From Soil Problems to Progress: Advanced Cover Crops Systems Planning

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Overview of talk

- Characteristics of cover crops
- Selecting a cover crop program for your soils and farm
- Selecting cover crops for different goals
- Managing cover crops in organic cropping systems.

Cover crops compliment

- Manure
- Compost
- Crop rotation
- Fallow land or resting the soil
- Intercropping

When to use a cover crop

- Reduced root growth
- Low nutrient availability
- Low ability to hold **or** drain water
- Soil is highly erodable
- Excessive pest populations

Designing a Cover Crop System

- **Equipment available**
- **Soil needs**
- **Window of opportunity**
- **Crop history**
- **Crop plans**

Contributions of cover crops

Biomass	→	**Organic matter** **Animal feed (harvested)** **Competition with weeds** **Reduce erosion**
Root penetration into soil	→	**Channels for drainage** **Nutrient recycling**
Nutrient availability	→	**Nitrogen from legumes** **Recycle nutrients**
Flowers	→	**Nectaries for beneficial insects**
Biofumigant	→	**Weeds, soil borne diseases, and nematodes**

Cover crop quality: C/N ratio

Organic Material	C/N ratio	Nitrogen available when?
Crimson clover and Hairy vetch	**10: 1 to 25:1**	Soon: weeks
Young Rye	**14:1**	Soon: weeks
Flowering rye	**30:1**	Moderately soon: months
Corn stalks	**60:1**	Long time (1 or 2 years)
Sawdust	**250:1**	Long, long time (many years)

Value of biomass

- Provides organic matter rich in nitrogen
- Feeds soil microorganisms when incorporated
- Reduces wind and water erosion
- Provides feed for livestock

Role of roots

- Break up clay and heavy soils
- Provide channels for water to drain
- Source & recycle available nutrients at varying depths
- Feed micro-organisms and earthworms
- Reduce nitrate leaching

Can't till your way out of a soil quality problem

- Increase pore space in root zone

- Improve infiltration and drainage

- Tillage induced pores less stable than cover crop enhanced pores!

Goodies from Ground Cover

- Provides weed competition
- Offers a harbor for beneficial insects
- Reduces compaction from rains

Mustard fall cover – reduces soil-borne disease (Pythium and Fusarium)

10g mustard versus no residue

Sugar Beet Cyst Nematode Trap Crop

- SBCN ‘Trap Cover Crop’ Tested in Michigan
  - Oilseed Radish
    - Colonel
    - Adagio
- Trap Crop Management
  - Stand
    - Requires an excellent cover crop stand
  - Cut and incorporate
    - At green pod stage

Planting cover crops

- Direct seeding preceding or following cash crop
- Interplant with cash crop
- Plant after crop plant is established-overseeding
- Use a seed-drill or a broadcaster

Cool season cover crop species

Oats – winter kills

Rye-offers a nice mulch

Oil-seed radish-winter kills

Hairy vetch-it can go to seed!

Warm season cover crop species

Buckwheat-needs only a month

Sudan grass-can graze
then cut or turn

Legume cover crops

Crimson clover-a fast annual

Red Clover- a good tap root to break up soil

Alfalfa-you can harvest it for hay while it fixes N2

Hairy vetch-is easily established

Cover Crop Mixtures

Fitting the Cover Crop IN

- **Fall Planting**
  - Mustards
  - Mixtures (rye + hv)
  - All winter annuals

- **Intercrop with corn/wheat**
  - Red clover
  - Annual rye grass

- **Frost Seeded Cover**
  - -Red Clover
  - -Hairy Vetch

- **Short Window**
  - -Buckwheat (warm)
  - -Brassicas (cool)

Intercropping with cover crops

Cover Crop Incorporation

Blade discs

Flail mower

Crimper for no-till systems

Hairy Vetch - June 4, 2004


Chisel Plowing

Cereal cover crop + & -

Cover	#/acre	Potential Problems	Advantages
Annual rye grass	15-30 broadcast	Can become weedy	Permanent cover reduces erosion or under-sow
Oats	110-140	Winter kills	Good mix with sweet clover
Rye	90-140	Vigorous growth and difficult to incorporate	Establishes well Grows in cold temp.
Wheat	100-150	May winter kill	Good mix with red clover, cash crop?
Sudan grass	40-50	Possible allelopathy, (inhibit germination)	Reduce weeds, possibly pests

Legume cover crop + & -

Cover	#/a	Potential Problems	Advantages
Hairy Vetch	25-35	Root lesion nematode? Weed in cereal	Mix with rye, excel soil builder
Red clover	10-15	Scab in potato?	Excel. frost-seeding
Field Pea	50-90	Root rot in bean? High seed cost	Establishes well
Sweet-clover	15-20	Weedy	Deep rooting, reduce compaction

Inoculate legume seed to maximize N2 fixation

How much N can I get?

- Legumes = about 3.5% N, after flower = 3% N
- Grasses and Brassicas = about 2.5% N, less than 2% after flowering
- About 50% available after incorporated.. Less if a grass or a very cold or dry year.

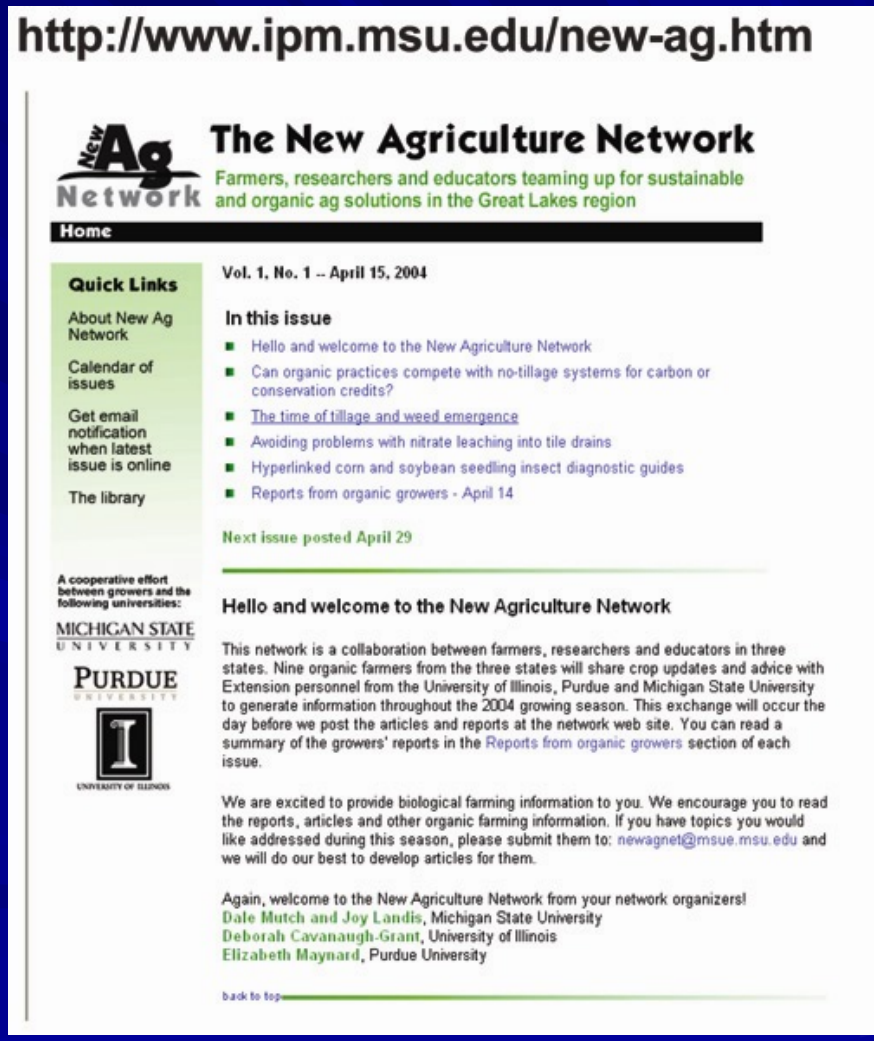
Information Sources at MSU

http://www.safs.msu.edu/soilecology.htm

Alternative cover crops for fall and winter niches

Sieg Snapp
CATwww.ipm.msu.edu/CAT05_fld/FC09-08-05.htm#5

http://www.ipm.msu.edu/new-ag.htm



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The New Agriculture Network

Farmers, researchers and educators teaming up for sustainable and organic ag solutions in the Great Lakes region

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Next issue posted April 29

A cooperative effort between growers and the following universities:

MICHIGAN STATE UNIVERSITY

PURDUE UNIVERSITY

UNIVERSITY OF ILLINOIS

Hello and welcome to the New Agriculture Network

This network is a collaboration between farmers, researchers and educators in three states. Nine organic farmers from the three states will share crop updates and advice with Extension personnel from the University of Illinois, Purdue and Michigan State University to generate information throughout the 2004 growing season. This exchange will occur the day before we post the articles and reports at the network web site. You can read a summary of the growers' reports in the Reports from organic growers section of each issue.

We are excited to provide biological farming information to you. We encourage you to read the reports, articles and other organic farming information. If you have topics you would like addressed during this season, please submit them to: newagnet@msue.msu.edu and we will do our best to develop articles for them.

Again, welcome to the New Agriculture Network from your network organizers!
Dale Mutch and Joy Landis, Michigan State University
Deborah Cavanaugh-Grant, University of Illinois
Elizabeth Maynard, Purdue University

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So any questions???

Thank YOU!