NORTH CENTRAL SARE
Sustainable Agriculture Research & Education

Incorporating Cereal Rye Into a No-Till Corn/Soybean Rotation For Erosion Reduction and Possible Grazing Use

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Cover Crops in a Corn/Soybean Rotation

Background/Objectives

BACKGROUND

Missouri has some unique cropping and livestock systems. Recent increases in crop and cattle prices has placed increased pressure on Missouri's fragile crop ground. Much of the state's crop ground is rolling with limited topsoil depth. Additionally some fields are being crop with multiple years of beans, increasing soil erosion further.

Using the Nutrient Tracking Tool modeling program, the typical upland field in East Central Missouri will experience 2.6 tons of soil loss per year. By incorporating a cereal rye cover crop between the corn and soybeans erosion is reduced to 1.8 tons per acre and if a cover of cereal rye is incorporated after soybeans erosion is reduced to .8 tons per acre per year. Cereal rye may provide forage opportunities for cattle reducing pasture/hay needs

OBJECTIVES

With Missouri's diverse soils and combination farms of grain and cattle the objectives include:

- Measure corn and soybean yield response to the incorporation of rye in the no-till rotation.
- Evaluate cereal rye forage quality and quantity through sampling.
- Measure corn's nitrogen response following cereal rye using sensors such as Greenseeker units.
- Measure economic impacts of incorporating cereal rye in the rotation from a crop yield and forage value standpoint.

Materials and Methods

Replicated strips on producer fields over a three county area (Audrain, Lincoln, Franklin) to incorporate cereal rye into a no-till corn/soybean production system. Comparisons were made between using cereal rye as a cover crop compared to no cover crop. The choice of using cereal rye was twofold with it being shown to reduce soil erosion, while possibly providing forage for livestock operations. Cereal rye is adaptable over the majority of the Corn Belt with an extended planting season in the fall providing a high likely hood of success. All sites were in a no-till system with the producers using a no-till drill as the method of seeding the cereal rye. Replicated strips of cover crop and no cover crop were designed to accommodate producer seeding and harvesting equipment with the length and width being large enough for accurate yield data collection with a yield monitor equipped combine. Treatments were replicated at least three times with a targeted total acreage of each treatment being at least three acres. Following cereal rye establishment, forage samples were taken during late March early April to measure the forage quality if it was used for grazing. Dry matter estimates of the cereal rye was also conducted at the time of forage sampling. Planned producer rotations, fertility management and weed control practices were practiced on all plots. Data collected from the plots was shared with participating producers and included in curriculum developed for area producers.

2015 and 2016 Field Results

The 2015 growing season experienced periods of excessive rainfall resulting in water logging of crops on flat topography while fields with slope maintained good yields. Fields 1 and 2 are examples of this with field 1 experiencing yield loss from excessive water made more pronounced with the use of rye and loss of nitrogen, while field 2 maintained yield with both treatments. The 2016 growing season was more consistent with moisture with the bean crop not experiencing water stress with any treatments.

Field 1 2015 Corn Yield Lincoln County		
Plot #	Rye	No Rye
1	75	100
2	75	121
3	86	130
4	80	116
5	95	100
Average	82	113

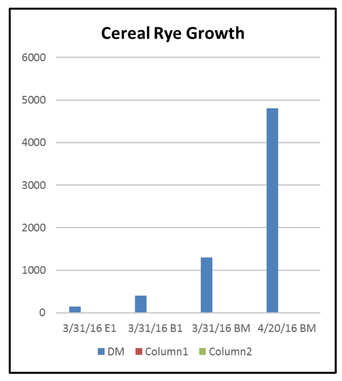
Field 1 2015 Sensor Reading and Nitrogen Recommendations				
Plot #	Rye	N Rec.	No Rye	N Rec.
1	.278	182	.212	89
2	.339	268	.243	133
3	.201	73	.173	34
4	.297	209	.182	46
5	.242	131	.187	54
Average		172		71

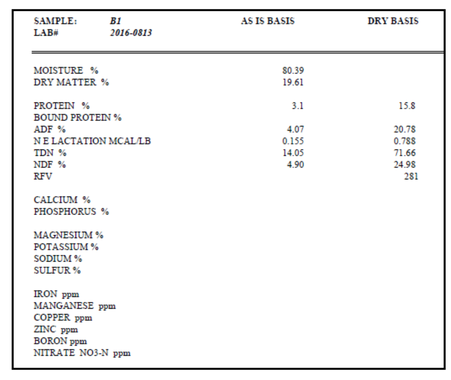
Formula: (240X(Reading/.17))-210. Readings taken 6/29/2015

Field 2 2015 Corn Yield Lincoln County		
Plot #	Rye	No Rye
1	163	194
2	179	177
3	182	172
4	178	174
5	195	199
Average	179	183

2016 Soybean Yield Franklin County	
Cereal Rye Ave. Yield	61.8
Control Ave. Yield	61

2016 Soybean Yield Audrain County	
Cereal Rye Ave.	71.75
Control Ave.	66





SAMPLE: B1 LAB# 2016-0813	AS IS BASIS	DRY BASIS
MOISTURE %	80.39	
DRY MATTER %	19.61	
PROTEIN %	3.1	15.8
BOUND PROTEIN %		
ADF %	4.07	20.78
N E LACTATION MCAL/LB	0.155	0.788
TDN %	14.05	71.66
NDF %	4.90	24.98
RFV		281
CALCIUM %		
PHOSPHORUS %		
MAGNESIUM %		
POTASSIUM %		
SODIUM %		
SULFUR %		
IRON ppm		
MANGANESE ppm		
COPPER ppm		
ZINC ppm		
BORON ppm		
NITRATE NO3-N ppm		

Spring growth of cereal rye accelerates rapidly near the end of March with there being only a few hundred pounds of dry mater the end of March with over 2 tons possible by the later part of April. As with other forages as yield increases forage quality decreases. The producer will need to balance these two variables with his desires.

Economic Considerations

- The value of topsoil.
- Nutrient retention on crop fields and the value of those nutrients economically and environmentally.
- The value of increasing soil organic matter and increasing water holding capacity and infiltration rates.
- An economic value of approximately $60/ton of rye forage if harvested for livestock feed.
- Changes both short term and long term to cash crop yields.

USDA

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