

## Impacts of Cover Crops on Soil Health

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## BENEFITS OF COVER CROPS

- Increase Soil Organic Matter Levels
- Increase Soil Biology Diversity
- Increase Infiltrations/Decrease Erosion & Runoff
- Recycle Nutrients (prevent N leaching)
- Fix Atmospheric Nitrogen
- Reduce/Alleviate Compaction
- Water Management (Salinity)
- Forage Option
- Weed Suppression
- Wildlife Habitat

## Spring Canola, Lentils, & Sweetclover

Seeded July 26, 2005

Picture October 3, 2005



## Cover Crop Production

October 21, 2005

5 Tons/acre



## Plant Available Water Content

10-27-05

Depth	NO Cover		Cover	
	Crop	Inch Water	Crop	Inch Water
0-6	21.0%	0.23	19.5%	0.15
6-12	23.3%	0.32	17.8%	0.05
12-18	23.7%	0.57	18.6%	0.03
18-24	23.5%	0.55	22.2%	0.43
24-30	23.7%	0.67	23.2%	0.62
30-36	23.2%	0.62	24.6%	0.77

TOTAL **2.96** **2.05**

Approximately 7 inches of rain in August, September, & October

## Soil Water Content

4-25-06

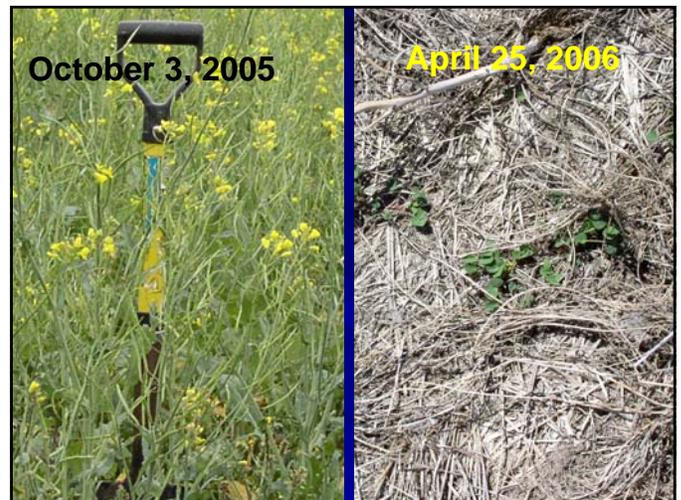
Depth	NO Cover		Cover	
	Crop	Inch Water	Crop	Inch Water
0-6	26.4%	1.77	27.1%	1.71
6-12	26.6%	1.89	29.5%	2.02
12-18	22.9%	1.77	22.3%	1.64
18-24	20.4%	1.53	23.3%	1.70
24-30	22.1%	1.56	23.4%	1.61
30-36	27.3%	2.03	24.5%	1.69

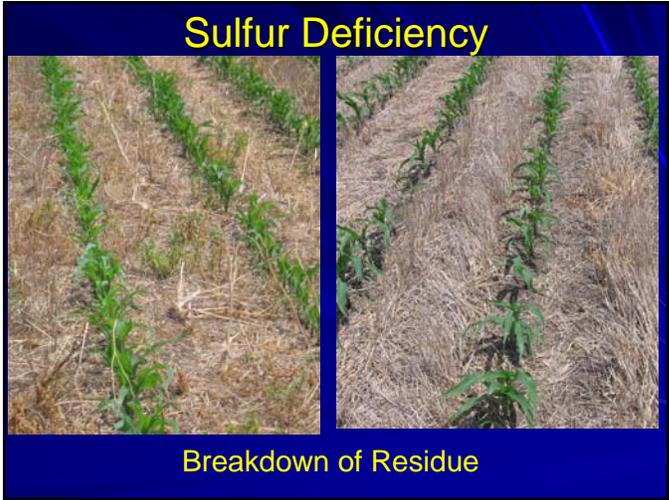
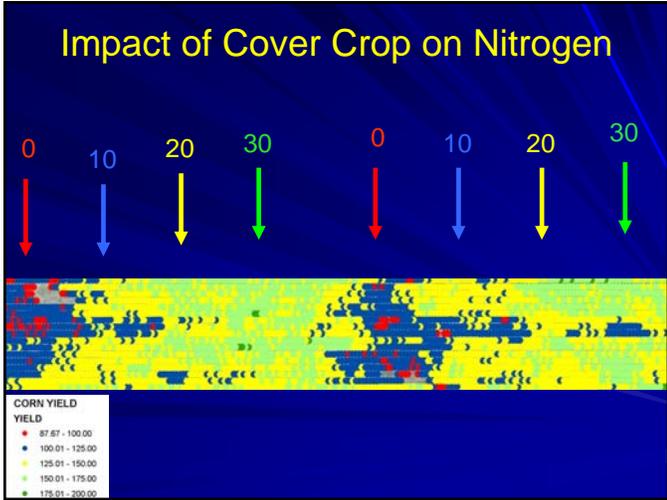
TOTAL **10.55** **10.36**

## Nitrogen Content

4-25-06

Depth	NO Cover	Cover
	Crop	Crop
0-6	8	8
6-12	12	4
12-18	9	2
18-24	8	2
24-30	11	3
30-36	14	2
TOTAL	62	21





### 2007 Soil Test Results for Canola, Radish, & Lentils Cover Crop

	9-6-07	11-18-07
SOM	4.3	4.4
pH	6.1	6.3
N lbs/ac	31	4
S lbs/ac	26	6
	54	60





## Knowledge Gained

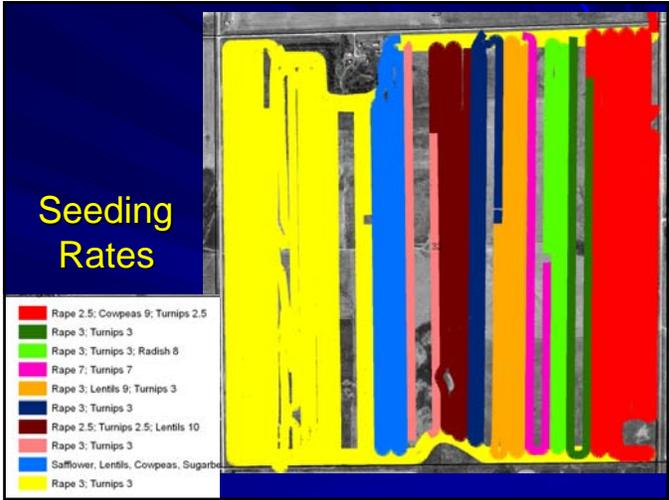
- 1) Soil Quality Improvements  
soil organic matter, aggregate stability,  
**stimulate soil biology**, water infiltration  
rate, decreased compaction
- 2) Produced 5 tons of biomass from free  
water
- 3) Decreased N leaching and Fixed N
- 4) Excellent Wildlife Habitat
- 5) Cover Crops and Soil Sulfur Levels

Cover Crops Seeded from early  
June to late September in 2007

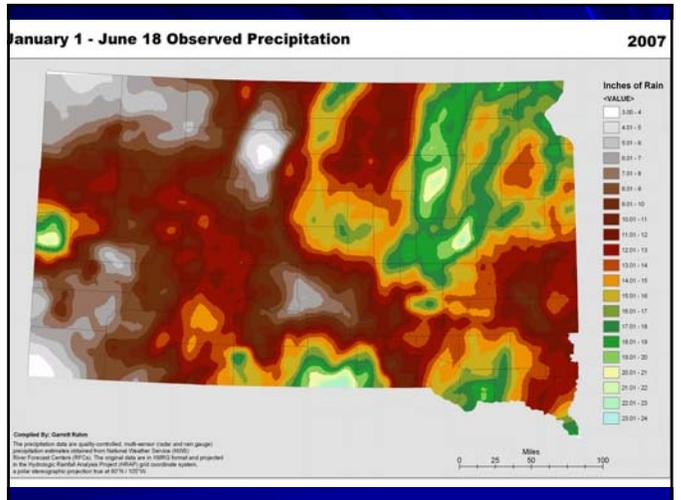


June 5 - 12 Seeding Date











# SD 2007 Prevented Planting Acres

## COUNTY

## ACRES

Brown

145,000

Spink

81,000

Marshall

53,000

Beadle

52,000

**SOUTH DAKOTA**

**638,130**

### Recommended Seeding Rates For Different Cover Crop Mixes

Mix #	Soil Type	Full Seeding Rate	Seeding Rate for Mix	Cost per Lb.	Cost per Ac.	
Mix # 1	upland soils	Winter Canola	5 lbs/Ac	4 lbs/Ac	\$0.30	\$1.20
		Lentils	20 to 30 lbs/Ac	10 lbs/Ac	\$0.30	\$3.00
		Radish (Fodder)	10 lbs/Ac	5 lbs/Ac	\$1.20	\$6.00
<b>Total per acre</b>					<b>\$10.20</b>	
Mix # 2	upland soils	Winter Canola	5 lbs/Ac	4 lbs/Ac	\$0.30	\$1.20
		Lentils	20 to 30 lbs/Ac	10 lbs/Ac	\$0.30	\$3.00
		Purple Top Turnips	4 lbs/Ac	2 lbs/Ac	\$1.35	\$2.70
<b>Total per acre</b>					<b>\$6.90</b>	
Mix # 3	upland soils	Purple Top Turnips	4 lbs/Ac	3 lbs/Ac	\$1.35	\$4.05
		Cowpeas	12 to 15 lbs/Ac	10 lbs/Ac	\$0.60	\$6.00
<b>Total per acre</b>					<b>\$10.05</b>	
Mix # 4	upland soils	Proso Millet	20 to 30 lbs/Ac	15 lbs/Ac	\$0.35	\$5.25
		Cowpeas	12 to 15 lbs/Ac	10 lbs/Ac	\$0.60	\$6.00
<b>Total per acre</b>					<b>\$11.25</b>	
Mix # 5	upland soils and saline soils saline soils less than 25% of acres	Winter Canola	5 lbs/Ac	4 lbs/Ac	\$0.30	\$1.20
		Lentils	20 to 30 lbs/Ac	10 lbs/Ac	\$0.30	\$3.00
		Sugar Beet	3 - 4 lbs/Ac	2 - 4 lbs/Ac *	\$1.70	\$5.10
<b>Total per acre</b>					<b>\$9.30</b>	
Mix # 6	upland soils and saline soils saline soils 25 to 50% of acres	Winter Canola	5 lbs/Ac	4 lbs/Ac	\$0.30	\$1.20
		Sugar Beet	3 - 4 lbs/Ac	2 - 4 lbs/Ac *	\$1.70	\$5.10
<b>Total per acre</b>					<b>\$6.30</b>	
Mix # 7	light to moderate saline soils	Sugar Beet	3 to 4 lbs/Ac	2 - 4 lbs/Ac *	\$1.70	\$5.10
		Barley	50 to 100 lbs/Ac	30 - 40 lbs/Ac **	\$0.10	\$3.50
<b>Total per acre</b>					<b>\$8.60</b>	
Mix # 8	strongly saline soils	Tall Wheatgrass	13 lbs/Ac	10 lbs/Ac	\$2.35	\$23.50
		Barley	50 to 100 lbs/Ac	50 - 60 lbs/Ac **	\$0.10	\$5.00
<b>Total per acre</b>					<b>\$28.50</b>	

\* Dependent on Seed Size  
\*\* Dependent on Percent Germination

NOTE: Keep in mind herbicides used that may be harmful to the seedlings.

GRAZA FODDER  
RADISH



DRAWF ESSEX  
RAPE/CANOLA



INDIANHEAD  
LENTILS



SUGARBEETS



PURPLE TOP  
TURNIPS



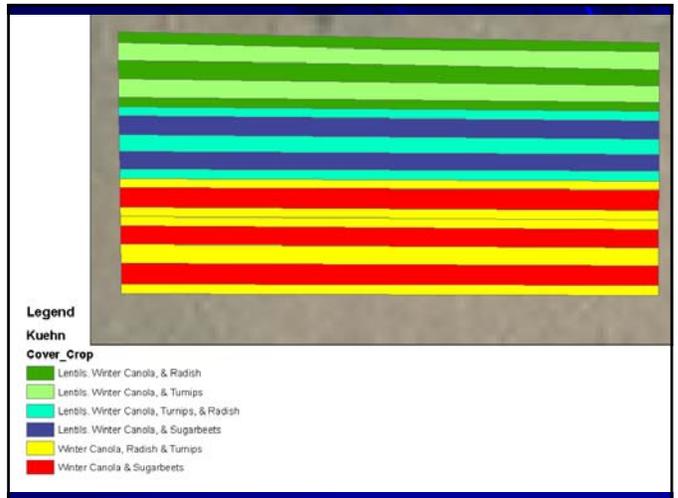
RED RIPPER  
COWPEAS



RED BERRY  
LENTILS



HAIRY VETCH



July 31, 2007



8-07-07



8-07-07 Radish



August 21<sup>st</sup>



August 30<sup>th</sup>



Winter Canola, Radish, & Cowpeas

9-23-07

9-30-07



Winter Canola, Radish, & Lentils



Winter Canola, Radish, & Cowpeas





## Cover Crop Experiment



## Saline Soil Analyses

Sample	EC mmhos/cm	8-02-07			
		pH	Ca	Mg	Na
			-----ppm-----		
1	1.5	7.7	2575	1121	308
2	5.6	7.7	3271	2770	2763
3	5.5	7.7	3832	3223	1642
4	5.3	8.2	6822	1846	1277



8-07-07



8-21-07 Barley & Sugarbeets



8-21-07 W Canola & Sugarbeets



8-30-07 Barley & Sugarbeets



Strawberry Clover



Strawberry Clover

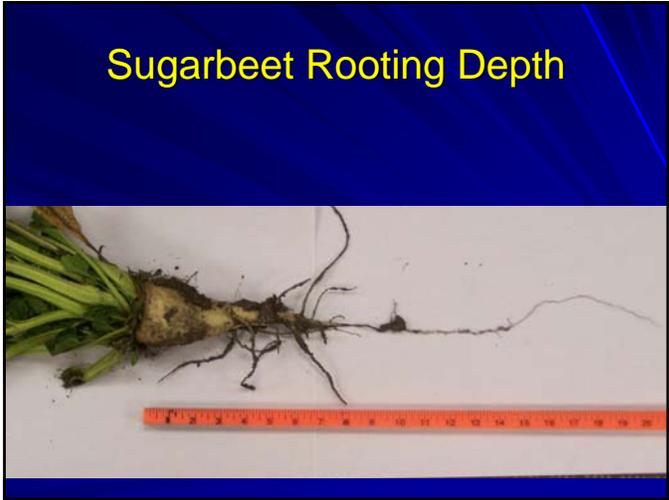


Tall Wheatgrass



9-7-07 Barley & Sugarbeets





### Saline Soil Analyses 8-02-07 & 11-13-07

Sample	EC	pH	Ca	Mg	Na
	mmhos/cm		-----ppm-----		
1	1.5	7.7	2575	1121	308
	1.6	7.7	2828	991	258
2	5.6	7.7	3271	2770	2763
	5.1	8.0	4000	1962	1893
3	5.5	7.7	3832	3223	1642
	4.0	7.8	4257	1976	760
4	5.3	8.2	6822	1846	1277
	3.6	8.2	9845	1512	1043



## Impact of CRP on Saline Soils

Depth	2001	2003
	EC	EC
0-3	9.8	1.3
3-6	---	3.2
6-12	---	5.0

Groton



Groton Area



Groton Area



## Groton Area



## Salinity and Cover Crops



## Winter Canola & Sugarbeets

Seeded  
8-15-07

Picture  
9-11-07



## Winter Canola & Sugarbeets

Seeded  
8-15-07

Picture  
10-29-07



## Saline Soil Nutrient Analyses

Sample	EC mmhos/cm	pH	N lbs/ac	P -----ppm-----	K
1	2.8	7.8	128	23	451
2	2.4	8.0	158	31	423
3	3.7	8.1	164	27	559
4	2.7	7.8	395	34	559
5	4.3	8.0	504	25	464
6	3.8	8.0	612	13	570

## Seeded September 21st



10-21-07



10-21-07



## Thoughts on Cover Crops

Prevented Plant Acres

Saline Acres

Additional Forage Production

Increase Soil Organic Matter

Soil Biology/Fix Nitrogen

Water Management

no-till corn into wheat stubble  
increase infiltration and permeability

## What Cover Crop Should I Select ?

- 1) What is the objective of the cover crop?
- 2) Where is the best time and place for the cover crop in the rotation?
- 3) Test different options
- 4) Wonder cover crop more than likely doesn't exist
- 5) Mixtures or "cocktails" may be required to meet your objectives
- 6) The cover crop should be an opposite type of the "cash crop" to be planted the following year.

## Ask Yourself These Questions

- How will I seed the cover crop?
- What were the previous crop herbicides?
- What will soil temperature and moisture conditions be like?
- How vigorous will other crops (or pests) be?
- What weather extremes and field traffic must it tolerate?
- Will it winterkill in my area?
- Should it winterkill, to meet my goals?
- What kind of regrowth can I expect?

## What to Look For in A Cover Crop

- Fast germination and emergence
- Competitiveness
- Tolerance to adverse climatic & soil conditions
- Ease of suppression or kill
- Fertility benefits
- Low-cost establishment

## Summary Objective Wheat going to Corn Potential Cover Crop Species

<b>N – Fixation</b>	Lentil, clovers, vetches, cowpea, soybean, field pea, chickling vetch
<b>Residue Cycling</b>	Brassicas: radish, turnips, rape, canola
<b>Nutrient Cycling</b>	Small grains, brassicas, sugarbeet, sunflower
<b>Forage Production/ Grazing</b>	Brassicas and Lentils
<b>Salinity</b>	Barley, sugarbeet, rape, canola

Cover Crop	Barley	Canola	Chickling vetch	Cowpea	Field pea	Lentil	Radish	Rape	Sugarbeet	Sunflower	Turnip	Vetch	Wheat	Winter wheat
Barley	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Canola	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Chickling vetch	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Cowpea	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Field pea	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Lentil	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Radish	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Rape	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Sugarbeet	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Sunflower	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Turnip	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Vetch	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Wheat	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Winter wheat	G	G	G	G	G	G	G	G	G	G	G	G	G	G

Any Questions?

