Cover Crops 101: Advice for Growers

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Cover Crop Paradigm Shifted

- Cover crops now “conventional in North America
- Farmers returning to this “old practice” for new reasons – paradigm shift
- Lot of interested but little experience
- Looking to agronomists for information and advice
- Agronomist experience is also a current limitation
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Some of my growers …

A. Have been using cover crops for years
B. Just grew their first cover crops
C. Are asking me information about cover crops
D. Are watching their neighbours that grow cover crops
E. This is not on their radar
Outline

• What are cover crops
• Fundamentals
  – Cover crop windows for Manitoba
  – Species selection
  – Management
• A cover crop example for wet soils
Green Manures
Green Manure
Green Fallow

Ehmke 2016. April CSA News Magazine
Cover Crop
Catch Crop
Winter Cover Crop Capturing Residual Nitrogen to Prevent Leaching

Beltsville, Maryland

*Significantly greater means than smallest mean within a depth increment ($p < 0.1$).

Dean and Weil 2009
Cover crop grazing

Photo courtesy of Blaine Schatz
Using plants to manage soil health
Extending the Green Period

- Goal to have living plants when the soil is otherwise bare
- Capture solar energy and carbon to feed the soil food web
- Transition from fallow shoulder seasons in annual cropping systems
- Intensifying annual cropping systems

Managing wet and saline fields
Cover crop roots elevate soil compaction

Forage radish tap root and “Bio-drilling”

- Roots break up compacted surface soil
- Fine roots penetrate plow pan
- Future crops will follow the root channels created by radish

Chen and Weil 2011

(Williams and Weil, 2004)
Cover crops key for reduced tillage in organic production
Fundamental for Getting Started

• Know your objectives
• Know the window
• Be site specific
  – Crop rotation
  – Tillage system
  – Soil type
  – Growing season
  – Drainage
  – Herbicide carryover
Know Your Objective

Short term

• Keeping the soil covered, prevent erosion
• Soil organic matter
• Fixing nitrogen
• Scavenging leftover nutrients
• Keeping live roots growing
• Food and habitat for soil microorganisms

Goals

• Residue management
• Weed management
• Grazing and forage value
• Enhance wildlife habitat
• Soil compaction
• Soil salinity
• Food source for pollinators

Long term
Know Your Window

• After early grain crops:
  – winter or spring wheat
  – edible beans or peas,
  – barley or oats
  – canola
• After silage, potato, or vegetable harvest
• Wet fields or areas that could not be planted
• Saline areas or areas with crop failure
Seeding

Range of Methods

• Drilled
• Broadcast  
  – Quad  
  – Combine  
  – Sprayer  
  – Shallow incorporation when possible
• Aerial seeding  
• Interseeders  
• Slurry seeding with manure application  
• Frost seeding
Termination Methods

- Frost
- Herbicide
- Tillage
- Grazing
- Mowing
- Roller crimper
Termination timing

- Winterkill vs. overwintering species
- Residue for ground cover
- Water use by cover crop
- Biomass and N-fixation
- C:N ratio
- Weather variability
- Timing of field work (spring vs. fall)

Photo courtesy of Ryan Odenbach
The Art of Species Selection

Ask lots of questions
• Know your objectives
• Know the window
• Be site specific
  – Crop rotation
  – Tillage system
  – Soil type
  – Growing season
  – Drainage
  – Herbicide carryover

Do your homework ….
• Limited research in Manitoba for fall/spring cover crops window
• Talk to farmers with experience
• Read the best resources available
Best cover crop references

• Managing Cover Crops Profitably
  http://www.sare.org/publications/covercrops/covercrops.pdf

• Mid-West Cover Crops Council website
  www.mccc.msu.edu

• Cover Crops Field Guide

• USDA Cover crop chart
  http://www.ars.usda.gov/Services/docs.htm?docid=20323
## Cover Crop Chart

### GROWTH CYCLE
- A = Annual
- B = Biennial
- P = Perennial

### RELATIVE WATER USE
- 🌞 = Low
- ☀️ = Medium
- 🌿 = High

### PLANT ARCHITECTURE
- ⚫ = Upright
- 🌾 = Upright-Spreading
- ⛽️ = Prostrate

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### Cool Season

#### Grass
- Barley
- Oat
- Ryegrass
- Wheat
- Cereal rye
- Triticale
- Annual fescue

#### Broadleaf
- Phacelia
- Flax
- Spinach
- Turnip
- Field pea
- Lentil
- Canola
- Beet
- Lupin
- Vetch

#### Legumes
- Berseem clover
- Red clover
- Birdsfoot trefoil
- White clover
- Sainfoin
- Sweetclover
- Alfalfa
- Mung bean

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### Warm Season

#### Grass
- Pearl millet
- Foxtail millet
- Proso millet
- Buckwheat
- Amaranth

#### Broadleaf
- Kale
- Radish
- Lentil
- Red clover
- Birdsfoot trefoil
- Cowpea
- Cajanus

#### Legumes
- Berseem clover
- Red clover
- Birdsfoot trefoil
- White clover
- Sainfoin
- Sweetclover
- Alfalfa
- Mung bean

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Source: [www.mandan.ars.usda.gov](http://www.mandan.ars.usda.gov)
Critic’s Pick
Cool Season Grasses

• Oats
• Barley
• Winter wheat
• Fall Rye
Warm Season Annual Forage Species

Sorghum  Pearl Millet  Sorghum-sudan
Cool Season Legumes

Field Pea

Faba Bean

Berseem clover
Warm Season Legumes

- Cowpeas
- Adzuki bean
- Soybean
Large-root broadleaf cover crops

Sugar beet

Radish

Pasja

Mangle

Turnip
Best cover crops for saline areas
Choose your cocktail mix

Different plant types
- Cool vs. warm season
- Broadleaf vs. grasses
- Tap root vs. fibrous roots
- Legumes to fix nitrogen vs. deep rooted scavengers
- Sensitive, frost tolerant, overwinters

Mixture you choose should be influenced by
- Time of planting and growing season conditions:
  - early summer / warm season annuals
  - late summer / early fall / cool season annuals
  - late fall / winter annuals
- Seeding equipment and planting method (broadcast, drilled, areal)
- Range of soil conditions (wet spots, salinity, eroded soils)
Plant to Measuring Cover Crop Impact

- shovel test – (visual assessment of soil and plant root structure and color)
- Leave check strips
- yield monitor
- Cover crop biomass
- Aggregate stability test in jar of water
- Standard soil test for SOM, N, P, other nutrients
- Soil health lab tests – new, expensive, how to interpret for Manitoba?
Cover crop Assignment Scenarios

1. Cover crops planted in June in a field that was flooded and too wet to plan at seeding
2. Cover crops planted in August after winter wheat harvest in a grain only cropping system
3. Cover crops planted in late May that will be grazed or cut for swath grazing in September
Cover Crop Assignment Questions

1. Cover crop goal?
2. Conditions at seeding?
3. Termination method
4. Plant characteristics needed
5. Identify cover crop species (1-4?)
6. Monoculture or mixture?
7. Planting
8. Termination
Can cover crops help bring flooded soils back into production?

Objective: Establish and quantify growth of cover crops on soils too wet for spring planting

Cover crops treatments planted across a gradient of well drained to imperfectly drained soils
Methods: Cover Crops for Wet Soils

Treatments:
1. Cover crop mix
2. No cover crop

Cover crop mix
- 20 lb/ac Sorghum
- 4 lb/ac Groundhog Radish

Seeded July 13, 2011 and July 4, 2013

Location: Portage La Prairie, MB
The story above ground:
Cover crop establishment and productivity

Challenging establishment conditions:
• Soil surface crusting and tillage resulted in large clods for a poor seedbed
• Flood and wet conditions followed by extended dry period
• Poor emergence, had to reseed in 2011

Satisfactory end of season biomass and ground cover:
- In 2011: well drained: 2105 kg/ha,
  imperfectly drained: 1417 kg/ha
- In 2013: average cover crop biomass was 6880 kg/ha
The story below ground in:
In the rooting zone

- Soil moisture in cover crop treatments consistently drier in the rooting zone
- Cover crops were helping to dry out the soil after flooding
Near the soil surface in 2011

- soil moisture was consistently drier in no cover crop treatment near the soil surface.
- cover crop canopy shading the soil and reducing surface evaporation to protected soil from excessive surface crusting.
Summary

• New paradigm for cover crops
• Agronomists are being asked for advice about cover crops
• Goals and windows need to be identified
• Research and resources are abundant but they are not local at this time
• On-farm innovation will be key to achieving goals
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