Cover crops for vegetable cropping systems

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http://www.slideshare.net/jbgruver/
My first wading pool garden in July 2009

The watermelon root system on the title slide was exhumed from this pool in September.
Housing project garden in early June ~ 1 month after transplanting
Wading pools filled with compost are **NOT** an optimal rooting environment but are an example of the plasticity of plant root systems. With limited rooting volume but adequate water and nutrients, it is possible to grow abundant crops.
Nutrient budgets on organic farms

*a review of published data*

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http://www.organic.aber.ac.uk/library/Nutrient%20budgets%20on%20organic%20farms.pdf
Soil nitrate measured in different soil layers in October for four different cropping systems

- **Continuous cash crops**: Total N: 19 kg N/ha
- **Cash crops with manure**: Total N: 113 kg N/ha
- **Cash crop and vegetable rotation**: Total N: 124 kg N/ha
- **Continuous vegetables**: Total N: 765 kg N/ha

The diagram shows nitrate (kg N/ha) across different soil layers (0-15 cm, 15-30 cm, 30-45 cm, 45-60 cm, 60-75 cm, 75-90 cm, 90-105 cm).
Cover crops generally require more management than manure or purchased nutrient amendments.
Feed the soil vs. Feed the crop?
Both strategies are important!

Unhealthy roots use nutrients inefficiently...
but healthy roots need available nutrients!

Plants with poorly developed roots tend to have nutrient deficiency and drought stress symptoms.

Chronic root malfunction

Acute root disease
You won’t know what is happening underground unless you take a look...
All you need is a shop-vac and a hose!

It's just like going to the dentist!
Best single source of info on cover crops is FREE!

### Chart 3A CULTURAL TRAITS

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<thead>
<tr>
<th>Species</th>
<th>Aliases</th>
<th>Type</th>
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Activities and research

Click [here](#) to explore cover crops related research in Minnesota

Click [here](#) to read about how Minnesota farmers using cover crops

Learn about the work of the Minnesota Department of Agriculture [here](#)

State representative
Get ideas from Minnesota farmers by reading about their experience with cover crops

Click on the name to find out about the farmer's practices:

- Learn from [Jim Chamberlin](#) about "Porkaculture" and the "three sisters".
- [Andy Hart](#) and his family raise corn, soybeans, hay, sweet corn, lima beans, peas and have been using cover crops for years. Learn about his methods of farming.
- Read how [Carmen Fernholz](#) uses cover crops on his farm
- Learn about [Norm Erickson](#)'s experiments with cover crops on his hazelnut farm
- Learn about the non-profit organization [Rural Advantage](#)
- [Tony Thompson](#)
Introduction

Many vegetable growers plant a winter cereal cover crop such as rye to prevent soil erosion by wind and water. Cover crops and forage rotation systems help growers build a healthy soil for healthy vegetables and reduce inputs while maintaining profitability. Growers are experimenting with a wide range of cover crop options. Here we discuss both benefits and potential problems with incorporating cover crops in vegetable systems.

down with an herbicide or mowed, and the crop is no-till into the residues.

No-till key benefits

Growing pumpkins on the cover crop mulch reduces the need to wash dirt off pumpkins, and improves weed control. The mulch prevents weeds from germinating, a critical means of control later in the growing season when it is difficult to apply herbicides around sprawling pumpkin vines.
Utilizing Cover Crops in Vegetable Production Systems

Alan Sundermeier
Ohio State University Extension Educator, Wood County

Vegetable growers can improve farm productivity and profitability by using cover crops. Cover crops normally are not intended to be harvested for cash sale; rather, their purpose is to naturally enhance crop and soil output. An intense vegetable cropping system removes large amounts of nutrients from the soil. Long-term fallow periods to naturally restore soil nutrients are not cost effective. Therefore, a crop rotation is needed that can utilize the maximum amount of vegetable production while allowing cover crops to help improve soil quality.

Benefits of Cover Crops

- Reduce weed pressure. Reducing initial weed pressure improves subsequent weed control strategies like herbicide applications and cultivation.
- Create a new source of nutrients in the soil. By planting a legume cover crop, nitrogen can be added to the soil, allowing a reduction in purchased commercial nitrogen for the cash crop.

Types of Cover Crops

There are many options for vegetable growers when selecting the type of cover crop to plant. These options can be separated into two major categories: legume and non-legume. Growers need to determine the primary purpose of the cover crop being planted. Is it to add nutrients, recycle nutrients, improve soil structure, or deter pest problems? Also, cover crop seed can be blended to combine several purposes into one planting. This shotgun approach may solve several problems at the same time. Seed cost and availability...
Haphazard cover cropping
What am I supposed to do now?
“What cover crop should I plant???”
Well… what do you want your cover crops to do for you?
Cover crops are not the missing puzzle piece(s) in your current crop rotation(s)!

CROP ROTATIONS — THE CENTRAL MANAGEMENT TOOL IN ORGANIC FARMING

Crop rotation is a system of growing different types of crops in a recurrent succession and in an advanced manner (Bullock, 1992). The practice of crop rotation dates back to China over 3000 years ago (MacRae and Meheys, 1993). Farmers have recognized the benefits of alternating leguminous crops with cereals more than 2000 years ago (Karlen et al., 1994).

http://www.ncl.ac.uk/tcoa/files/breakcrops_orgagr.pdf
Crop Rotation on Organic Farms
A PLANNING MANUAL

Charles L. Mohler & Sue Ellen Johnson, editors

Rotations should evolve, not revolve.
Overview of book contents

• Problems and opportunities for over 500 crop sequences

• Characteristics of more than 60 crops and 70 weeds

• Crop diseases hosted by over 80 weed species

• Modes of transmission for 250 diseases of 24 crops

• Thirteen sample four- and five-year vegetable and grain crop rotations Managing Crop Rotation Chart with key tasks & steps

• Sample worksheets and calculations

• Step-by-step procedure for determining crop rotation plans
Start planning today!

- Anticipate planting windows
- Match objectives with species
  - Confirm seed availability
- Make sure seeding equipment is ready
- Identify realistic termination methods
  - Allocate labor
- Develop contingency plans
Finding the right temporal niche(s) for cover crops

Adapted from Sarrantonio (1994)

A = cover crop seeded after spring crop harvested, tilled in before fall crop
B = cover crop overseeded into spring crop, tilled in before fall crop
C = Cover crop allowed to grow in strips when fall crop is young
### Indiana: Vermillion County Seeding Dates

**Location Information**
- **State/Province**: Indiana
- **County**: Vermillion

**Cash Crop Information**
- **Crop**: None or Prevented Planting
- **Plant Date**: 
- **Harvest Date**: 

**Field Information**
- **Soil Drainage Class**: Select a drainage class
- **Flooding/Ponding**: No

**Cover Crop Attributes**
- Select an attribute
- **Select cover crop to create information sheet**
  - 50% HV/50% WC Rye

**Nonlegumes**
- Barley, Winter (C)
- Buckwheat (C)
- Millet, Japanese (C)
- Millet, Pearl (C)
- Oats (C)
- Rye, Winter Cereal (C)
- Ryegrass, Annual (C)
- Sorghum-sudangrass (C)
- Sudangrass (C)
- Triticale, Winter (C)
- Wheat, Winter (C)

**Brassicas**
- Radish, Oilseed (C)
- Rapeseed/Canola (E)
- Turnip, Forage type (C)

**Legumes**
- Alfalfa - Non-dormant (E)
- Clover, Berseem (E)
- Clover, Crimson (E)
- Clover, Red (C)
- Cowpea (E)
- Pea, Field/Winter (E)
- Sweetclover (C)
- Vetch, Hairy (C)

**Mixes**
- 50% HV/50% WC Rye (C)
- 50% W.Pea/50% OSR (E)
- 60% ARyegr/40% OSR (E)
- 60% Cr CI/40% ARyegr (E)
- 60% Oats/40% OSR (C)
Opportunities for planting cover crops

- Dormant seeding early or late winter
  - Frost seeding
  - In the spring
- When planting summer crops
  - Prevent plant scenarios
    - At last cultivation
    - After small grains
    - After vegetables
  - After seed corn or silage corn
- Aerial or high clearance seeding into standing crops in late summer/early fall
  - After long season crops
What is this CC?
Phacelia

yes, it grows better in the spring than planted in August because it like cool weather. Phacelia was the most consistent cover crop planted last year on Nov 25, Dec 10 and March 3.

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Steve Groff
"Soil is meant to be covered"
http://www.tillageradish.com/
http://www.cedarmeadowfarm.com/
Spring Mustard

In the Northeast, yellow mustard is used as a spring-planted cover crop before regular season vegetables. It is used particularly for reducing root rot. It also adds organic matter, breaks up hardpan, and suppresses weeds in the following crop.

Land preparation
Firm seedbed free of weeds to ensure a good stand. Available nitrogen levels at 120 lb N/

May require sulfur application at 6:1 N:S. Vegetable land often has sufficient nutrients.

Seeding rate
Drill 10-12 lb/ac with grass seeder.
Broadcast 10-15 lb/ac. Cover 1/2 inch. After seeding, roll the ground to improve seed-to-soil contact but do not break up soil aggregates.
Klaas and Mary Martens, organic innovators in Central NY State, are reporting excellent results with frost-seeded confectionary mustard ahead of dry beans.
Mustard variety trial at the Allison farm in early June 2011

- **Pacific Gold**
  - Slower to mature
  - More biomass

- **Ida Gold**
  - Faster to mature
  - Less biomass
Mustards are very responsive to N
Mustards are easy to kill with tillage
CALIENTE MUSTARD RESEARCH

August planted Caliente mustard in early October

Chopping mustard in October

Chopped mustard

Incorporation with a disk
The biofumigation process.

- **UNBROKEN CELL**
  - MYROSINASE
  - GLUCOSINOLATE

- **MACERATED CELL**
  - MYROSINASE
  - GLUCOSINOLATE
  - D-GLUCOSE
  - ISOTHIOCYANATE (bio fumigant)
  - NITRILE
AC Greenfix is a new annual legume in the United States, developed as a fertilizer alternative to supply green manure Nitrogen for both organic and conventional growers. In only 8-10 weeks of growth an average of 80-100 lbs N/acre can be produced. This plant is drought tolerant, moisture efficient, resistant to many insects and diseases, and suitable for a variety of climates and soil types. It has been found to markedly enhance all major components of soil biological quality and boost soil fertility. AC Greenfix should be of interest to every farmer who wants to increase soil fertility and improve yields and soil conservation.

AC Greenfix is a variety of chickling vetch (Lathyrus sativus L.) also known as a grass pea or grassy peavine, bred at the Semiarid Prairie Agricultural Research Centre in Swift Current, Saskatchewan, Canada, by Dr. V. O. Biederbeck.
AC Greenfix was the top N fixer in a recent study.
Important considerations

Like most legumes, AC Greenfix grows slowly for the first 30-40 days.

Weeds can be controlled by mowing or grazing when AC Greenfix starts to flower or during the first week of flowering. This will make the AC Greenfix tiller out faster and grow faster, resulting in a better stand.

For maximum nitrogen availability to the following crop, the plants should be incorporated before seedpods begin to filling.

DO NOT PLANT AC GREENFIX WHERE SOYBEANS WERE GROWN THE YEAR BEFORE
- AC GREENFIX WILL NOT DO WELL!
Dedicating land for one or two years to replace a vegetable crop with a summer cover is one of the most effective means of rebuilding soils degraded by intensive vegetable production.

Summer cover crops are frequently called smother crops. They can be a timely intervention, markedly reducing problems from annual weeds such as lamb’s-quarters, pigweed and foxtails.

Summer legume cover crops can fix substantial amounts of nitrogen, and legume, cereal and mixed summer cover crops are all effective at recycling soil nitrogen and reducing fertilizer requirements.
Sudangrass and Sorghum-Sudangrass Hybrids

Sudangrass and Sorghum-Sudangrass hybrids are heat and drought tolerant cover crops that can be used to scavenge residual N, suppress weeds, suppress certain diseases and nematodes, and build soil quality. Described below are the practices typically used by growers of these crops in the Columbia Basin. (Unless otherwise noted, sudangrass will refer to both crops.)

**Uses**

- **Scavenge soil nitrogen:** With its extensive root system and high production ability, sudangrass can effectively take up and store soil nitrogen. Some of this nitrogen will then be available to the following crop as the residues decompose.

- **Suppress weeds:** When seeded at high rates, sudangrass makes an effective smother crop. In addition to smothering weeds, the entire sudangrass plant contains chemical compounds that suppress many weeds. Sudangrass roots secrete sorgoleone, a chemical that inhibits weed growth. It is active at extremely low concentrations.

- **Break up compacted soil:** By mowing sudangrass when stalks reach 3–4 feet tall the root mass is increased five to eight times compared with unmowed stalks. This also forces deeper root penetration. Managed in this way, sudangrass is the best cover crop for loosening compacted soils.

- **Suppress diseases and nematodes:** Sudangrass produces the chemical dhurrin, which when incorporated, forms hydrogen cyanide that can suppress populations of root-knot and possibly other types of nematodes. Sudangrass cover crops, when incorporated green, have also been shown to suppress *Verticillium dahliae* in potato fields.

- **Root system, and the residue’s effect on soil-borne diseases and nematodes make sudangrass a good choice for improving soils.**

**Crop Characteristics and Requirements**

Sorghum-Sudangrass hybrids (*Sorghum bicolor*-*Sorghum bicolor* var. *sudanese*) and Sudangrass are fast growing, warm-season annuals.

**Biomass**

8,000–10,000 lbs per acre is possible, usually less with cover crops. Sorghum-Sudangrass hybrids will produce more biomass than sudangrass.

**Soil pH**

6.0–7.0 optimum

**Temperature**

Sudangrass and hybrids respond well to daytime temperatures above 80°F and are very frost sensitive.

**Management**

**Seeding Method and Rate**

For a cover crop, broadcast at 40–50 lbs per acre and then harrow to cover seed, or drill at 35–40 lbs per acre.
Cover crop rotation in permanent beds on a vegetable farm in OH
Grazing

Nutrient scavenging/cycling

Bio-drilling

N-fixation

Bio-activation/fumigation

Weed suppression

**GRAZING = #1 way to make cover crops pay!**

*brassicas, clovers, small grains, a. ryegrass, sorghum-sudan*

*brassicas, small grains, annual ryegrass*

*brassicas, sugarbeet, sunflower, sorghum-sudan sweet clover, alfalfa*

*clovers, vetches, lentil, winter pea, chickling vetch, sun hemp, cowpea, soybean*

*brassicas, sorghum-sudan, sun hemp, sesame*

*brassicas, sorghum-sudan, cereal rye, buckwheat*

Match CC objectives with species

- Cover crops (winter or summer) can provide high-quality forage and increase economic return and farm diversity, but some farmers have been reluctant to take this advantage due to perceived “compaction” caused by animal trampling.

- Grazing of cover crops can compact soil, but not to the detrimental levels often perceived.
Terminating spring planted oats with a soil finisher ~ 3 weeks before planting corn
Are you **equipped** to handle a situation like this?
10’ Howard Rotavator tilling ~ 3” deep with C blades
Complete kill after 1 pass and 2 days of sun
Typical weather in spring 2009-2011 :-<
Moldboard plowing can be the best option
Are you familiar with the fence post principle?

Zone of maximum biological activity and rapid residue decay

Deeper burial does not optimize decay but sends weed seeds into deep dormancy and brings deeply dormant weed seeds to the surface where they germinate slowly.
Performance over Price

- Buy CC seed on value not price

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</table>
The cheapest seed available is frequently VNS – variety not stated

Do you know the difference between “variety name” and “brand name”?

How important is uniform seed size and vigor to you?
How much is good technical support worth to you?
Reduce Risk

- Enroll in programs that pay you to plant CCs
  - Use time tested CC methods
- Use more than one method of planting CCs
  - Plant mixtures/cocktails
  - Grow some crops e.g. small grains, vegetables, corn silage, shorter season hybrids/varieties that are harvested early
    - Irrigate
Traditional cover cropping in the Midwest

The most tried and true cover cropping system in the Midwest region

Frost seeded red clover
Drilling CC after small grain harvest
Effective multi-tasking or cover crop chaos???
<table>
<thead>
<tr>
<th>Species</th>
<th>C:N Ratio (mature growth estimate)</th>
<th>N Fixing Potential (scale of 1-10)</th>
<th>Diversity Rating (scale of 1-10)</th>
<th>Frost Tolerance (scale of 1-10)</th>
<th>Full Rate Ibs per acre</th>
<th>Season</th>
<th>% by weight</th>
<th>% by # seed</th>
<th>% by cost</th>
<th>Seeds/lb</th>
<th>Seeds per acre</th>
<th>Cost per pound</th>
<th>Cost 1K seed</th>
<th>Cost per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legumes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cowpeas</td>
<td>24</td>
<td>4.5</td>
<td>4.5</td>
<td>2.3</td>
<td>30-50</td>
<td>WS-B</td>
<td>72%</td>
<td>34%</td>
<td>78%</td>
<td></td>
<td>41,000</td>
<td>$0.65</td>
<td>$0.159</td>
<td>$6.50</td>
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<tr>
<td>Sunn Hemp</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14-20</td>
<td>WS-B</td>
<td>72%</td>
<td>34%</td>
<td>78%</td>
<td></td>
<td>45,000</td>
<td>$2.25</td>
<td>$0.150</td>
<td>$6.75</td>
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<tr>
<td><strong>Grasses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>70,000</td>
<td>$0.80</td>
<td>$0.011</td>
<td>$1.60</td>
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<tr>
<td>Pearl Millet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10-14</td>
<td>WS-G</td>
<td>11%</td>
<td>56%</td>
<td>9%</td>
<td></td>
<td>140,000</td>
<td>$0.80</td>
<td>$0.011</td>
<td>$1.60</td>
</tr>
<tr>
<td><strong>Brassicas</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other Broadleaves</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8,000</td>
<td>$0.70</td>
<td>$0.088</td>
<td>$2.10</td>
</tr>
<tr>
<td>Sunflower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15-25</td>
<td>WS-B</td>
<td>17%</td>
<td>10%</td>
<td>12%</td>
<td></td>
<td>24,000</td>
<td>$0.70</td>
<td>$0.088</td>
<td>$2.10</td>
</tr>
</tbody>
</table>

Add your own seed and seed cost in the section below. Totals will be reflected in grand totals at top but not in the Green Cover Seed cost total.

**Green Cover SmartMix total:** $16.95

**Inoculant and mixing:** $0.00
Cowpea fixed more N when intercropped w/ Japanese millet

<table>
<thead>
<tr>
<th>Cover crop species</th>
<th>% N from fixation</th>
<th>Total N fixed (lbs/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowpea</td>
<td>39</td>
<td>37</td>
</tr>
<tr>
<td>Cowpea + Japanese millet</td>
<td>72</td>
<td>59</td>
</tr>
<tr>
<td>Cowpea + SorgumSudan</td>
<td>56</td>
<td>26</td>
</tr>
</tbody>
</table>
Beware of hype!

• Cover crops are not a silver bullet solution to any problem
The rock star of cover crops!!!
With lots of space, moisture, fertility and time to grow, individual radishes can get huge!

but a good stand of 1” radishes will probably do more for your soil!
Roots at ~ 40” after 45 days
Learn from cover crop innovators

• Attend field days/host a field day
  • Attend conferences
• Participate in internet forums
Field day at Steve Groff’s farm
Field day at Steve Groff’s farm
I took a bunch of photos at the WIU Organic research farm today.

The first photo shows a 10' wide strip of "Bounty" annual ryegrass that was drilled about 2 weeks ago... I also overseeded ryegrass into the adjacent soybeans so it will interesting to observe the stands after the beans come off.

The next photo shows some forage brassicas (Egyptian cabbage, Hunter and Winfred) that were drilled about 2 weeks ago... you can't really distinguish the different brassicas in this photo. None are growing quite as fast as the Tillage radishes in an adjacent field.

The next photo shows our Buffalo cultivator about to form some ridges.

The last photo shows an ear of our purple and gold popcorn. We've been selling it on campus in 1/2 bags but decide to try some microwave bags this year. 1200 microwave bags will be getting filled this week with the 2008 crop and ~ 4000 more bags will get filled later in the fall with the 2009 crop.

********************************

The weather is looking pretty wild for our Twilight tour on Thursday (10/1) but we'll be out there rain or shine.

here is a link to the press release which includes directions: http://www.wiu.edu/newsrelease.shtml?release_id=7557

We will have another tour in about 2 weeks.
Use precision planting
Huge news in radishes

By TIM WHITE

JUST when you think David Brandt has done about everything there is to do with cover crops, he comes up with something — well, something different. Maybe that’s why Randall Reeder, Ohio State University agronomist, took Bob Stewart, a colleague visiting from the Dryland Institute in Canyon, Texas, to visit Brandt’s farm near Carroll.

“If there is a way to break compaction or add some nitrogen, Dave is going to give it a try,” says Reeder.

“I learned a lot from my visit,” Stewart says. “When farmers speak, scientists should listen.”

Brandt showed the researchers a variety of test plots, including his latest take on cover crops: dicom oilseed radishes.

“I’d messed around planting them with a drill, but really wasn’t satisfied with what I was getting, so we put them in the planter this year,” Brandt says. Using a new White planter with plates specially designed to handle the tiny radish seeds, Brandt planted about 4 or 5 inches apart in 24-inch rows following wheat harvest. The result was huge radishes that are up to 30 inches long.

Brandt says leaving the radishes to rot will produce a compaction-buster that leaves the soil richer with organic matter, as well. “As far as compaction goes, it’s like taking a 3-inch posthole digger and removing about 2½ feet of soil every 4 or 5 inches,” Reeder says. “It should be very helpful.”

Brandt especially likes the trial where he planted the radishes in rows alternating with Austrian winter peas. As legumes, the peas return about 75 units of nitrogen to the soil a year. “That’s about one third of what we use,” he says. With the planter, he is only putting about 1 pound per acre of radishes in the soil. “That’s about $2.25 an acre in seed, compared to about $19 per acre to drill it in with the drill.” The peas add another $10 per acre to his costs.

Brandt plans to be able to use GPS to place the corn right alongside the radish plants. That way it will have a moist organic seed bed with plenty of nitrogen.
Bio-strip till

September 2008
Steve Carruthers’s farm in Ontario, Canada
Radish planted on 30” rows using milo plates in mid-August 2010
**Corn following cover crop experiment in 2011**

<table>
<thead>
<tr>
<th>Cover crop system</th>
<th>Relative corn yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volunteer oats</td>
<td>79%</td>
</tr>
<tr>
<td>Radishes planted on 30”</td>
<td>99%</td>
</tr>
<tr>
<td>Radishes drilled on 7.5”</td>
<td>91%</td>
</tr>
</tbody>
</table>
Keep good records

– Date of planting
– Seeding rates, drill settings…
– Take lots of photos!
Optimize fertility

- Inoculate legumes
- Inoculate non-legumes?
- Fertilize cover crops when residual fertility is low
Hairy Vetch

3,260 lbs of DM/ac

141 lbs of N/ac

133 lbs of K/ac

52 lbs of Ca/ac

18 lbs of P/ac

18 lbs of Mg/ac
Understanding cover crops as nutrient sources

Early kill date = 114 lbs total N
Late kill date = 140 lbs total N

Wagger (1989)

Early kill date = 107 lbs total N
Late kill date = 131 lbs total N

Wagger (1989)
Many vegetable crop residues are comparable to a legume cover crop.

Residues with a low C:N ratio that decompose quickly can release N even though they are not legumes.

http://res2.agr.ca/stjean/publication/bulletin/nitrogen-azote_e.pdf
Learn from research

On-farm research

• Leave check strips - replicate if possible
  • Work with universities/NRCS

Research station trials

• Make suggestions
• Pay attention to results
WIU Allison Organic Research Farm – September 2007
Early May

Warmer and drier than soil with other cover crops and almost no weed growth
Fall weed suppression by cover crops following winter wheat.

Seeding: July 8
Weed biomass: October 21

http://www.covercrops.msu.edu/pdf_files/extension_bulletin_E2907.pdf
Cover crops following snap beans, 1999.

LSD@0.05
Cover - 1020
Weed - 988
Soil compaction decreased by >40%

Ohio State University
Crop root density as affected by previous cover crop

Chen and Weil (2006)
Good advice from Steve Groff…

TREAT YOUR COVER CROPS LIKE YOUR CASH CROPS!