

**TYING IT TOGETHER,  
a Farmer's  
Perspective**

**Paul Conway,  
Leavenworth CO KS  
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](tel:402-469-6784)

## Information/Help

### “Weed the Soil, not the Crop”

Anne and Eric Nordell  
3410 Rt 184  
Trout Run PA 17771

### Paul Conway

25476 183d St  
Leavenworth KS 66048  
[913-775-2559](tel:913-775-2559)  
[pconway@wildblue.net](mailto:pconway@wildblue.net)

**Questions???**