TYING IT TOGETHER,
a Farmer’s Perspective

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Vegetable Farmer
Managing vegetable production for healthy soils and profit thru:

Crop Rotations,
Manure Management &
Cover-cropping Systems
INTRODUCTION

- Continuous vegetable production is hard on soils

- Biologically active healthy soils are key to growing good crops over the long run.

  - healthy soils are resilient.

  - healthy plants less susceptible to disease and pests.
INTRODUCTION

• How to do this:

• Fertilizer alone not enough "Feed the soil, not the crop" (generally)

• Use rotations/manure/cover crops to build healthy soil

- soil organic matter is the barometer of soil health. Good management can increase organic matter levels (within the limits of climate)

- Many approaches possible;
Principles/Rules of Thumb

• 1. Recognize the problem

• 2. Manure is good

• 3. Roots build soil organic matter- top growth(foliage) builds roots

• 4. Start somewhere; with experience your ability to manage complexity improves.
Principles/Rules of Thumb

• 5. One size does not fit all- be prepared to manage different fields differently

• 6. Keep ground covered as much as possible

• 7. Minimize tillage especially deep tillage

• 8. Good is often good enough-remember the rule of diminishing returns.
Rotations:

• The key component to keeping soils fertile and healthy
• Well designed rotations allow optimum use of manures/purchased inputs/cover crops

Rules of Thumb for Cash Crops:

• Separate families 1-3 years
• Alternate light and heavy feeders
• "Cleaning" crops with more weed friendly crops
Rotations:

Rules of Thumb for Cash Crops:

• No hard and fast rules; complications and opportunities:

  • Double and triple crop opportunities

  • Soil characteristics and fertility will vary field to field

• Irrigation encourages more intensive cropping

• Long term grass/legume sods are best for soil building.
What to Do?

1. Start simple, rotations will evolve as you gain experience.

2. Don't try to make one rotation fit entire farm, you will end up with different rotations for different fields.

3. Incorporate soil building (manure and cover crops) into rotations.
What to Do?

• Some general rotation models

• - more labor than land or quick maturing/light feeding crops (salads);

• crops every year, manure/compost with off season cover crops.

• - more land than labor: alternate soil building "fallow" (cover crop) years with cash crops.
What to Do?

- Double crop year followed by cover crop year.

- Strip cropping: 2-4 years grass/legume sod followed by 2-4 years crops, manure/annual cover crops on cash crop strips.
Strip Cropping:

- Easiest way to use soil building rotations

- works best on larger fields with generally uniform slopes
- less useful on smaller and more irregular fields

- lay out equal width strips against the contour across the field.
Strip Cropping:

- alternate cash crop strips with long term, perennials usually legumes or legume /grass mixes.

- change over every 2-4 years (or more)
Strip Cropping: Advantages

• 1. Undisturbed soil best environment for soil building.

• 2. Limits soil erosion across field.

• 3. Driveways: vehicle/foot traffic on sods
Strip Cropping: Advantages

- 4. Readily available mulch/concentrate manure on vegetable strips
- 5. Grazing opportunity (chicken tractors or small animal) especially in off season.
- 6. Spreads out work load.
Strip Cropping: Disadvantages

• 1. Laying out strips takes time

• 2. Changeovers best done over several years, changeover all strips in one year is a lot to do.

• 3. Biggest problem- perception of giving up production land.
Strip Cropping: Disadvantages

- don't ignore double crop potential.

- makes more time available to successfully raise vegetables to completion.

- Not practical if you have more labor than land, and lots of manure.
Manure

• Good for building organic matter.

• Generally P and K levels fairly high, N content varies a lot

• Best manure: whatever you can get
Manure

• Manure is always an materials handling problem unless self-hauling.

• Raw manure is "best" applied in Summer and Fall

• Grass cover crops ideal for spreading large amounts of manure. Eliminates problems with contamination
Manure vs Compost

- Compost better than manure on a per lb. basis

- takes time and resources to make good compost

- purchased compost can be expensive.
**Manure vs Compost**

**Bottom Line:**

- Use manure even if you rely on fertilizers
- Be aware of pollution potential - fairly easy to control (buffer strips along streams/cover crops)
- Same concerns with N applications.
Common and adapted Cover Crop Species

Perennials - for strip cropping:

- **Alfalfa** - real disadvantages
- **Sweet clover**
- **Red Clover** (mammoth/medium)
- **Ladino white clover** **
Common and adapted Cover Crop Species

Perennials- for strip cropping:

- **mixes** (legumes/grasses or legume mixes)

- Most legumes can be frost seeded into winter small grains or seeded with Spring planted grass/small grain.

- **Annual ryegrass** is suited to mixes and well adapted
Most Common Annual Cover Crops

Winter grasses (Fall planted):

- *grain rye*
- *triticale*
- *wheat* - better than nothing
Most Common Annual Cover Crops

Winter grasses (Fall planted):

- **oats** - will Winter-kill usually

- **annual ryegrass** - if seeded by mid Sept
Most Common Annual Cover Crops

Summer Grasses:

- oats (Spring sown)
- annual ryegrass
- buckwheat
Most Common Annual Cover Crops

Summer Grasses:

• *Sorghum Sudan*/ *Sudan* (can be seeded in early Fall)

• All grasses are excellent soil builders because they scavenge N BUT need lots of N (manure)

• *Annual ryegrass*/ *rye*/ *sorghum Sudan* - densest root mass
Most Common Legume Cover Crops

Winter annuals

• *Hairy vetch* - versatile but with drawbacks

• *Other vetches*

• *Sweet clover/clovers?*
Most Common Legume Cover Crops

Winter annuals:

• **Austrian Winter Peas** - very micro-climate dependent

• **Spring forage peas** - rapid growth but will Winter-kill

• Plant winter legumes in mixes with grass(small grains) and brassica?
  - frost protection
  - better for soil microbes
Most Common Legume Cover Crops

Summer Annuals

• *Forage soybeans* (grain types OK)

• *Cowpeas* - most versatile, maybe best if mixed with grasses

• *Sunhemp* ??
Most Common Legume Cover Crops

Summer Annuals

- *Vetches* - all vetches can be early Spring planted, flowering a few weeks after Fall planted vetches

**NOTE:** planting legumes and grass in a mix slows down N mineralization when killed, generally desirable
Up and coming cover crops

- Tillage type radish
  - N scavenger/ breaks up compaction layers (will choke out legumes if planted thick).

- Crimson clover- new strains (Dixie) more
  Winter hardy
  - good Fall growth- will usually survive winters if planted in mixes.
Up and coming cover crops

- **Tillage type radish**

- **Lana Woolypod vetch**  
  - explosive Fall growth- winterkills

- **Cahaba vetch**  
  - good Fall growth but low growing, winterkills probably better in Spring
More Up and coming cover crops

• *Common vetch*
  - cheaper than hairy vetch, good Fall growth usually will survive Winters in mixes

• *Chickling Vetch aka AC Greenfix:*
  - plant early Fall or early Spring. Very rapid nodulization (45 days)
More Up and coming cover crops

- *Black oats?*

- *mustards?*

- *Other brassicas?*
Legume cover crop combos for organic growers

- Available N limiting factor in organic farming
- Two week minimum wait after termination before planting cash crop.

1. Early planted crops (before mid April)

- Fall planted forage peas (mixed with sorghum-sudan or oats)
Legume cover crop combos for organic growers

1. More early planted crops (before mid April)
   - Fall planted Lana Woolypod/cahaba in mixes
   - Fall planted crimson clover in mixes
     - Mixes may include tillage radishes EXCEPT if brassica is the planned cash crop.
   - Make ridges in Fall for very early planted cash crops especially on heavier soils
More Legume cover crop combos for organic growers

2. Mid-late Spring crops (mid April-late May)

- hairy vetch/mix
- common vetch /mix
More Legume cover crop combos for organic growers

2. More Mid-late Spring crops (mid April-late May)

• crimson clover/mix

• Austrian Winter pea/mix where adapted

• AC Greenfix- planted early March
More Legume cover crop combos for organic growers

3. Summer planted crops (June on)
   - hairy vetch/rye
   - AC Greenfix
   - Spring forage peas
   - Spring planted vetches alone or with oats
Special uses/issues with cover crops

- Windbreaks

- vetch/rye or clovers/rye

- cowpeas/soybean with sorghum Sudan or other Sudan grasses

- Rye or sorghum Sudan by themselves.
Special uses/issues with cover crops

• Cover crops for hoop-houses & high tunnels

• most cover crops will work- easily killed species probably best

• "cocktail" mixes?
_info & contacts_

**Sources:**

Numerous seed suppliers now:

- Green cover seed
  - Greencoverseed.com
  - 918 Road X
  - Bladen NE 68928
  - 402-469-6784

**Information/Help:**

- “Weed the Soil, not the Crop”

  - Anne and Eric Nordell
  - 3410 Rt 184
  - Trout Run PA 17771

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Questions???