SOIL HEALTH – COVER CROPS – RELAY CROPPING

*Sustainable Agriculture in North Dakota*

Tim Semler – Extension Agent
Farm Business Management

NDSU Extension Service
North Dakota State University
As a crop producer only – Why grow a cover crop (CC)? CC pros:

• Prevented Planting or sizeable wet areas
• Plant growth feeds soil organisms and keeps soils active and “healthy”
• Idled/fallowed soil organisms like Rhizobia and Mycorrhizal will go to “sleep”
• Utilize excessive moisture – allows soil salts to leach deeper into profile
• CC - legumes will “fix” nitrogen
Cover Crop Pros cont’d.

- Tap-rooted CC plants may bring deeper soil nutrients closer to soil surface (P-K-S)
- Tap-rooted CC can break-up clay pans
- Improve soil organic matter content
- Provide high quality late season grazing for cattle and sheep
- What are your goals from a Cover Crop?
Cover Crop Cons

- Certain seed mixes can use up existing fertility – are they a good trade-off?
- Crop Insurance limitations ??
- Differences between PP & Failed Acres
- Prevent Plant – cannot harvest until Nov. 1
- Cover Crop Choice affects residue left in field next spring – No-Till operations
2010 CC Seed Costs?

- Purple Top Turnip - $2.37/#
- Pasja Radish - $3.73/#
- YB Sweetclover - $2.37/#
- Red Clover - $2.37/#
- Grain Millet - $0.32/#
- Hay Millet - $0.56/#
- Field Peas - $0.07/# (bin run)
- Barley - $0.10/#
- Oats - $0.14/#
Cover Crop Considerations

• Reason?
• Cost? Mix your own or Custom Blend?
• Time of year to seed?
• Choice of warm season vs. cool season
• Seeding rate
• Pre-seeding weed control
• Graze or Not?
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Mandan USDA – ARS
Cover Crop Chart
www.mandan.ars.usda.gov
## Cover Crop Chart

### Growth Cycle
- **A** = Annual
- **B** = Biennial
- **P** = Perennial

### Relative Water Use
- \(\odot\) = Low
- \(\odot\) = Medium
- \(\odot\) = High

### Plant Architecture
- \(\odot\) = Upright
- \(\odot\) = Upright-Spreading
- \(\odot\) = Prostrate

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

- **Broadleaf**
  - Turnip
  - Field pea
  - Lentil
  - Kale
  - Radish
  - Canola
  - Beet
  - Lupin
  - White clover
  - Vetch

- **Legumes**
  - Field pea
  - Berseem clover
  - Lentil
  - Red clover
  - Birdsfoot trefoil
  - Lupin
  - White clover
  - Sainfoin

### Warm Season
- **Grass**
  - Pearl millet
  - Foxtail millet
  - Proso millet
  - Buckwheat
  - Amaranth

- **Broadleaf**
  - Medic
  - Chickpea
  - Sunflower
  - Sudan grass
  - Teff

- **Legumes**
  - Chickpea
  - Cowpea
  - Safflower
  - Squash
  - Grain sorghum

### Additional Information

*V 1.0. June 2010*
Do we want to see this next season?
Blending Oats + Turnip + Radish Seed
30# + 1.5# + 1.5# = $13.35/A.
Seeding – Aug. 27th
Oats – Turnips – Radish
Emergence Sept. 7th
Cover Crop Stage – Oct. 1st
Cover Crop Growth – Oct. 1st
Glen Cunningham – Lansford on Prevented Planting

• Seeded August 3rd
• Custom Mix – 25% Oats + 25% Millet + 19% Peas + 16% Barley + 9% Turnips + 6% Radish
• Seed Cost per Acre = $22.65
• Grazed Cows/Calves after Nov. 1
• Herd adapted quickly – no digestive probs.
• Calves actually reduced creep feed cons.
Cunninghams will repeat in 2011
Cunnighams Cont’d.
Cunninghams – Turnip & Radish
Pat Flaherty – Westhope on Prevented Planting

• Seeded July 26th
• Bin Run Conf. Sunflowers + Arvika Peas + Millet + Turnips + Radish
• Herd turned-out after Nov. 1
• Grazed clean by Nov. 17 – roots to the soil
• Will incorporate this system as an annual forage management tool
Pat Flaherty cont’d.
Pat Flahery cont’d.
Pat Flaherty cont’d.
Herd Turnout – Oct. 24th
Growing Period is Over
Radish & Turnips do not like Saline-Flooded Soils
Oct. 24th cont’d.
Oct. 24th cont’d.
Oct. 24th cont’d.
Field Pea Relay Cover Crop: Expanding the Benefits of Peas in Rotation

Blaine G. Schatz
Carrington Research Extension Center
Field Pea Relay Cover Crop System

** A system where field pea seeds that are lost at harvest are encouraged to germinate and re-grow.

** The re-growth becomes a source of organic matter, nitrogen, and other benefits that otherwise would not exist.
The opportunity exists for significant pea development.

Field pea harvest occurs early in season.
  - Late July to mid-August.

Field pea are tolerant to freezing temperatures.

Experience indicates pea growth continues until late October to early November.
Field Pea Relay Cover Crop System

- Pea seeds lost at harvest must be introduced to the soil to achieve proposed benefits.
  - Seed to soil contact required for germination.

- Methods to foster seed to soil contact.
  - Disking (light)
  - Coulter Harrow
  - Roller

- Timing and effectiveness of this operation is important to attain maximum re-growth.
Field Pea Relay Cover Crop
System Management Option: Graze Re-growth

Pea re-growth is a high quality and very palatable forage.
Ex: CREC 2008 - 16 acre pea field
Harvested Aug.10 ~ Disked Aug.20

52 Beef cows grazed re-growth
- Turned in on October 15
- Grazed for 21 days (Nov. 4)
-Est. Intake = 2,800 lbs DM/A
Field Pea Relay Cover Crop System

- Enhances/Increases:
  - Organic matter
  - Soil nitrogen
  - Biological activity
  - Soil cover/stabilization
  - Grazing or Forage options
  - Re-crop response
Pea Relay Cover Crop: Nitrogen Benefit

* Growing conditions in the fall are very favorable for symbiotic nitrogen fixation in field pea.

* Generally cool growing conditions.

* High numbers of rhizobia bacteria, ‘inoculum’, from crop just grown.
Field Pea Relay Cover Crop System
Organic Matter and Nitrogen Yield

2008 replicated samples from CREC commercial field pea fields

- **Field 14B**
  - 3026 lb dry matter / Ac
  - 129 lbs total N at 4.3% N

- **Field 14A**
  - 1582 lbs dry matter / Ac
  - 63 lbs total N at 4.0% N

- **Field 12**
  - 1877 lbs dry matter / Ac
  - 69 lbs total N at 3.7% N
Field Pea Relay Cover Crop System
Organic Matter and Nitrogen Yield – CREC Past Years

- **2007**
  - 3400 lbs dry matter / Ac
  - 136 lbs total N at ~4.0% N

- **2006**
  - 2000 lbs dry matter / Ac
  - 80 lbs total N at ~4.0% N

- **2005**
  - 3020 lbs dry matter / Ac
  - 121 lbs total N at ~4.0% N

- **2004**
  - 2700 lbs dry matter / Ac
  - 108 lbs total N at ~4.0% N
2010 Field Pics – Oct. 7th
QUESTIONS ? – COMMENTS !

- RESOURCES -
  - NDSU Extension Service
  - Blaine Schatz, Dir.–NDSU Carrington Res./Ext. Ctr.
  - USDA – Agricultural Research Service – Mandan
  - Natural Resources Conservation Service