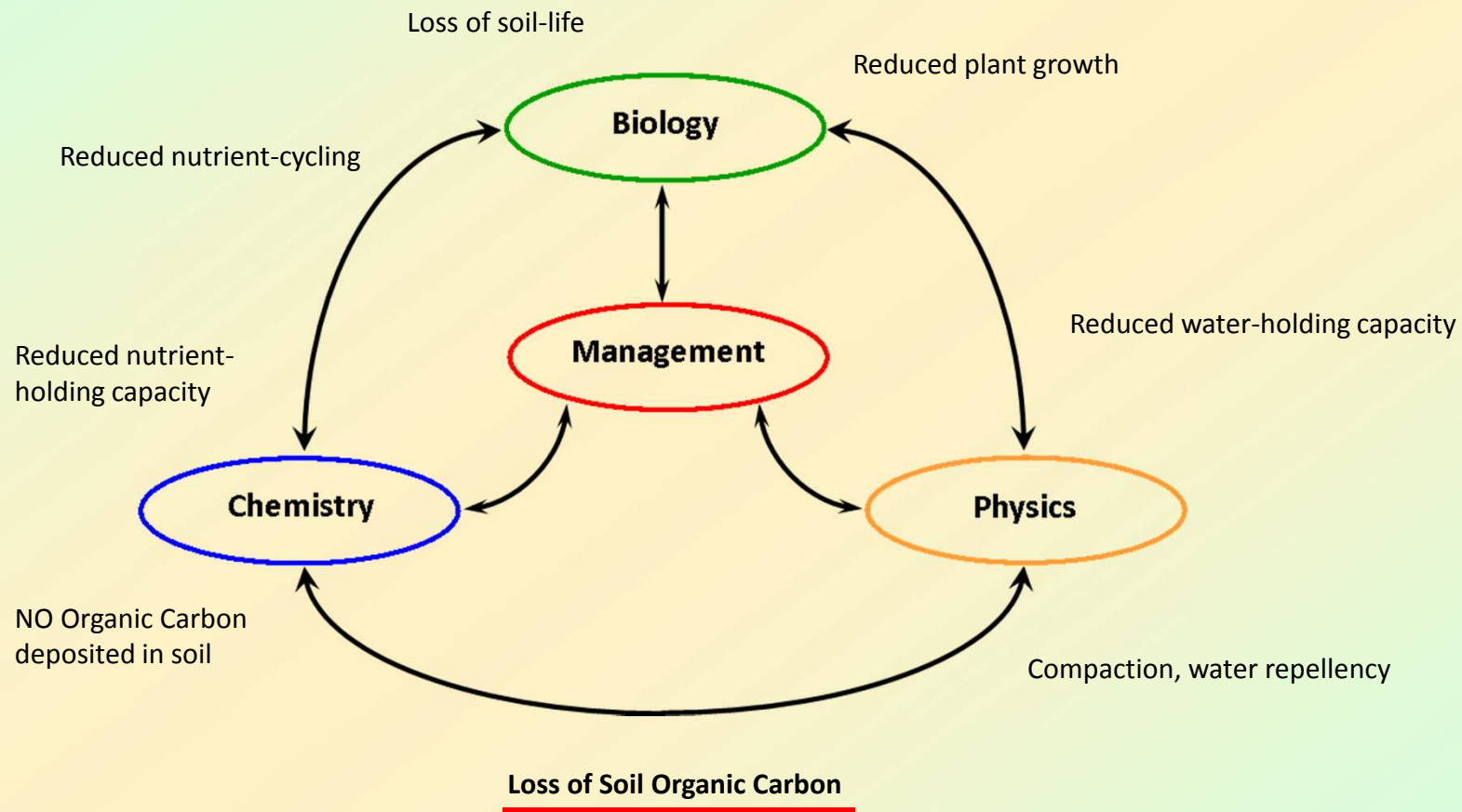
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The Soil System - Simplified



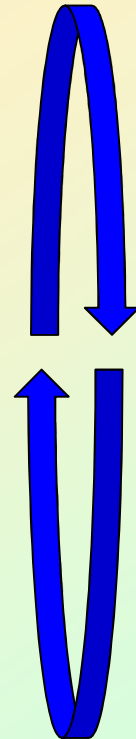


Key Soil Chemical Elements

Air



Water



Soil Organic Carbon

Living – Plant tissue, micro-organisms, fungal tissue, macro-organisms

Non-Living – Particulates, humus, litter, charcoal

Essential Elements

Main Elements (Ca, Mg, K, Na, P, S, N)
Trace Elements (Cu, Zn, Fe, Mn, B, Mo)
Also Cl, HCO₃, Si, Se, Co, Ni, Al

Balances and Ratios

Acidity (pH) & Alkalinity
Cation Balance (Ca: Mg: K: Na)
Carbon:Nitrogen

Soil Matrix

Rocks, saprock, subsoil and topsoil - gravels, sands, clays

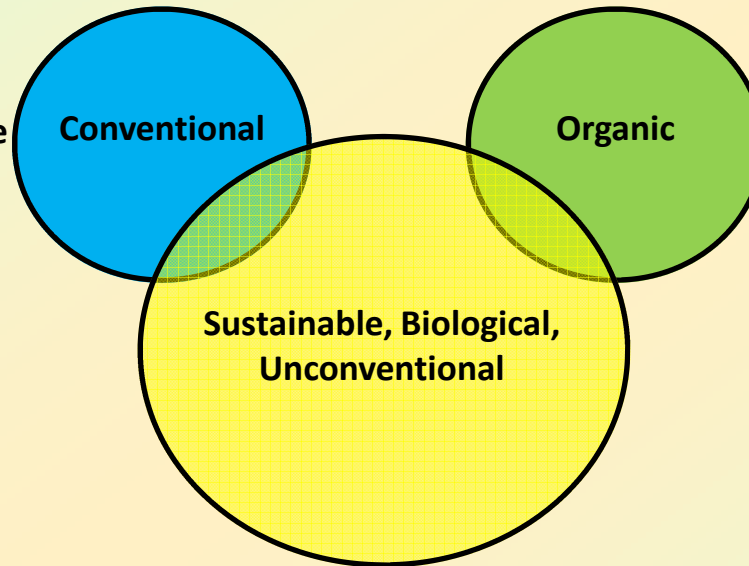


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The Bridge

High Inputs
High Chem Use
High (Low) Disturbance
Feed the Plant
Mine SOC
Soil Life Disregarded



Low Inputs
No Chem Use
Low Disturbance
Feed the Soil First
Build/Maintain SOC
Soil Life Critical

Targeted Inputs
Reduced Chem Use
Appropriate Disturbance
Feed Soil & Plants
Rebuild SOC
Soil Life Important

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How to Build a Bridge

Step 0 – Desire to Change and Grow

Step 1 – Collect Information

1. Use your senses, experiences and records
 - Eyes, ears, nose, hands/feet, gut
 - Historical soil/plant tests, crop results, field notes
2. Assemble monitoring equipment
 - Includes; maps; shovel and/or soil auger/corer; camera; basic pH/Conductivity meter; refractometer
3. Sample soils, plant tissue, biology
 - Comprehensive soil tests – simple types are next to useless
 - Plant tissue tests – appropriate time/method for crop type
 - Soil biological tests – most still problematic

Soil Testing

Soil Test:

1. From same area
2. With same method
3. About the same time of year
4. Every 3-4 years

Optional Tests

- **Total Main Elements** (Phosphorous (P), Potassium (K), Sodium (Na), Calcium (Ca), Magnesium (Mg), Sulphate (SO₄))
- **Total Trace Elements** (Silicon (Si), Copper (Cu), Zinc (Zn), Manganese (Mn), Iron (Fe), Boron (B), Molybdenum (Mo), Cobalt (Co), Selenium (Se))

Essential Tests

- pH (1:5 CaCl₂), pH (1:5 H₂O)
- Conductivity + Total Dissolved Solids (TDS)
- **Total Organic Carbon (OC)**
- **Total Nitrogen (N)**
- **Available Main Elements** (Nitrate (N-NO₃) and Ammonium (N-NH₄), Phosphorous (P), Potassium (K), Sodium (Na), Calcium (Ca), Magnesium (Mg), Sulphate (SO₄))
- **Available Trace Elements** (Silicon (Si), Copper (Cu), Zinc (Zn), Manganese (Mn), Iron (Fe), Boron (B))
- Chloride (Cl)
- Aluminium (Al) if acidic
- Lime Requirement to pH6.0
- Phosphate Buffering Index (PBI)
- **Effective Cation Exchange Capacity (ECEC)**
- **Exchangeable Cations (Ca%, Mg%, K%, Na%, Acid%)**
- Total Exchangeable Bases (TEB)
- Total Exchangeable Acid (TEA)

Plant Testing

Plant Test:

1. From same area
2. With same method
3. At the same growth stage
4. Every season or if deficiency suspected

Plant Tissue

Total Nitrogen (TN), Total Carbon (TC), Total Sulfur (TS); Sodium, Potassium, Calcium, Magnesium, Phosphorus, Silicon, Cobalt, Molybdenum, Zinc, Manganese, Iron, Copper, Boron.

Sap

pH, EC, Moisture, Brix, Nitrate, Ammonium, Chloride, Calcium, Magnesium, Sodium, Potassium, Phosphorus, Sulfur, Boron, Copper, Iron, Manganese, Zinc, Aluminium, Molybdenum, Cobalt



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Step 2 – Identify Problems for Treatment

1. Plants
 - Test and visible deficiencies
 - Poor/Variable growth, seed/fruit set, root development
 - Weeds
2. Soil
 - Poor structure (hardpan), water repellency
 - Tests show deficiencies/imbbalances
3. Biology
 - Active rhizosphere?
 - Presence of fungi, macropods
4. Management
 - Too many passes with the tractor
 - Over/Undergrazing





Step 3 – Develop Strategy

1. Importance

- Whole farm problem or site specific?
- What's easy/hard/inexpensive/expensive?

2. Triage

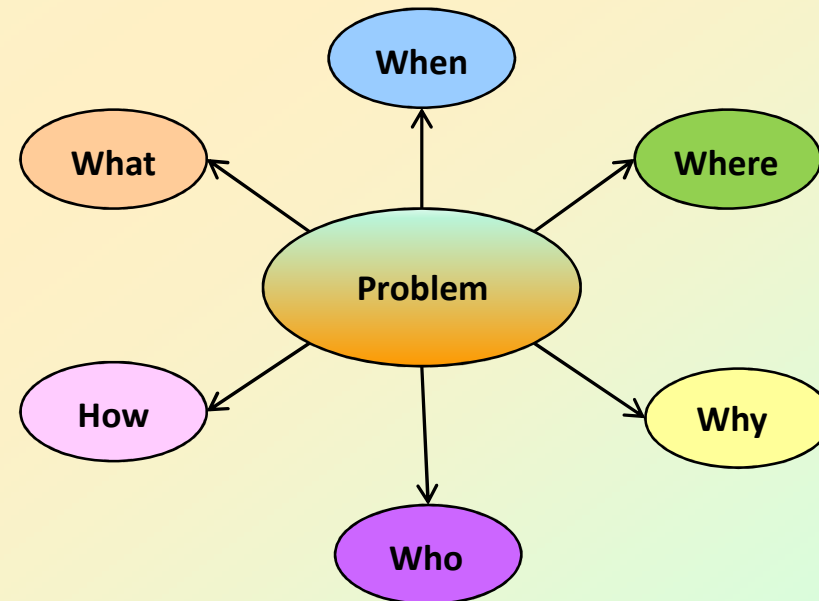
- Treat worst widespread problems first

3. Adjust/Change Inputs

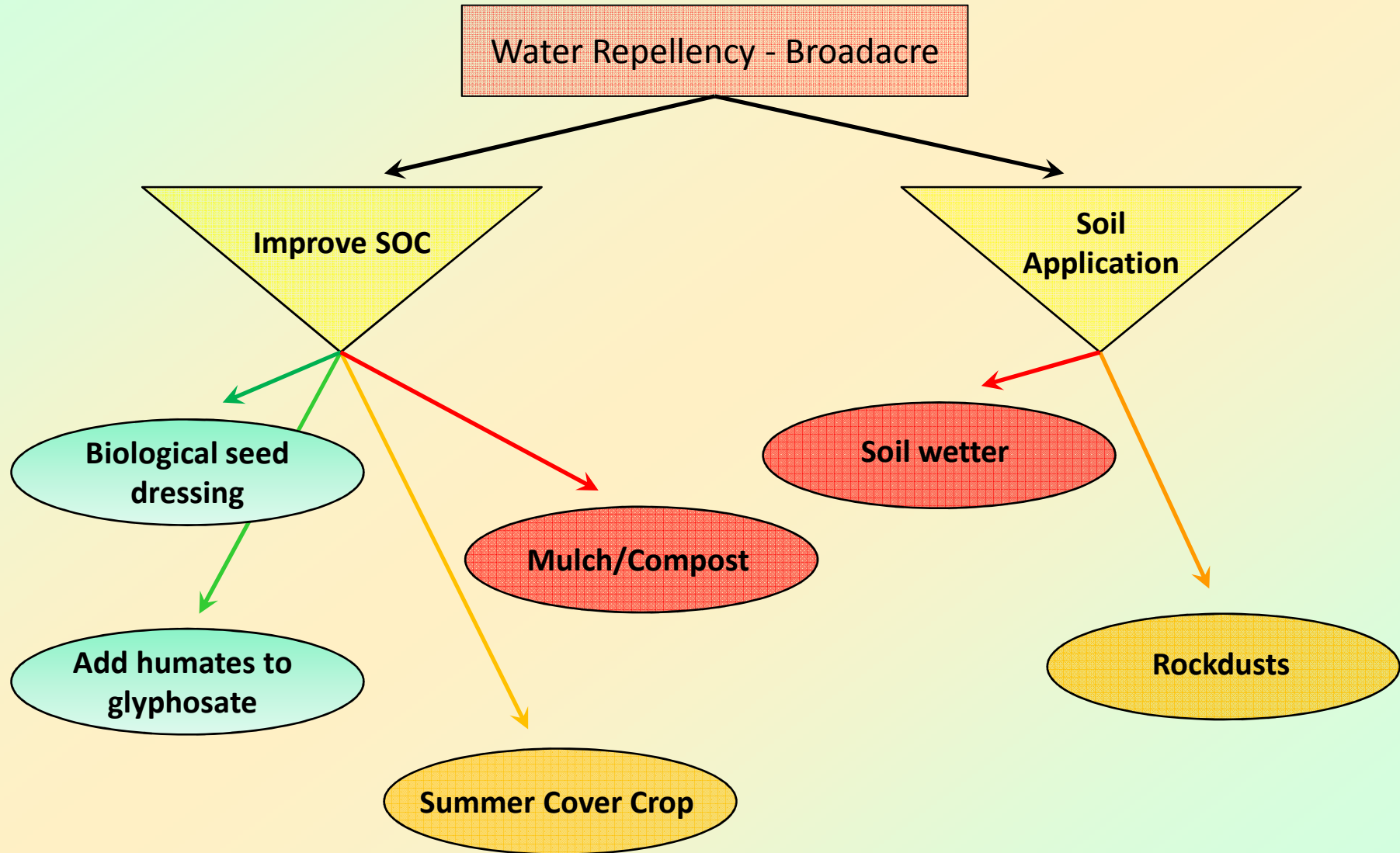
- Substitute fertilisers
- Reduce herbicide/pesticide
- Add biostimulant

4. Adjust/Change Management

- Combine inputs, reduce traffic
- Stubble mulch and apply N (Fish)
- Change crop?



Solution Pathways



Step 4 – Trials

1. Setup

- Aim and design (strips or checkerboard)
- Select trial area (average, no previous trials)
- Soil Test
- Assemble equipment and supplies - Do it!

2. Monitor (at least monthly)

- Photograph
- Measure shoot/root development, check sap sugar, stock behaviour, yield at harvest
- Leaf/Sap test
- Record rainfall and unusual weather events
- General observations

3. Review

- Were the aims achieved? Quantify/Qualify
- Were there any other unexpected changes?
- Seek help for strange results

4. Repeat/Expand

- Many results require 2-3 years to show
- Successes can be applied to larger areas





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**Better soil
produces
better crops**



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Tips for Tomorrow

1. Add C source to N inputs (humic acid + urea)
2. Reduce regular cultivation
3. Re-introduce stock animals back into the cycle
4. Add biostimulants
5. Plant a green cover crop for summer
6. Switch to slower release fertilisers
7. Stubble mulch (add a little N)
8. Substitute harsh fertilisers where possible (MOP -> SOP)
9. Reduce/Substitute herbicides
10. Apply rockdust (basalt)

Summary

- ✓ The living soil system is interconnected. Improvements in soil chemistry/physics helps kick-start soil biology, which then improves plant growth. If you start to build it, they will come and they will keep building for you.
- ✓ Conventional and Organic aren't the only ways – there are other methods.
- ✓ You already have many of the abilities and resources to make beneficial changes to your farm system.
- ✓ Trial, trial, trial – prove any new treatment works, for yourself, on your farm. Share your findings.
- ✓ **Switch to a more sustainable farming system to reduce costs and risk.**



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PUBLIC NOTICE

WANT TO

TAKE ACTION

WITHOUT SACRIFICING LIFESTYLE?

GLOBAL FINGER-CROSSING



JOIN WITH OVER 4 BILLION PEOPLE
CROSSING FINGERS SIMULTANEOUSLY
AT EVENTS SCHEDULED WORLDWIDE,
ALL WITH THE SAME HOPE:

IT'LL ALL BE OK.

12 NOON SUNDAY. MYER MUSIC BOWL
PARKING AVAILABLE.

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