

Bringing out the best in your soil: Organic Soil and Fertility Management with Ellen Mallory

- many useful books and videos available for sale at agro-point

Soil health/Quality

- good tilth, water infiltration, nutrients released over time, weed seed bank, disease
- soil organic matter, 1-6% of total soil mass, types: active (turn over in weeks/months, supplies nutrients, energy to microbe, soil structure, not easily measured in organic matter), slow (years, carbonation, structure, nutrients slowly released), humus (stable, centuries, structure)
- additions to soil: organic residues including roots, manure, compost
- losses: decomposition, don't want fast burn from tillage or oil disturbance, erosion
- tillage is most effective way to destroy organic matter, destroys structure and oxidizes organic matter
- "tillage is an earthquake followed by fire"> Bob Papendick

Building soil:

- Reduced tillage, rotation,
- Study from Presque Isle ME; 2 yr barley/potato rotation, 13 year study
- Conventional fertilized crop vs amended soil (manure, compost, rotation, green manures, 70% less fertilizer)
- Organic matter increased 75%, water stable aggregates, density, less dense, cation exchange increased, decreased fertilizer needed, P went up significantly
- yield of potatoes higher in amended soil, especially in poor growing years, buffers poor rainfall years
- competed better with weeds than non-amended
- soil building cannot: change intrinsic characteristics (i.e. rocky), correct soil ph, compensate for intense tillage,
- needs P:N = 0.2:1 (too high is polluting for water cycle)
- poultry manure = 1.4:1, dairy manure = 0.6:1, composted manure = 1:1, composted leaves = 0.5:1
- potatoes are one of toughest crops on soil structure because of turning of soil every year
- to maintain 2.7% organic matter, need 2.5 ton of dry matter/ac/yr (i.e. hay harvest)
- fall cover crops: 2-4" = 1/3 ton DM; 4-6" = _ ton DM, 14" = 1ton DM
 - o can't rely on fall cover crop to maintain organic matter
- organic matter lost most from Mb plow, less with disc, less with chisel plow, less with no till
- less tillage saves fuel, time, water
- how to reduce: shallow till (perfecta harrow for small seeded crop), zone till (strips for vegetables),
- Rob Goranson working with organic strip tillage and smaller cart, Anu Rogen working on zone till

Rotation

- Cover crop (fava beans), Broccoli, cover crop winter squash, cover crop

- Early harvest, rye/vetch mix (plowed in spring)
- Alternative year rotation: Winter rye, bare fallow (2-3 weeks), broccoli, rye vetch, fallow, squash, cover crop.
 - o Better for killing weed seed bank than 2 year cover crop
 - o Best systems target times of weed germination with tillage to flush out, not just suppress. Good for high weed seed bank soils
- Nordell's are horse farmers with cleanest fields
- Summary of improving soil health: balance with other goals (like weed management), amendments, reducing tillage
- Test soil: ph level, organic matter, P levels, correct nutrient deficiency
- Organic matter: ideal amount depends on what you are growing and your type of soil, reflects nutrient imbalances,
- Crimper roller used after winter crop, needs lots of residue to act as mulch to keep weeds down while large seeded crop comes through
- Used as termination technique for green manure crop, knocks off weeds, eliminates tillage but gets green manure benefits
- Biochar: take carbon form, humifies it into stable form through pyrolysis (burn wood like willows, 2 in at most, with low air and temperature), has higher nitrogen than charcoal, powdered, adds to soil, doesn't add fresh organic matter needed, balances moisture over season,
- Biological tests of soil: measurements of earthworms, microorganisms, but only one of factors in overall soil health
- Dry soil, when rewet, flush of nitrogen comes out because of dead microorganisms storing N that gets released
- P and K easy to measure because says put, but N up and down quickly so can look at organic matter somewhat
- 2-5% of organic matter released during typical growing season
- PSNT test for dairy systems using lots of manure for corn silage, when corn 1ft tall so spring variability passed, look at nitrate (inorganic form of N), finds sufficiency level (25ppm),
- Can be used for vegetables too but 30ppm is sufficiency level
- Chemical test using growing degree days or exchange membranes also available
- Post-hoc testing at end of season, demoed on corn stalks but could apply to vegetable systems also, test bottom 8-16" for nitrate or total nitrogen, relates to total levels in soil; takes few years to calibrate, but seems more reliable number
- Reading the weeds can be an indicator to soil, but are lots of other factors. Weed survive by adaptation so they survive in lots of places, but used with other indicators like smell can be helpful
- Ex. Purple strife indicates nutrient shortage,
- Test strips are helpful, if applying something new, leave a check strip for comparison
- Get neighbours to all do test at same time to compare results