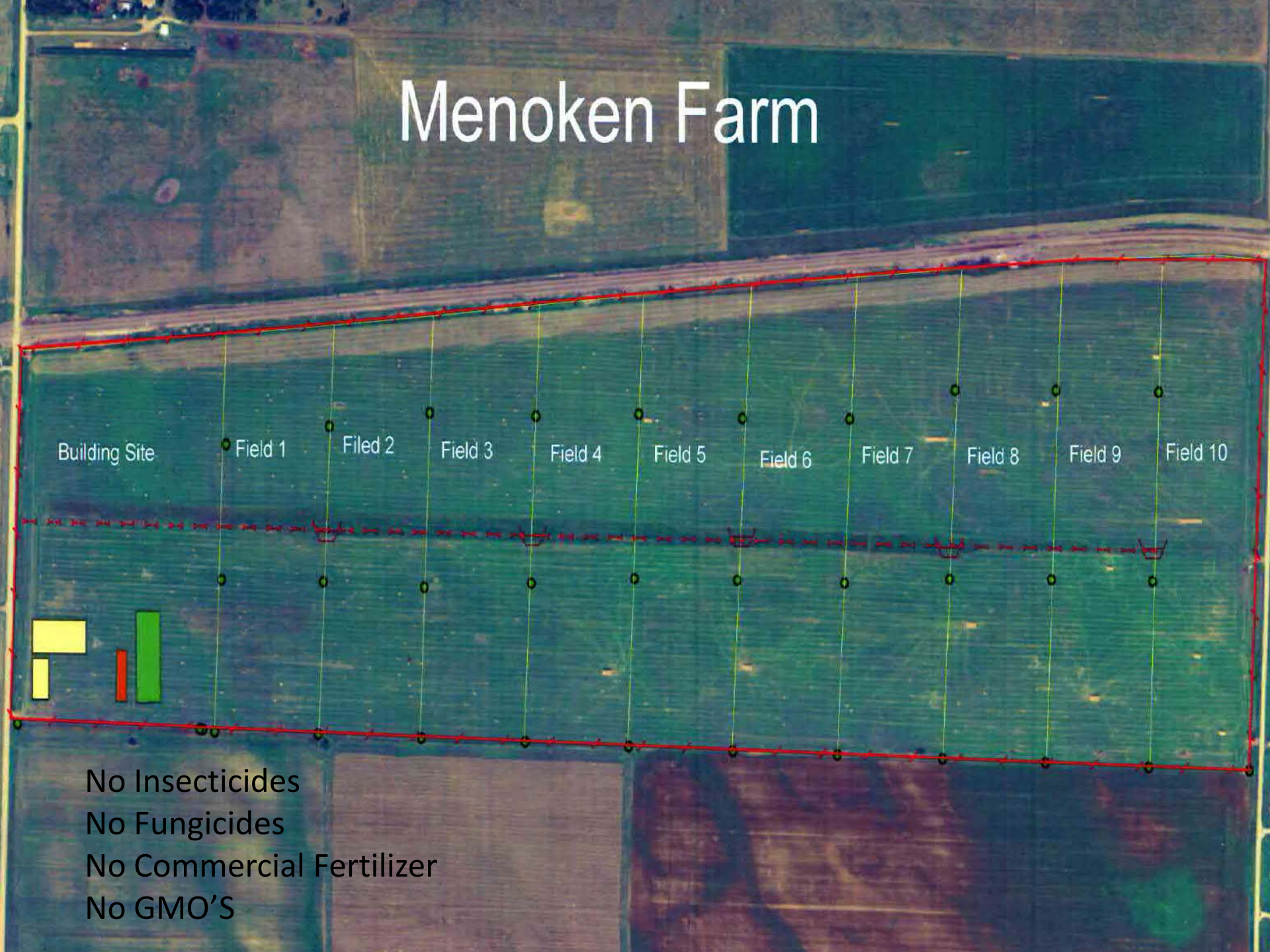
The Menoken Farm

By

Jay Fuhrer
NRCS
Burleigh County


Goal: SOIL HEALTH
Tools: No-till Cropping Systems, Grazing Systems,
Cover Crops, Livestock, Compost…….
The Soil Health concepts are universal,
but your road is unique!!


Menoken Farm
Building Site
Field 1
Filed 2
Field 3
Field 4
Field 5
Field 6
Field 7
Field 8
Field 9
Field 10
No Insecticides
No Fungicides
No Commercial Fertilizer
No GMO'S

Resource Concerns

- Armor
- Diversity
- Soil Aggregates
- Infiltration
- IPM
- SOM
- Nutrient Cycling
- Pollinators

Foodweb Analysis
Soil

Menoken Farm
Year 1 - 2009

Report prepared for:
NRCS North Dakota
Hal Weiser
218 2nd Ave SW
Jamestown, ND 58402 USA

hal.weiser@nd.usda.gov

Report Sent: 5/28/2009
Sample#: 01-107264 | Submission:01-019543
Unique ID: 3
Plant: peas
Invoice Number: 3873
Sample Received: 5/19/2009

For interpretation of this report please contact:
Soil Foodweb Oregon
info@oregonfoodweb.com
(541) 752-5066

Consulting fees may apply

Organism Biomass Data	Dry Weight	Active Bacteria (µg/g)	Total Bacteria (µg/g)	Active Fungi (µg/g)	Total Fungi (µg/g)	Hyphal Diameter (µm)
Results	**0.860**	30.1	1458	14.0	329	2.9
Comments	Above Range	Above range	Above range	In range	Above range	
Expected Range Low	0.45	15	100	10	50	
Expected Range High	0.85	25	300	20	175	

	Protozoa (Numbers/g)			Total	Mycorrhizal Colonization (%)	
	Flagellates	Amoebae	Ciliates	Nematodes #/g	ENDO	ECTO
Results	**1607**	6674	**37**	**7.99**	Not Ordered	Not Ordered
Comments	Low	High	Low	Low		
Expected Range Low	5000	5000	50	20	40%	40%
Expected Range High			100	30	80%	80%

Organism Biomass Ratios	Total Fungi to Tot.Bacteria	Active to Total Fungi	Active to Total Bacteria	Active Fungi to Act.Bacteria	Plant Available N Supply (lbs/ac)	Actino Bacteria (µg/g)
Results	**0.23**	**0.04**	**0.02**	**0.46**	25-50	3.83
Comments	Low	Low	Low	Low		
Expected Range Low	0.5	0.25	0.25	0.75		
Expected Range High	0.75	0.95	0.95	1.5		

Nematode detail (# per gram or # per mL)
Classified by type and identified to genus.
(If section is blank, no nematodes identified.)

Bacterial Feeders		
Acrobeles		0.86
Acrobeloides		0.34
Cephalobus		1.89
Heterocephalobus		0.17
Metateratocephalus		0.17
Plectus		0.34
Rhabditidae		0.17
Fungal Feeders		
Thonus		0.34
Fungal/Root Feeders		
Aphelenchoides	Foliar nematode	0.17
Aphelenchus		1.38
Ditylenchus	Stem & Bulb nematode	0.69
Filenchus		0.34

Soil Foodweb Analysis

Report prepared for:
Burleigh Co. Soil Conservation
Vicki Bailey
1511 E. Interstate Avenue
Bismarck, ND 58503-0560 US
(701) 250-4363
vicki.bailey@nd.nacdnet.net

Report Sent: 07/29/2005
Sample#: 01-100984
Unique ID: GB1
Plant: Corn
Invoice Number: 8357
Sample Received: 07/14/2005

For interpretation of this report please contact:
Local Advisor: or regional lab
Soil Foodweb, Inc
info@soilfoodweb.com
(541) 752-5066
Consulting fees may apply

Organism Biomass Data	Dry Weight	Active Bacterial (µg/g)	Total Bacterial (µg/g)	Active Fungal (µg/g)	Total Fungal (µg/g)	Hyphal Diameter (µm)
Results	**0.850**	46.3	405	**5.24**	274	2.5
Comments	To Wet	Excellent	Excellent	Low	Good	
Expected Range Low	0.45	15	100	15	100	
Expected Range High	0.85	25	300	25	300	

	Protozoa Numbers/g			Total Nematodes #/g	Percent Mycorrhizal Colonization	
	Flagellates	Amoebae	Ciliates		ENDO	ECTO
Results	178500	**9736**	331	**4.45**	**31%**	**0%**
Comments	High	Low	High	Low	Low	Low
Expected Range Low	10000	10000	50	20	40%	40%
Expected Range High			100	30	80%	80%

Organism Biomass Ratios	Total Fungal to Total Bacterial	Active to Total Fungal	Active to Total Bacterial	Active Fungal to Active Bacterial	Plant Available N Supply
Results	**0.68**	**0.02**	**0.11**	**0.11**	200+
Comments	Low	Low	Low	Low	
Expected Range Low	0.8	0.25	0.25	0.75	
Expected Range High	1.5	0.95	0.95	1.5	

Nematodes per Gram of Soil
Identification to genus

Bacterial Feeders		
Acrobeles		0.81
Acrobeloides		0.18
Cephalobus		0.45
Cervidellus		0.18
Rhabditidae		0.45
Fungal Feeders		
Eudorylaimus		0.09
Fungal/Root Feeders		
Aphelenchoides	Foliar nematode	0.54
Aphelenchus		0.45
Ditylenchus	Stem & Bulb nematode	0.54
Filenchus		0.09

Soil Food Web

- Disease Suppression – applied as a foliar.
- Nutrient Enhancement – protozoa & nematodes consuming bacteria & fungi (who eats who).
- Soil Structure Improvement – micro paths and macro paths.
- Weed Suppression – F:B = 1:1
- Preventing leaching and erosion – bacteria & fungi hold nutrients and soil particles

Cover Crops and Compost

Designing for what you don't have!

- Cover Crops can be designed to achieve specific C/N Ratios, legume & nonlegume, taproot & fibrous root and more…
- Compost can be designed to be bacterial or fungal dominate and more…

Fungal Starting Material

- **Planned** 25% High Nitrogen Manure, Alfalfa, Bean, Pea
- **Planned** 30% Green Grass Clipping, Silage
- **Planned** 45% Woody Wood Chips, News Paper
- Water

- **Actual Nitrogen**: 15 Alfalfa Bales, 30 Ton Manure, 7 Bales Pea,
  400 lbs BC Carp
- **Actual Green**: 20 Grass Bales, 30 Tons Corn Silage.
- **Actual Woody**: 56 Wheat Straw Bales, 21 Ton Wood Chips. 8 Ton Wood Shavings.
- Water

Desired C/N Ratio is 20:1 to 30:1

The Nature and Property of Soils - Brady and Weil

"The more diversity in the recipe, the greater the biological diversity in the compost"

Starting The Compost Windrows
Straw Was Used As The Base

Adding Layers

Adding Water

First Turn


REOTEMP
°C
°F
REOTEMP INST. CORP.
SAN DIEGO, CALIF. U.S.A.
Do Not Exceed 160 Degrees F

July 31, 2010

July 31, 2010

The Sieve Bag is Filled ¾ Full of Compost

How To Apply…As An Extraction To The Soil Surface Or As A Foliar To The Plant.

The Compost Tea Cooks for 24 Hours

Food Amendments for the Live Biology

GREATER EARTH ORGANICS, LLC

GEOTEA Complete

Compost Tea Microbial Food Packet

NOT FOR HUMAN CONSUMPTION!!

A balanced and diverse food resource to encourage the proliferation of naturally occurring microbes present in high quality compost, with an emphasis on fungal development.

Directions;

Slowly add the entire contents of this container to one 250 gallon batch of compost tea at the beginning of the brew cycle.

Add 1 - 5 oz. vegetable or fish oil to control foaming.

Ingredients;

Grain flours, vegetable powder, malted grains, whey, powdered seed shell, soluble kelp powder, humates, yucca.

Net weight 6 lbs. (2.72 kg)

N2210 Brothertown Beach, Chilton, WI 53014 920-849-3939

GREATEREARTHORGANICS.COM

Tea Food

Bacteria Food

- Molasses, nonsulfured
- Cane Syrup
- Maple Syrup
- Fruit Juices
- Fish Emulsion

Fungal Food

- Kelp
- Humic Acid
- Fulvic Acid
- Phosphate Rock Dust
- Yucca

Viewing the Quality and Quanity of Soil Biology before Applying

Transfer Pump Moves the Tea from the Extractor to the Sprayer

Two Applications of Compost Tea to the Right Side of the Field.

Menoken Farm - BCSCD 2009

Tea Application Stages

- Seed
- 1st True Leaf
- Flower Bud
- Post-Seed-Set

Healthy Soil Foodwebs by Elaine Ingham

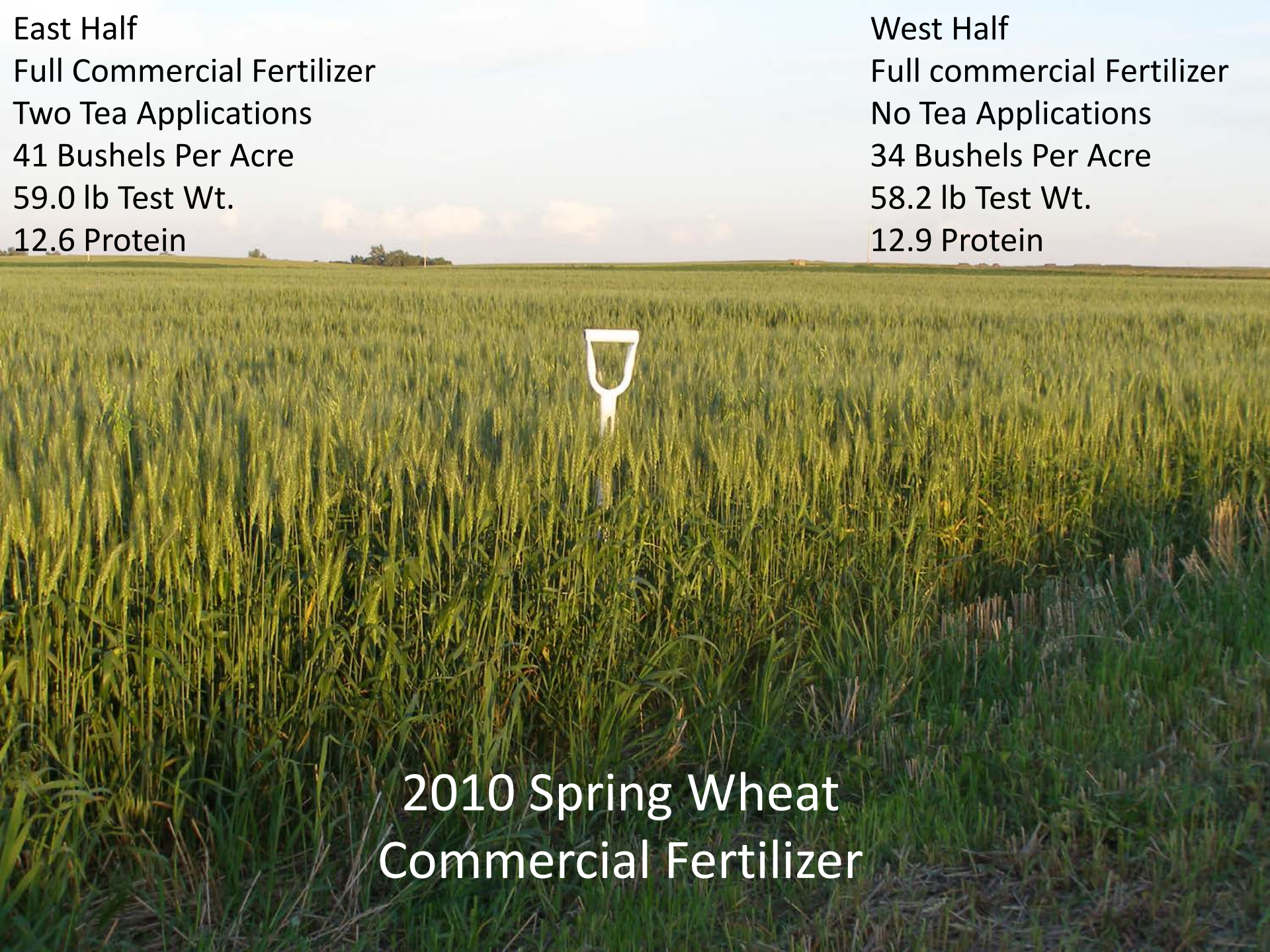
Tissue Analysis 7/14/09

No Tea

- Nitrogen 3.7
- Phosphorus 0.24
- Potassium 2.2
- Sulfur 0.25
- Calcium 0.25
- Magnesium 0.21
- Sodium 0.01
- Zinc 19
- Iron 76
- Manganese 57

Two Tea Applications

- Nitrogen 4.2
- Phosphorus 0.25
- Potassium 2.1
- Sulfur 0.30
- Calcium 0.41
- Magnesium 0.30
- Sodium 0.01
- Zinc 22
- Iron 150
- Manganese 79

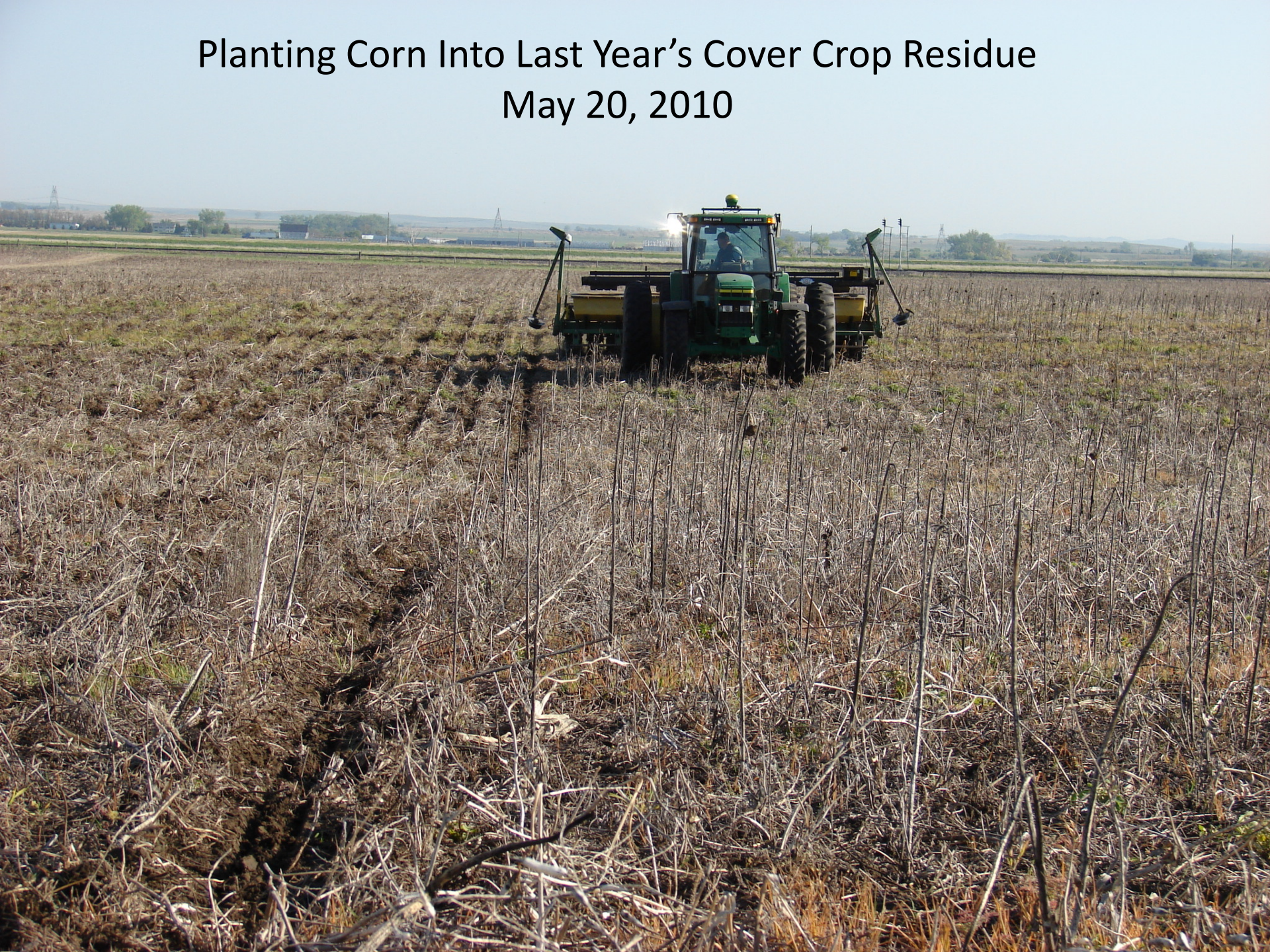

East Half
Full Commercial Fertilizer
Two Tea Applications
41 Bushels Per Acre
59.0 lb Test Wt.
12.6 Protein
West Half
Full commercial Fertilizer
No Tea Applications
34 Bushels Per Acre
58.2 lb Test Wt.
12.9 Protein
2010 Spring Wheat
Commercial Fertilizer

2010 Canola

East Half
No Commercial Fertilizer
No Milk
664 lbs Per Acre

West Half
No Commercial Fertilizer
One Milk Application – 18 Gallons /Ac
Plus 18 Gallons/Ac Water
Applied on June 23rd
744 Lbs Per Acre

Planting Corn Into Last Year's Cover Crop Residue
May 20, 2010



Spreading Compost on Corn
One Leaf Stage


Menoken Farm – July 30, 2010
1-2 Tons of Compost & 2 Tea Applications
NO Commercial Fertilizer

Grower:
BCSCD
916 E INTERSTATE AVE

BISMARCK ND
58502

Submitter:
ALLIANCE AG-BISMARCK
1505 YEGEN ROAD SOUTH
BOX 996
BISMARCK ND
58504

1-2 Tons Compost

2 Tea Aps

No Com Fertilizer

Nutrient	Test Level	Rating	Sufficient Range
Total N	3.3 %	S	3.0 To 3.4
P	0.28%	S	0.25 To 0.50
K	2.0 %	S	2.0 To 2.4
S	0.19%	S	0.16 To 0.50
Ca	0.18%	L	0.30 To 0.60
Mg	0.21%	S	0.16 To 0.40
Na	0.01%	S	0.00 To 0.10
Zn	27 ppm	S	20 To 75
Fe	112 ppm	S	50 To 250
Mn	49 ppm	S	18 To 150
Cu	10 ppm	S	5 To 15
B	12 ppm	S	5 To 25

D.R.I.S. FOR CORN:

N	P	K	S	CA	MG	ZN	FE	MN	CU	B
10	-6	8	-8	-39	3	3		5	6	18

Ratings for: CORN 12 in TO TASSLING
VL=Very Low, L=Low, S=Sufficient, H=High, VH=Very High

From: AGVISE LABORATORIES
BOX 510
NORTHWOOD, ND 58267

Date Received: 07-07-10
Date Reported: 07-08-10
Date Sampled: 07-06-10

ower:
BCSCD
916 E INTERSTATE AVE

BISMARCK ND
58502

Submitter:
ALLIANCE AG-BISMARCK
1505 YEGEN ROAD SOUTH
BOX 996
BISMARCK ND
58504

No Compost

No Tea

No Com Fertilizer

trient	Test Level	Rating	Sufficient Range
tal N	3.0 %	S	3.0 To 3.4
	0.30%	S	0.25 To 0.50
	2.1 %	S	2.0 To 2.4
	0.20%	S	0.16 To 0.50
	0.21%	L	0.30 To 0.60
	0.23%	S	0.16 To 0.40
	0.01%	S	0.00 To 0.10
	28 ppm	S	20 To 75
	107 ppm	S	50 To 250
	54 ppm	S	18 To 150
	10 ppm	S	5 To 15
	12 ppm	S	5 To 25

R.I.S. FOR CORN:

N	P	K	S	CA	MG	ZN	FE	MN	CU	B
4	-5	8	-8	-31	4	3		6	4	16

tings for: CORN 12 in TO TASSLING
VL=Very Low, L=Low, S=Sufficient, H=High, VH=Very High

West Side
No Commercial Fertilizer
No Compost
No Compost Tea
122.3 Bushels per Acre

East Side
No Commercial Fertilizer
1-2 Ton of Compost
2 Compost Tea Applications
128.8 Bushels per Acre

The Menoken Farm

Power of Crop Diversity

Both Sides were Planted into Last Year's Cover Crop Residue

2006 – 2010 Burleigh County FSA Committee Reasonable Yield Established by Year = 100 Bushels per Acre


Sunflower-WSB 1 lb
Soybean-WSB 15 lbs
Cowpea-WSB 10 lbs
Turnip-CSB 1 lb
Radish-CSB 2 lbs
Proso Millet-WSG 3 lbs
Pearl Millet-WSG 3 lbs
Corn-WSG 1 lb
Squash-WSB 1 lb
Canola-CSB 1 lb
It's About Balance


3 Sisters
Corn 12 lbs
Pinto Bean 30 lbs
Butternut Squash 2 lbs

Menoken Farm 2010

Warm Season Cover Crop
11 Species
Seeded June 7, 2010

Soybean 15 lbs
Cowpea 10 lbs
Pearl Millet 4 lbs
Proso Millet 4 lbs
Sunn Hemp 5 lbs
Radish 2 lbs
Turnip 1 lb
Sunflower 2 lbs
Sweet Clover 1 lb
Canola 0.5 lbs
Plains Coreopsis 0.1 lbs

Menoken Farm 2010

Cool Season Cover Crop
14 Species
Seeded May 12, 2010

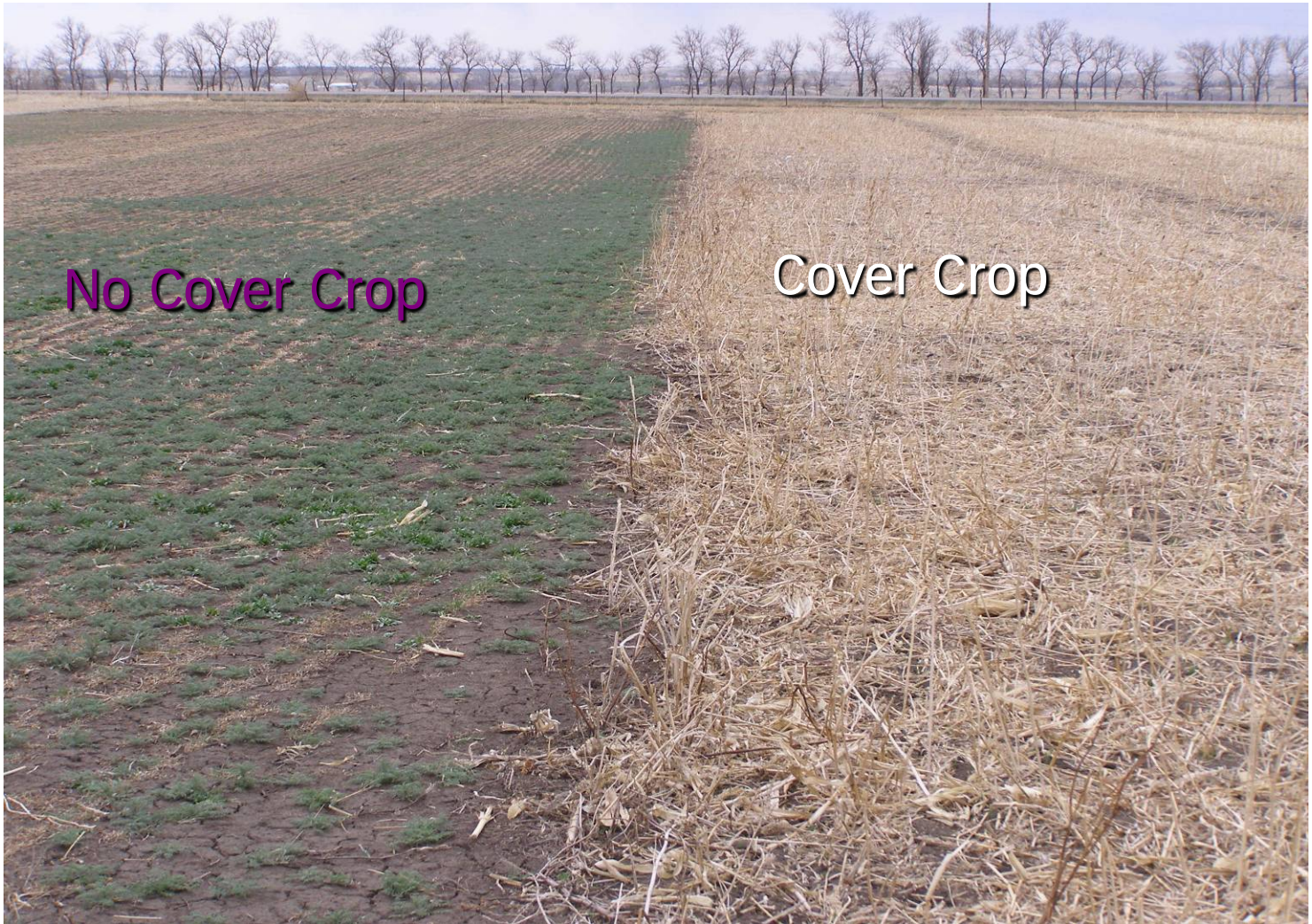
Wheat 28 lbs
Oat 7 lbs
Forage Pea 30 lbs
Lentil 5 lbs
AC Greenfix 4 lbs
Turnip 1 lb
Radish 2 lbs
Sunflower 2 lbs
Italian Rye Grass 5 lbs
Hairy Vetch 5 lbs
Sweet Clover 1 lb
Phacelia 2 lbs
Canola 1 lb
Flax 1 lb
Total lbs/ac = 95


Phacelia and Native Pollinator


Pollinators

Nutrient Cycling

Spring Weed Suppression
IPM BCSCD Site



Soil Profile
Breaking Horizontal

- Infiltration
- Compaction
- Surface Saturation

Sweep layer

Plow layer

Root breaking compaction layer

Ready To Integrate The Livestock


Mob Grazing Sheep
90 Dry Ewes
Approximately 1/4 Acre Per Day


Electric Ribbon &
Step-In Posts


90 Ewes X 165 Lbs Each = 14850 Total Lbs
Divided by 0.25 Acres = 59,400 Lbs /Ac

Returning Approximately 60% Of The Forage To The Soil Surface


Clipping Data
10,421 Lbs Per Acre

NIRS Results

Grazingland Animal Nutrition Lab
Texas AgriLife Research

Prepared For:
BCSCD
Ken Miller
916 E Interstate AVE
Bismarck, ND

Sample #:	A0093
Profile(s):	Dry Ewes
Pasture Name:	Menoken Farm
Date Collected:	Thurs, 07 Jul 2011
Date Received:	Tues, 12 Jul 2011
% Crude Protein:	14.79
% Digestible Organic Matter:	67.90
% Fecal Nitrogen:	2.19
% Fecal Phosphorus:	0.77

Adding Live Biology

- Compost
- Compost Tea
- Milk
- Mob Grazing
- Crop Diversity

Where Can We Go In The Great Plains Agricultural System?

- Supplying the soil biology with food and a home.
- Using Cropping Systems, Grazing Systems, Cover Crops, and livestock.
- Remember:
  - Minimize soil disturbance
  - Provide armor
  - Continual living roots
  - Diversity, diversity, diversity!

Self Education

- The Nature and Properties of Soils – 14th Edition : by Brady and Weil
- Buffalo Bird Women's Garden : by Gilbert Wilson
- Agroecology: by Gliessman
- The One Straw Revolution: by Masanobu Fukuoka
- Managing Cover Crops Profitably 3rd Edition
- Guns, Germs, and Steel: by Jared Diamond
- Soil Biology Primer: by Elaine Ingham

www.bcscd.com

www.dakotalakes.com

www.sustainableranching.com

www.mandakzerotill.org

www.cedarmeadowfarm.com

Soil Health-Food Health-People Health Discussion

Soil Health Tour
September 15, 2011

Winter Grazing Tour
December 1, 2011

Soil Health Workshop
January 18, 2012

Burleigh County Soil Conservation District
Upcoming Events