SARE Farmer Rancher Grant Program

2013 Final Report

Project Identification: Skip Row Corn Planting Techniques with Cover Crops for Sustainable Grazing

I. PROJECT IDENTIFICATION

Project Number: FNC10-817

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PROJECT BACKGROUND

I am a full time livestock producer with 100 head of cattle, 400 ewes and occasionally 400 head of feeder goats. I have 1800 acres of rented ground consisting of 240 acres of crops and the remaining 1560 acres is made up of pasture and timber. I farm near my brothers and we share management ideas. In the last few years I have been growing some corn for grazing only. The cost of grazing lowers the labor investment and feeding costs for my cattle, sheep and goats.

I am using management intensive grazing systems (MIG) concepts on all of my forage acres to maximize forage utilization and quality, and to hold feed costs to a minimum. A MIG system was put in place in 2012 to further increase forage utilization efficiency.

I am a member of the Montgomery County Soil & Water Conservation District. The land that I use in my operation all have Conservation Plans developed by the county Soil & Water District. Conservation practices implemented include waterways terraces and field borders.

I update my skills yearly by attending grazing conferences, tours and other state and regional educational programs, including participation in University of Missouri Extension education programs.

PROJECT DESCRIPTION

In solid row stands, canopy density light penetration limits winter cover crop establishment until midpoint of crop senescence. By skipping planter rows at corn establishment extra light would allow earlier planting with dealer available high clearance ground equipment. An earlier emerging and more robust cover crop would result in greater forage mass, higher quality forage and lower grazing costs for 400 feeder lambs followed by ewes and beef cattle. Skip-rows would also allow ease of controlled grazing with portable electric fencing.

Goals

I am looking to enhance profitability per acre and reduce business risk by improving land utilization efficiency by getting more forage out of existing acreage and minimize input costs by intensively managing feed costs. By extending the length of time animals can graze forages I can reduce purchased feed costs and be in a better position to maintain a profitable operation during extreme changes for input costs and livestock price cycles.

My proposal is designed to provide data on the most productive combination of corn population, skip-row planting techniques and ground seeded cover crops into standing corn for increasing dry matter yield for fall grazing of sheep. It is important to maximize both corn DM contribution and the cover crop contribution to the total feed available to the livestock.

Light penetration to the soil surface is necessary for early germination of cover crop species. Therefore, a significant part of the study is evaluating how to manage light penetration through the corn canopy. Light can be managed by reducing total corn population per acre or by increasing light penetration by creating a strip cropping edge effect. Strip cropping practices have long been known to allow greater use of light interception of the leaf canopy, resulting in greater yield.

My project also looks at broadcast application of multiple species of covers into V8-10 stage corn during the midseason time period and evaluating cover crop species for successful establishment in the light management treatments.

The final part of the study was to measure feeder lamb gains on grazing treatments in comparison to a control.

Process

A randomized complete block research design of four treatments with five replications was laid out in a twenty acre field for evaluation. Each of the 20 plots in the design was 0.75 acres in size. Corn was planted in April-early June during each year of the project. A burn down herbicide application was done prior to planting in each of the years. This design was consistent during the study years of 2010-2013.

Treatments consisted of variations in corn population and solid stand planting or skip-row planting.

Treatments:

-- Solid stand 26: six rows of a six row planter with 26,000 population
--Solid stand 20: six rows of six row planter with 20,000 population
-- Skip-row 26: rows 1, 3, 4, 6 of six row planter with 26,000 population, rows 2 & 5 bare
-- Skip-row 32: rows 1, 3, 4, 6 of six row planter with 32,000 population, Rows 2 & 5 bare

A mixture of cover crop species was broadcast into standing corn at corn growth stage V10 –VT each year of the study.

The corn and cover crops grown on each treatment were harvested in the fall prior to introduction of feeder lambs.

Feeder lambs were ear tagged with identifying numbers, weighed in and out during the grazing portion of the study.

People

Rich Hoormann, University of Missouri Extension (MUEXT) Agronomist, Charles Ellis, MUEXT Ag and Natural Resources Engineer and Wayne Shannon, MUEXT Livestock Specialist assisted in various parts of the project including planting, cover crop seeding and data collection for the plant and animal evaluation. They also helped with presentations at the site as part of a SARE Professional Development Program (PDP).

Staff from the Montgomery County SWCD and NRCS office assisted with advertisement of the field days.

Results:

2010

A portion of the study project was conducted in 2010 in anticipation of the grant. The cover crop mix was broadcast with a retail dealer high ground clearance dry spinner containing urea. The cover crops were seeded on June 30 at corn stage V10.

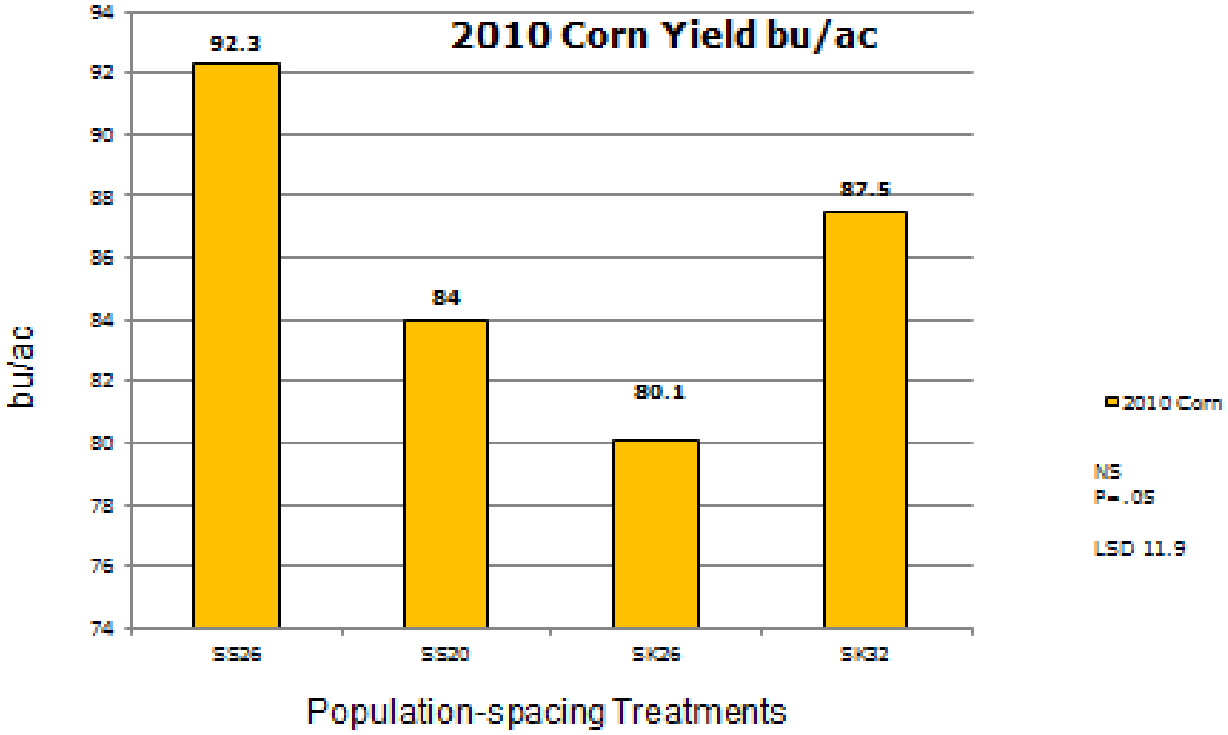
In October cover crops were hand harvested, air dried and dry matter calculated. A portion of the 15 acres were machine harvested to obtain corn yields. Late season weeds reduced the pounds per acre of cover crops.

The first year results found: That the initial seeding rates of the cover crop species was too low to produce the pounds of cover crop needed; a residual herbicide was needed to reduce weed competition with cover crops.

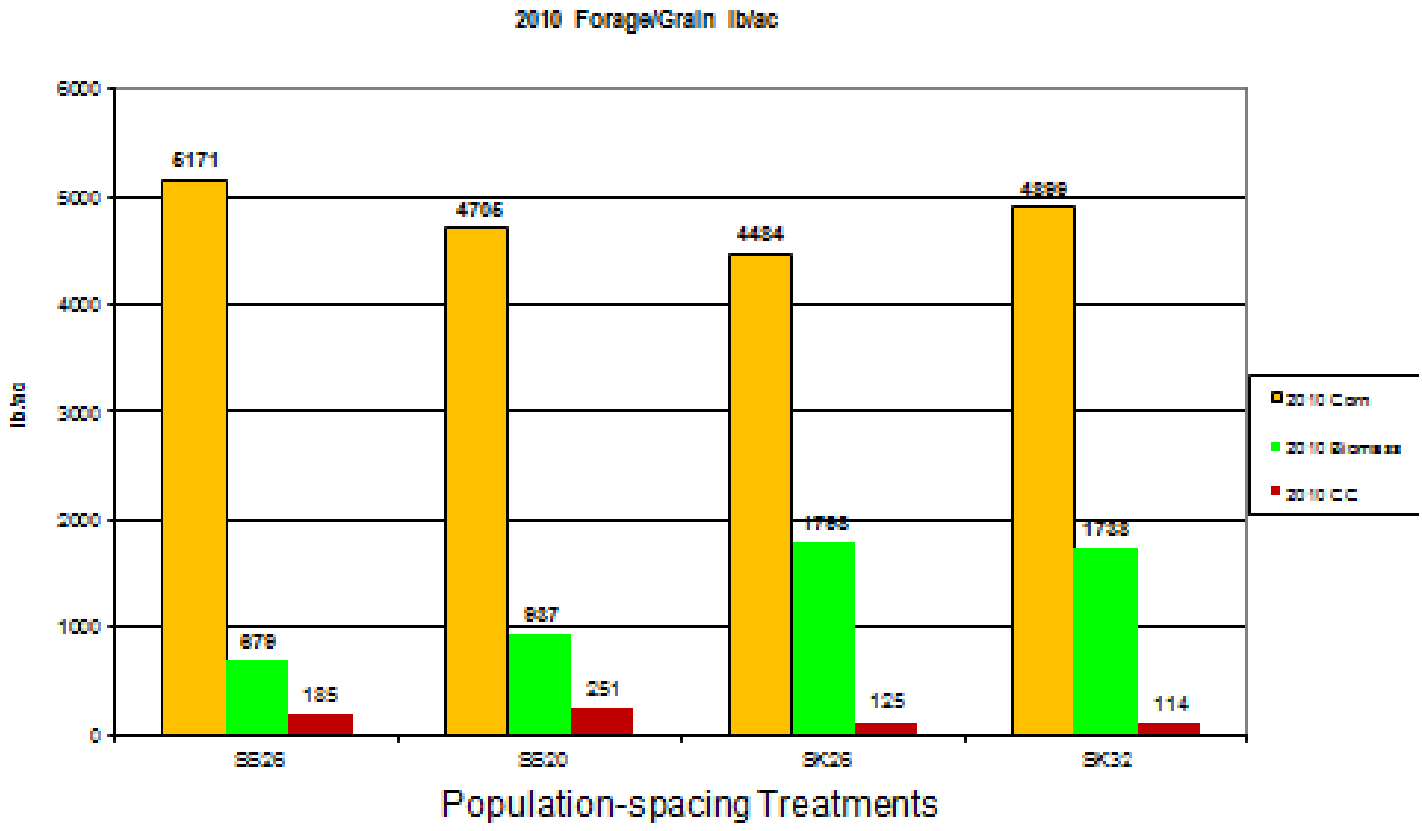
In addition it was found that there was no difference between corn population treatments in seed reaching the soil based on pan sampling at time of broadcast seeding.

Cover crop harvest samples found that field peas, kale, annual ryegrass, and oats were able to germinate successfully in the plots. However, Daikon radish and cereal rye were not found in the October sampling of cover crop yield checks.

2010 Corn Yield



2010 Summary
Forage/Grain Yield



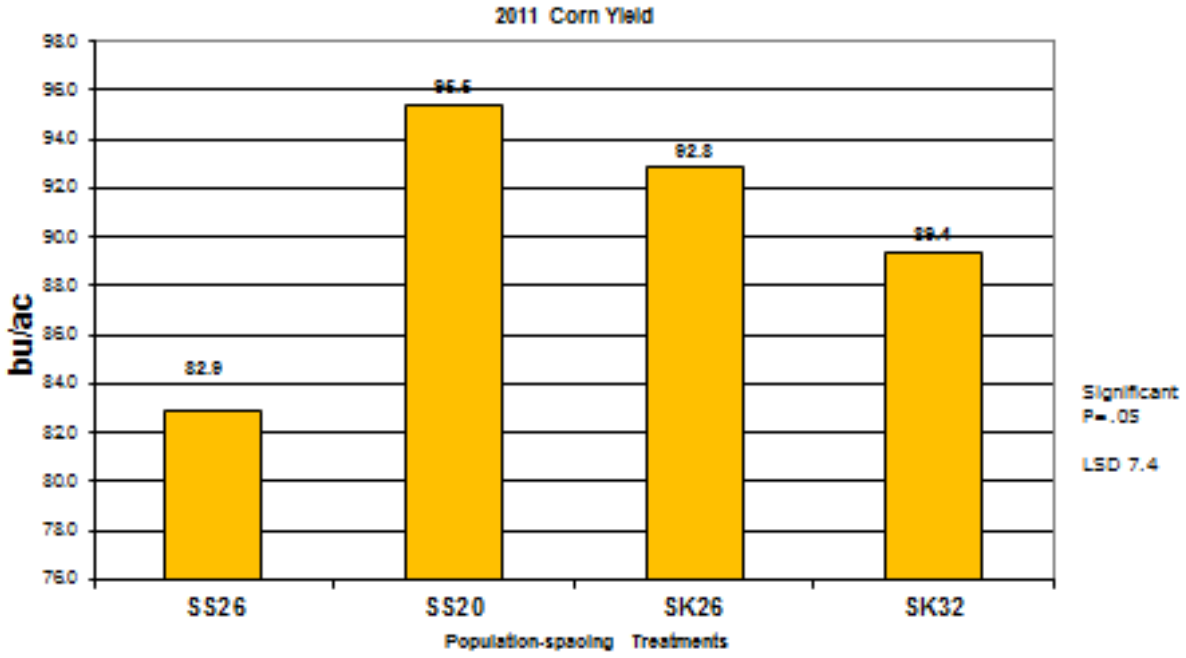
2011

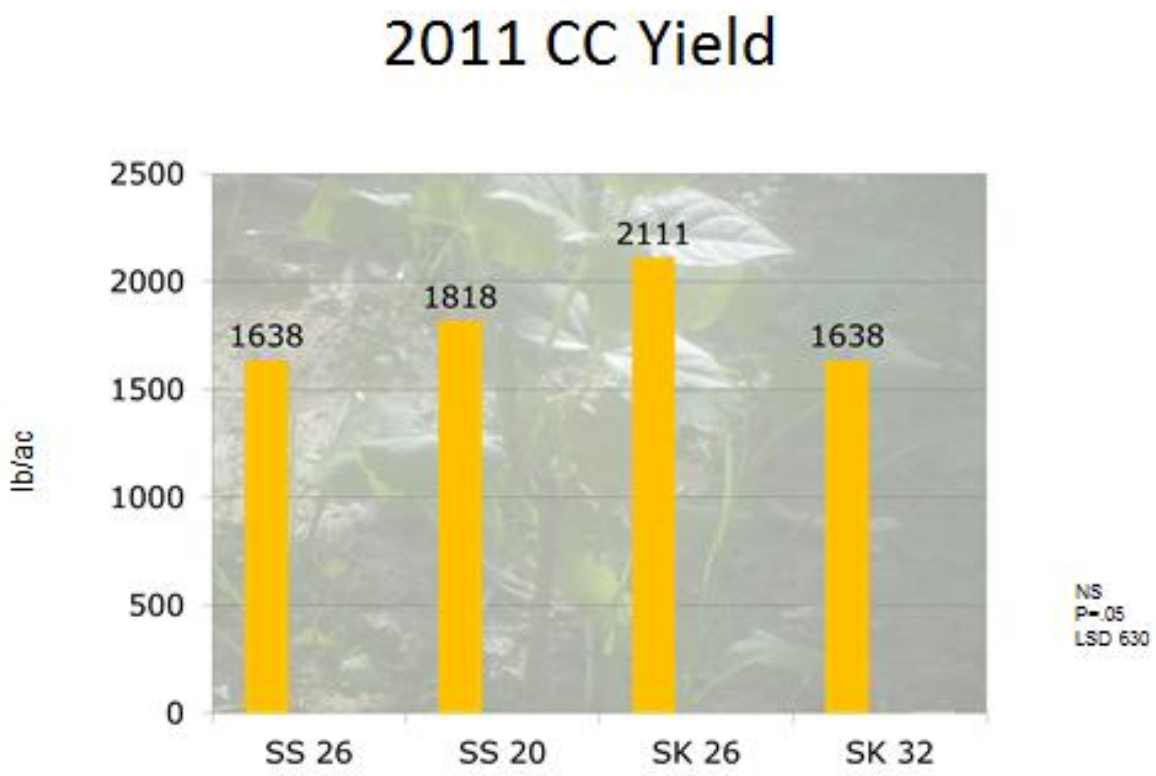
The plots were planted again in 2011. An April corn planting failed and was replanted in early June. Dual Magnum II was used pre-plant to control weeds.

Broadcast seeding of cover crops changed from dealer high clearance equipment with fertilizer to a John Deere highboy with an electric spinner set at a height of 10 feet. The cover crop seeding was done in early August.

Corn yields were done with hand checks of four rows of 1,000 of an acre, and put through a plot harvester for moisture and weight. Cover crops were harvested with a push lawn mower with a bag attachment.

2011 Corn Yield





Cover crop dry matter yield was much improved in 2011, however in data not shown feeder lambs quickly consumed the cover crops and needed supplemental hay before the end of a 27 day grazing trial. The pounds of cover crops were not sufficient to carry the animals for a planned 28 day feeding trial

2012

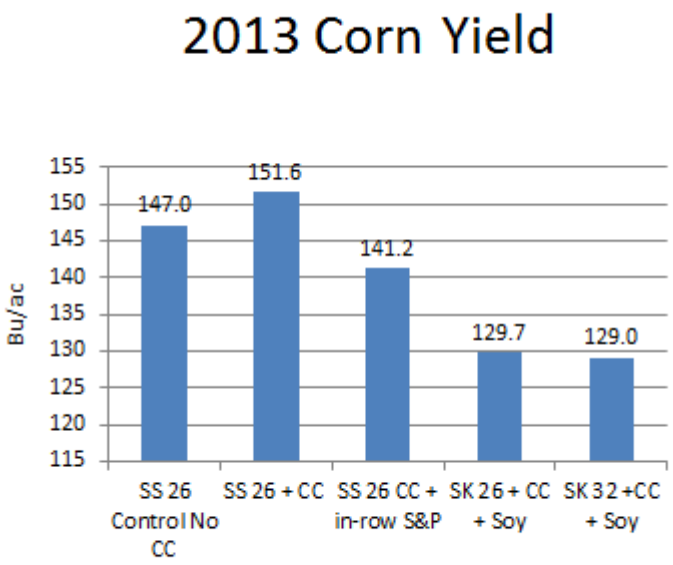
The 2012 study year was lost due to early drought and a failed corn stand. Application was made to extend the study an additional year.

2013

In 2013 treatments were modified from the original design to reflect lessons learned from previous years. The skip-row treatments had rows 2 and 5 planted with a Group XI forage soybean at the time of corn planting to increase the DM production. This was in place of the "bare" ground treatment used in previous years.

In addition the control did not have a cover crops broadcast at the VT stage of corn growth. This was done to improve the control concept of what corn yield would be in the local community without competition from cover crops.

A soil applied herbicide was used to manage weed competition with cover crop establishment. The planned herbicide was a burndown of glyphosate + Dual Magnum II. However, Bicep was inadvertently used in place of Dual and the atrazine portion of the premix killed the forage soybeans. The combination of drought and incorrect herbicide resulted in no measureable cover crop establishment in 2013 at the time of feeder lamb introduction to the treatments.



In September three groups of 75 feeder lambs were tagged, weighed and placed in grazing trial treatments. The grazing feeding trial treatments were: pasture only, corn +cover crops+ hay, and pasture + free access to corn + cover crops. The pasture for the study had not been grazed since late May and was a minimum of 12" in height. It is important to note that the area suffered from a late summer drought. Subsequently pastures were very dry with no new growth since late June and the nutritional quality of the forage was poor. This was reflected in the results of the feeding trial.

The feeding trial ran 47 days and at the end of the trial lambs were weighed. Statistical analysis was run on the three feeding treatments a *t* test for LSD.

	Average gain	Average daily gain	
	---------- lb. ----------		
pasture only	8.5	0.18	A
pasture + corn free choice	5.87	0.12	B
corn + cc + hay	3.63	0.08	C

Means with the same letter are not significantly different

The animal performance across all treatments in 2013 was much less than past farm average rates of gain. Typical rate of gain for feeder lambs is 0.5 lb/day.

Again, there was no measurable cover crop in the plots due to soil herbicide and drought. Dry hay was provided free choice in the corn + cover crop treatment.

PROJECT IMPACTS

The project provided data that refined ideas about using cover crops in standing corn for early fall grazing.

First, the project identified that cover crops can be broadcast into standing corn prior to leaf senescence, during July and early August. Species identified with the ability to germinate over a wide time range in this project include hybrid Kale, annual ryegrass, oats, field peas, and crimson clover. It also identified Daikon radish as not being successful in establishment in seeding with these conditions.

In addition the project found planning on cover crops to increase the DM in standing corn for early fall grazing is high risk and should not be counted on to fill grazing needs in a year round grazing plan. In a droughty clay pan Mexico silt loam soil, cover crops for grazing are only successful if July rains result is soil moisture. At that point cover crops enhance grazing opportunities.

The study found that lambs, as a group, do not figure out how to make use of corn to meet nutritional needs. The feeding study showed that a few individual animals had impressive weight gains, but on average lambs did not make use of the corn.

The conclusion was mature dry corn does not fit the grazing need in October-December for feeder lambs and the dry matter per acre of seeding into standing corn was not great enough to compensate for not knowing how to feed on ear corn or dry leaves. Ewes or beef cattle would be better suited to graze standing corn with cover crops in this time niche.

A formal economic analysis has not been conducted. However, in the four years looked at in the study, only one had a substantial cover crop yield. Significant droughts interfered with two outcomes and weed management interfered in the outcome of one year and played a role in another. The funds spent on seed along with extra labor and equipment application and the high risk due to weather makes this a questionable routine practice to fill needed grazing windows.

In years with ample moisture, it becomes a useful practice with the ewes or beef cattle.

OUTREACH

The information gather was used in SARE webinars in 2011 and 2012. In addition the information was presented in Montgomery County Soils & Crops Conference session in years 2010 and 2011.

A presentation was given at the NCR-SARE Farmers Forum at the National Small Farm Trade Show and Conference in Columbia, Missouri in 2012.

In 2012 I gave a presentation of the project at the Soil & Water Conservation Society‘s Illinois conference “Effective Cover Cropping in the Midwest” held in Decatur Illinois.

Rich Hoormann presented the data collected from 2010-2011 at the 2012 National Association of County Agricultural Agents (NACAA), in South Carolina and at the Mid Missouri Grazing Conference in Jefferson City in 2014.

PROGRAM EVALUATION

I do not see a need to change the Farmer Rancher SARE program. The funding enabled me to evaluate an idea with the use of grant funds to gather the necessary data with assistance from extension, SWCD and NRCS staff. I was able to share information with other farmers in the state.