LONG-TERM CROPPING SYSTEMS WITH COVER CROP & GRAZING ON-FARM RESEARCH

Jenny Rees, Ken Herz, Mary Drewnoski

jrees2@unl.edu

BACKGROUND

- Dryland area with 50% cropland and 50% rangeland
- Operation consists of myself and sons Aaron and Zach with individual operations but working co-operatively
- Operation consists of crops, cow/calf, and beef finishing in bedded barn
- Systems approach is used in operation
- Focus on developing a sustainable system using cover crops
    - -that enhance the environment/soils
    - -that is profitable
- Approached Jenny Rees, Extension Educator, about On Farm Research

EXTENSION

Intent of research

1. System approach to integrating livestock into a dryland cropping rotation

2. Study effects of growing and grazing cover crop on system profitability

3. Study effects on soil health in integrated livestock/cropping system

Effects of Grazing Cover Crops in a Three-year Non-irrigated Rotation

- This is a three-year, non-irrigated, no-till crop rotation:
  - Wheat
  - Corn
  - Soybean

  with cover crops planted in the cover crop treatments following the wheat crop only.
- Grazing of cover crops and corn residue in the 'Grazed Cover Crop' treatment only
- WATERMARK™ soil moisture sensors were installed to determine treatment impacts for each growing season.

Nuckolls and Webster Counties

Non-irrigated

3 Treatments:

Wheat Stubble

Grazed Cover Crop

Ungrazed Cover Crop

Data Collected:

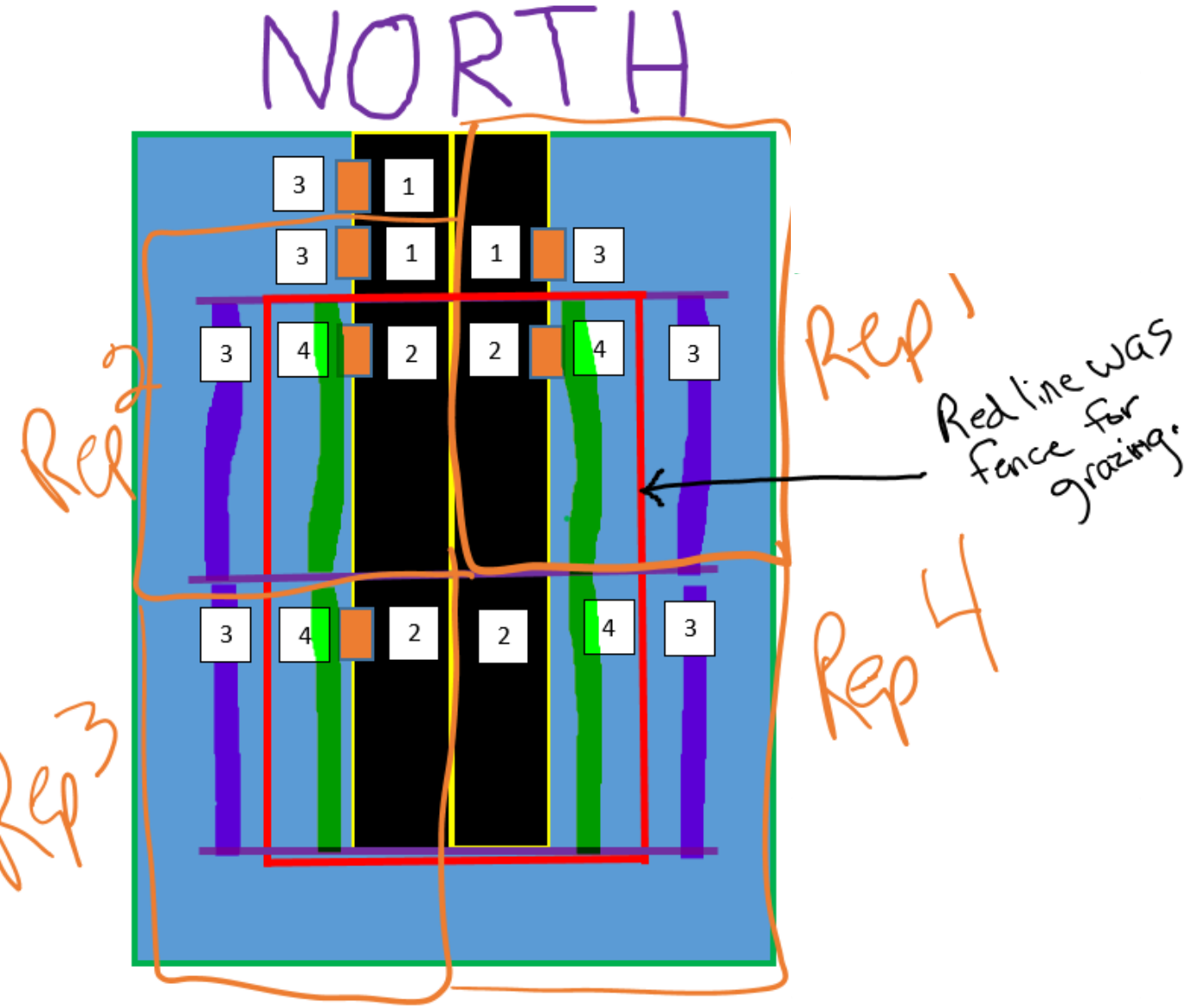
Soil properties

Value of grazing
(animal unit months)

Succeeding crop yields

Soil moisture

Cover crop Biomass



Location Crop Rotation

Year	Nuckolls Co.	Webster Co.
2016	**Cool-season cover crop** planted into wheat stubble & GCC* treatment grazed. (winter terminated)	
2017	**Corn**. Corn residue grazed in GCC treatment.	
2018	**Soybean**. Wheat planted in the fall.	**Warm-season cover crop** planted into wheat stubble (CSP program) and GCC treatment grazed. (winter terminated)
2019	**Wheat** harvested. **Cool-season cover crop** planted into wheat stubble and GCC treatment grazed. (chemical terminated)	**Corn**. Corn residue grazed in GCC treatment.
2020	**Corn.** Corn residue grazed in GCC treatment.	**Soybean**. Wheat not planted. End study.
2021	**Soybean.** **Wheat** planted in the fall.	
2022	**Wheat** harvested.	

*GCC = Grazed Cover Crop treatment

2016 Nuckolls County Cool-Season Cover Crop

Planted on August 14, 2016, following wheat harvest and consisted of a mix of winter peas, spring triticale, oats, collards, and purple top turnip.

Cover crop biomass measured on October 19, 2016, was 3,401 lb/ac and consisted mainly of grass and turnip

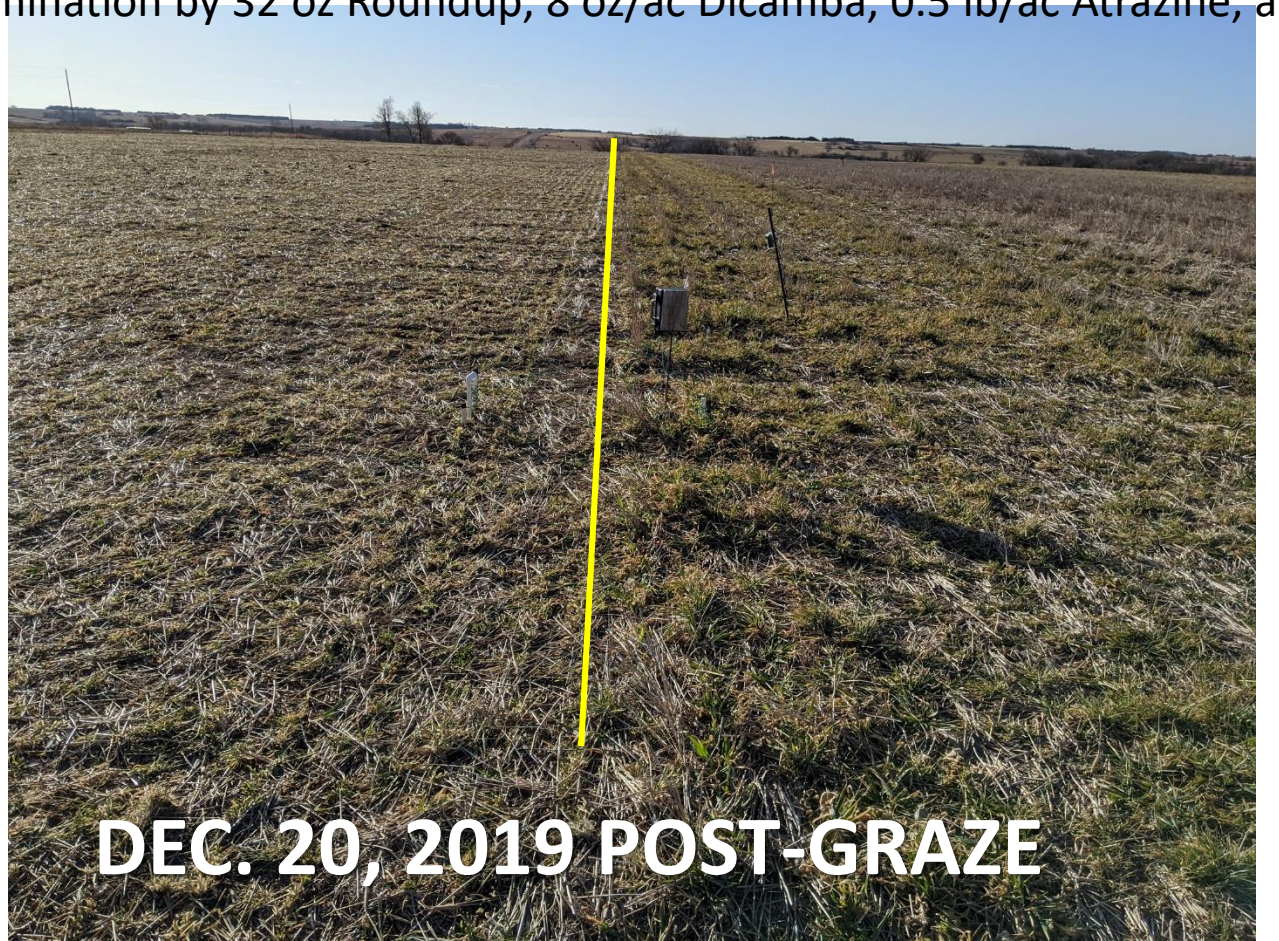
November 2016, 28 (1,100 lb) first-calf heifers grazed 9.6 acres for 22 days, resulting in the cover crop carrying 2.4 animal unit months (AUM)/ac. Post-grazing, 2177 lb/ac biomass still present.

2019 Nuckolls County Cool-Season Cover Crop

Planted on 9/3/19. Cover crop contained 10 lb/ac winter peas, 25 lb/ac winter triticale, 25 lb/ac black oats, 1.3 lb/ac collards, and 1.3 lb/ac turnip.

Cattle grazed the cover crop and only 8.66 AUM (vs. 19.03 AUM in 2016) were achieved due to the wet fall, late planting, and minimal growth.

Cover crop was 8” at time of termination by 32 oz Roundup, 8 oz/ac Dicamba, 0.5 lb/ac Atrazine, and 4 oz/ac Balance Flexx on 3/20/20.



Webster County Cover Crop

Webster County Cover Crop

2nd Field (Webster Co.) – Cover Crop Fall 2018 (Post-grazing)

- Planted July 15, 2018 with 6 lb/ac cowpea, 7 lb/ac BMR sorghum sudan, 4 lb/ac pearl millet, 2 lb/ac radish, 1.5 lb/ac turnip.
- 8,405 lb/ac biomass pre-grazing (88% grass).

2nd Field-Webster County-Year 1 (2019 cover crop)

- The grazed area contained 52.3 acres.
- October 21, 2018, 35 head of first-calf heifers weighing 1,100 lbs grazed for 91 days.
- A great deal of forage remained in the grazed area when cattle were removed.
- Post-grazing biomass samples were not able to be collected.

Crop Yields Nuckolls

2017 Corn Yield	Stand Count (plants/ac)	Moisture (%)	Test Weight	Corn Yield (bu/ac)†		2019 Wheat Yield	Test Weight (lb/bu)	Moisture (%)	Wheat Yield (bu/ac)†	
Cover Crop—Non-grazed	22,500 A	15.0 A	61 A	213 A		Cover Crop – Non-grazed	59 A*	10.3 AB	84 A	
Cover Crop/Stubble—Grazed	22,167 A	14.9 A	61 A	211 A		Cover Crop/Stubble – Grazed	59 A	10.4 A	84 A	
Stubble—Non-grazed	22,500 A	15.2 A	61 A	218 A		Stubble – Non-grazed	59 A	10.2 B	83 A	
P-Value	0.952	0.129	0.267	0.141		P-Value	0.483	0.067	0.613	
2018 Soybean Yield	Stand Count (plants/ac)	Test Weight	Moisture (%)	Soybean Yield† (bu/ac)		2020 Corn Yield	Stand Count (plants/ac)	Moisture (%)	Test Weight	Corn Yield (bu/ac)†
Cover Crop—Non-grazed	120,750 A*	55 A	10.7 B	50 A		Cover Crop—Non-grazed	16,875 A	13.8 A	60.125 A	215.48 B
Cover Crop/Stubble—Grazed	120,500 A	55 A	11.0 A	40 B		Cover Crop/Stubble—Grazed	18,000 A	13.58 A	60.3 A	216.02 B
Stubble—Non-grazed	117,750 A	55 A	10.6 C	52 A		Stubble—Non-grazed	18,125 A	13.6 A	60.2 A	226.52 A
P-Value	0.629	0.397	0.0002	0.0004		P-Value	0.4355	0.2648	0.9201	0.0057

Economic Analysis-Nuckolls County (2016 Cover Crop – 2020 Corn Crop)

	2016 Cover	2017 Corn	2018 Soy	2019 Wheat	3-Year Total
Cover Crop—Non-grazed	-$46.64	$211.35	$54.18	$59.56	**$278.45**
Cover Crop/Stubble—Grazed	$22.86	$210.05	-$19.82	$59.56	**$272.65**
Stubble—Non-grazed	-$18.00	$227.10	$68.98	$55.91	**$333.99**

	2019 Cover	2020 Corn	2021 Soy	2022 Wheat	6-Year Total
Cover Crop—Non-grazed	-$49.42	$304.23	TBD	TBD	*$533.26*
Cover Crop/Stubble—Grazed	$20.80	$311.13	TBD	TBD	*$604.58*
Stubble—Non-grazed	-$18.00	$342.99	TBD	TBD	*$658.98*

- Used closest UNL Budget each year so anyone could compare costs.
- Cost of cover crop includes: seeding and cover crop seed. Fence/labor for grazing and hauling water added cost to grazed cover crop treatment. Value of Animal Unit Months grazed added value to the grazed cover crop (GCC) treatment.
- Cost of $18/ac assessed to chemical burndown of weeds in wheat stubble.
- Value of $5/ac rental rate (common for area) added to grazing the corn residue in GCC treatment.
- Value of each harvested crop based on yield and market year average price used for all on-farm research studies that year.

Crop Yields Webster

Corn 2019	Stand Count (plants/ac)	Stalk Rot (%)	Test Weight (lb/bu)	Moisture (%)	Corn Yield (bu/ac) †			Soybean 2020	Stand Count (plants/ac)	Test Weight (lb/bu)	Moisture (%)	Soybean Yield (bu/ac)†
Cover Crop – Non-grazed	24,333 A*	3.33 A	61 AB	15.0 A	189 A			Cover Crop – Non-grazed	88,500 A*	55.55 B	11.73 A	61.375 A
Cover Crop – Grazed	24,833 A	1.00 A	61 B	14.6 B	191 A			Cover Crop – Grazed	84,250 A	56.13 A	11.97 A	62.65 A
Wheat Stubble – Non-grazed	23,167 A	0.83 A	62 A	14.2 B	187 A			Wheat Stubble – Non-grazed	87,000 A	55.5 B	11.7 A	60.675 A
P-Value	0.409	0.474	0.067	0.009	0.233			P-Value	0.851	0.03	0.1284	0.6851

EXTENSION

Economic Summary-Webster County (final) (2018 Cover Crop-2020 Soybean Crop)

Marginal net return ($/ac) economic analysis of this study for two crop years.

	2018 Cover	2019 Corn	2020 Soy	2-Year Total
Cover Crop—Non-grazed	**(-$41.82)**	**$285.79**	**$190.16**	**$434.13**
Cover Crop/Stubble—Grazed	**$74.06**	**$298.45**	**$202.28**	**$554.79**
Stubble—Non-grazed	**(-$18.00)**	**$278.13**	**$183.51**	**$443.64**

- Used closest UNL Budget each year so anyone could compare costs.
- Cost of cover crop includes: seeding and cover crop seed. Fence/labor for grazing and hauling water added cost to grazed cover crop treatment. Value of Animal Unit Months grazed added value to the grazed cover crop (GCC) treatment.
- Cost of $18/ac assessed to chemical burndown of weeds in wheat stubble.
- Value of $5/ac rental rate (common for area) added to grazing the corn residue in GCC treatment.
- Value of each harvested crop based on yield and market year average price used for all on-farm research studies that year.

N EXTENSION Nebraska CornBoard Nebraska CornGrowers ASSOCIATION NEBRASKA SOYBEAN CHECKOFF Nebraska Dry Bean Commission

Take Home Points

- After three years: grazed cover crop treatments had higher total microbial biomass and fungal biomass than other treatments.
- After three years: No difference in soil physical properties amongst treatments.
- Economical returns for cover crops in a system need to include:
  - Seeding & seed cost -Fence/labor, hauling water, animal care, grazing value (when grazing cover crops)
  - In the future: benefits to the soil (need better information on how to calculate)
- Cover crop biomass dependent upon planting timing and environmental conditions.
- Cool-season cover crop produced less biomass and was more variable over years than warm-season cover crop.
- Ungrazed wheat stubble was the most economical treatment with the cool-season cover crop when water had to be hauled for cattle grazing.
- Grazed cover crop was the most economical treatment with warm-season cover crop when water didn’t have to be hauled for cattle grazing.

https://cropwatch.unl.edu/nebraska-farm-research-network-results-update-meetings-2021

Nebraska On-Farm Research Network Results Update Meetings 2021

FEBRUARY 25 AND 26, 2021

RELIABLE, RESEARCH BASED INFORMATION FOR YOUR FARM

Questions