

Effect of Oat Cover Crop and N Fertilization on Subsequent Soybean Grain Yield

Year 1 – 2012 Crop Year

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Rationale

- Cover crops may offer an opportunity to grow biomass to improve soil quality and reduce soil erosion potential in central Kansas
- Oats may be suited in central Kansas within the row-crop portion of the rotation (Corn>Oat>Soybean)
- Not fully understood are the potential impacts of growing a spring oat cover crop on the subsequent crop and cropping system

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Objectives

- Use on-farm research techniques to evaluate the effects of spring seeded oats on subsequent soybean and wheat yields
- Evaluate the practice of Nitrogen fertilization of the oat cover crop as it relates to cover crop growth and impact on subsequent crops
- Improve ability to efficiently and effectively carry out on-farm research

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Materials and Methods – All Sites

- Treatments
 - 1 – No-Till Fallow
 - 2 – Oat Cover Crop (65 lbs/ac)
 - 3 – Oat Cover Crop (65 lbs/ac) plus 25 lb/ac actual N in-furrow as dry urea at planting

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Materials and Methods - Barton

- Previous Crop – Grain Sorghum
- Oats Planted – Mar 2, 2012
- Oats Terminated – May 2, 2012
- Oat biomass was collected at termination
 - Collected and dried the sample within a 32" hoop
- Soybeans not planted due to drought conditions

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Materials and Methods - Barton

- Software - EasiSuite
- Planting Equipment – JD 1890
 - 10" oat row spacing
 - Soybeans not seeded
- Harvesting Equipment – N/A

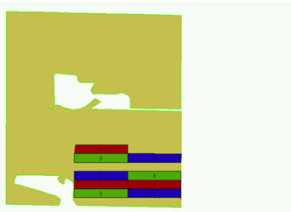
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Materials and Methods – Barton 2012 Plot Plan

- Strip plot design
- 3 replications of 3 treatments
- 120ft wide strips
- Ensures at least 1 clean yield monitor pass



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Photos – Barton County



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Materials and Methods - Jewell

- Previous Crop – Grain Sorghum
- Oats Planted – Mar 29, 2012
- Oats Terminated – May 14, 2012
- Soybeans Planted – June 5, 2012
- Soybeans Harvested – Oct 9, 2012
- Other comments – Delayed soybean seeding due to lack of moisture, delayed soybean emergence and reduced stand in oat strips

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Materials and Methods - Jewell

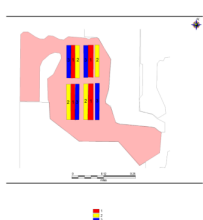
- Software - FarmWorks
- Planting Equipment – JD 1990CCS
 - 10" oat row spacing
 - 20" soybean row spacing
- Harvesting Equipment – JD 9600 – 30' head

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Materials and Methods – Jewell 2012 Plot Plan



- Strip plot design
- 4 replications of 3 treatments
- 90ft wide strips
- Ensures at least 1 clean yield monitor pass

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Photos – Jewell

Fertilized strip – 12" height



Unfertilized strip – 8" height



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Photos - Jewell



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Photos – Jewell



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Materials and Methods - Mitchell

- Previous Crop – Grain Sorghum
- Oats Planted – Mar 9, 2012
- Oats Terminated – May 15, 2012
- Soybeans Planted – June 5, 2012
- Soybeans Harvested – Oct 18, 2012
- Other comments – Delayed seeding date due to dry soil conditions

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Materials and Methods - Mitchell

- Software – FarmWorks
- Planting Equipment – JD 1890
 - 7.5" oat row spacing
 - 20" soybean row spacing
- Harvesting Equipment – JD 9770 35' head

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Materials and Methods – Mitchell 2012 Plot Plan

No Seed
Corn Only
Corn and Fertilizer
Corn Only
No Seed
Corn and Fertilizer
No Seed
Corn and Fertilizer
Corn Only

Fallon 2012
10/11

Corn and Fertilizer
Corn Only
No Seed
Corn Only
Corn and Fertilizer
No Seed
Corn and Fertilizer
No Seed
Corn Only

- Strip plot design
- 6 replications of 3 treatments
- 90ft wide strips
- Ensures at least 1 clean yield monitor pass

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Photos - Mitchell

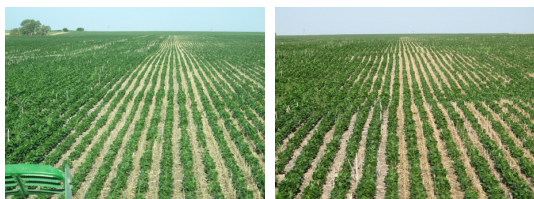


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Photos - Mitchell



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Photos - Mitchell



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Materials and Methods - Dickinson

- Previous Crop - Corn
- Oats Planted – Mar 5, 2012
- Oats Terminated – May 5, 2012
- Soybeans Planted – June 13, 2012
- Soybeans Harvested – Oct 16, 2012
- Other comments – Soybean seeding delayed due to dry soil conditions

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Materials and Methods - Dickinson

- Software - EasiSuite
- Planting Equipment – JD 1890
 - 7.5" oat row spacing
 - 15" soybean row spacing
- Harvesting Equipment–CIH 8010 – 40' head

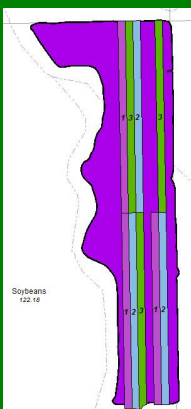
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Materials and Methods – Dickinson 2012 Plot Plan

- “Modified” strip-plot design
- 3 replications of 3 treatments
- 70ft wide strips
- Ensures at least 1 clean yield monitor pass



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Photos - Dickinson



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Photos - Dickinson



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Photos - Dickinson



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Analysis

- Buffered treatment strips (plots) by $\frac{1}{2}$ header width to ensure that only one full pass of treatment yield data was included
- Aggregated data to each plot and recorded yield into Excel spreadsheet



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Analysis

- Analysis of Variance was conducted with the MIXED procedure in SAS 9.2
- Each site was analyzed independently
- An across-sites analysis was conducted
- P-value of 0.05 criteria for significance

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Barton County Biomass Results

Treatment	Barton
	lbs ac ⁻¹
Oat Cover w/Nitrogen	2428 a
Oat Cover	1611 b

ANOVA P>F

Source	
Treatment	0.0094
LSD = 0.05	484

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Yield Results

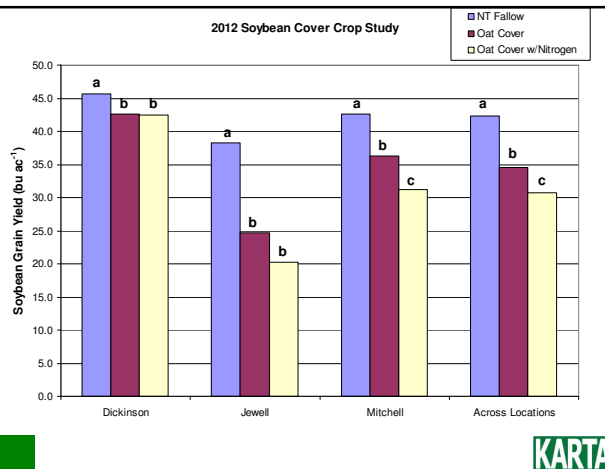
Treatment	Dickinson	Jewell	Mitchell	Across Locations
				bu ac ⁻¹
NT Fallow	45.7 a	38.3 a	42.6 a	42.3 a
Oat Cover	42.6 b	24.7 b	36.3 b	34.5 b
Oat Cover w/Nitrogen	42.5 b	20.2 b	31.2 c	30.8 c

ANOVA P>F

Source				
Treatment	0.0112	0.0013	0.0001	<0.0001
LSD = 0.05	1.8	6.6	3.6	3.2

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Discussion

- Why a 18 bu. ac⁻¹ reduction at JW, 11 at MC, and 3 at DK? What made the difference?
 - Delayed emergence/reduced stand at Jewell
 - Rest came down to moisture?
 - Should have taken soybean stand counts
- Difference in residual N at sites
 - Clearly more residual N at DK site
 - Should have taken profile N data

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Discussion

- How much value to place on additional residue from Oat cover?
 - Difficult part of the rotation to maintain residue
 - Less soil erosion/residue loss from Fall winds
- Will there be any effect (positive or negative) on subsequent crops?

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Conclusions

- On-farm research methods can produce “clean” data
 - Plots of equal size
 - Treatment strips of 3x header width will help in getting one good pass of yield data
- Coordinated multi-site studies allows collection of multiple “site-years” in less time
- Nitrogen effected biomass growth of oats at sites that did not have excess N carryover from previous crop
- Noted absence of Maretail and less overall weed pressure in oat strips

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Conclusions

- Good research leads to more questions
- At 3 central Kansas sites in 2012 the use of an oat cover crop reduced subsequent soybean yields an average of 11.5 bu. ac⁻¹ (range of 3 to 18 bu. ac⁻¹)
- 2012 gave us a snapshot at one potential set of outcomes, study needs to continue

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Thank You

- KARTA for helping fund this project
- Lucas Haag for help in design, analysis, and how to run our computers

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Questions?

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