MANAGEMENT STRATEGIES FOR SOIL QUALITY

2016 Crop Summary

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Introduction

The 'Management Strategies for Soil Quality' study was established in 1993 by Dr. Don Tanaka to evaluate long-term impacts of minimum and no-till cropping systems on crop yield, precipitation use, and soil properties. The study was designed with six crop sequences (whole plot) each split by tillage type (split plot). All phases of each crop sequence are present every year, and treatments are replicated three times.

Beginning in 2012, three crop sequences were adjusted to reflect changing cropping practices in the northern Great Plains. Specifically, millet and safflower were replaced with corn and soybean, and rye (partial fallow) was replaced with a full season cover crop mixture (Table 1). Tillage treatments were left unchanged.

Table 1. Changes to Crop Sequences in Management Strategies for Soil Quality Study.

Sequence	Previous (1993-2011)	Present (beginning 2012)
1	Continuous spring wheat, straw chopped and spread	Unchanged (CSW+)
2	Continuous spring wheat, stubble left in place, straw removed	Unchanged (CSW-)
3	Spring wheat – millet	Spring wheat – soybean (SW-S)
4	Spring wheat – safflower - fallow	Spring wheat – corn – soybean (SW-C-S)
5	Spring wheat – safflower – rye (partial fallow)	Spring wheat – corn – cover crop, full season (SW-C-CC)
6	Spring wheat – fallow	Unchanged (SW-F)

Field Activities

On May 16 Roundup (24 oz/ac), Savvy (½ gal/100 gal), and UAN (2 gal/100 gal) were applied to the cover crop plots. Sharpen was then added (1.6 oz/ac) and all remaining plots were sprayed. Spring wheat was sprayed post-emergent on June 7 with Axial XL (16.4 oz/a) + Wolfpack (16 oz/a) + Headline (3 oz/ac). Corn, fallow, and soybean (2yr rotation only) plots were sprayed June 15 with Durango (24 oz/a) + surfactant. Volunteer (12 oz/ac) was then added to the tank and 3yr rotation soybean plots were sprayed where volunteer corn was a problem from last year's high wind causing significant ear drop. On June 23 continuous spring wheat plots were sprayed with Tacoma (5.3 oz/ac).

Table 2. Planting, fertilizer, and harvest documentation for 2016 crop year.

Crop	Planting date	Cultivar/ type	Planting rate – seeds/ac	Fertilizer – Urea & 11-52-0	Drill/ Planter	Harvest
Spring wheat	5/13/16	Glenn	1.3 million	60 lb N/ac recrop; 30 lb N/ac fallow + 10 lb P/ac.	JD750	8/16/16 hand harv. 8/22/16 combined
Corn	5/19/16	NuTech 5N-183 3000GT	24,500	90 lb N/ac + 10 lb P/ac	JD 1750	10/24/16 biom. harv. 10/27/16 combined
Soybean	5/20/16	Asgrow AG 0434	170,000	100 lb/ac 11-52-0	JD 1750	9/13/16 biom. harv. 9/21/16 combined
Cover crop	6/20/16	7-way mix	34 lb (total seed)	60 lb N/ac + 10 lb P/ac as 11-52-0	JD750	8/16/16 sampled 8/24/16 swathed

Crop Yield Summary

1. Seasonal precipitation from April through September was over 4¼ inches higher than the long term average (15.26 vs. 12.97in., Fig. 4). Average monthly temperatures were also higher than the long term average through the entire growing season (Fig. 5).

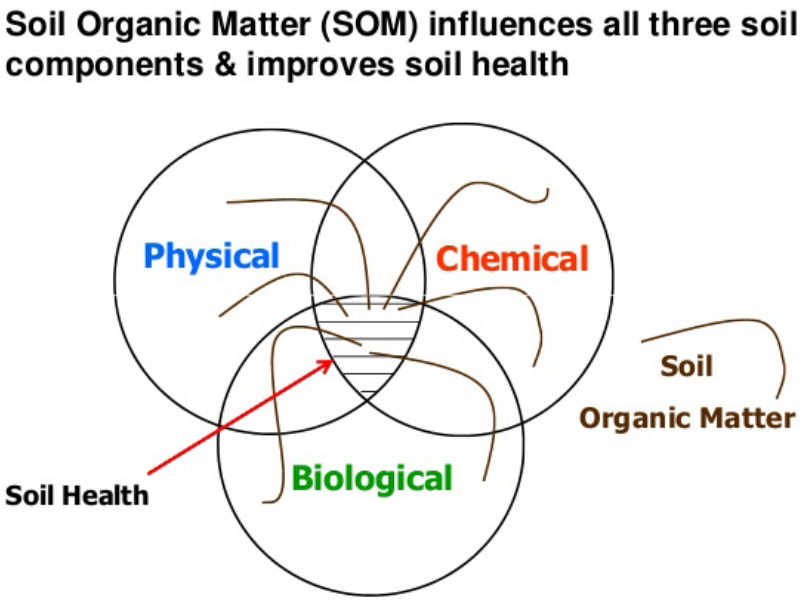
2. The 2016 season marked the fifth year after switching rotations within this study. The largest difference among the spring wheat yields was just under 15 bu/ac, ranging from 32.6 to 47.4 bu/ac; however test weights were consistently between 60 and 62 lb/bu. The two 2-yr rotations were the highest yielding with SW-S significantly higher than all other rotations except SW-F (Fig. 1).

3. Because of nearly an inch above normal precipitation in July (3.46 in.), corn yields averaged 114 bu/ac for both 3yr rotations (Fig. 2); however, test weights were generally low, ranging from 53.3 to 55 lb/bu.

4. Soybean yields were also high, averaging 42.5 bu/ac, but showed no difference between the two rotations (Fig. 2). Similar to corn, test weights were somewhat low ranging 57 to 58 lb/bu.

5. High rainfall also stimulated high cover crop biomass production (4740 lb/ac) which continues the steady upward trend in this treatment since the beginning of this new phase of the experiment (Fig. 3).

6. No significant differences in yield were found between the minimum and no-till tillage treatments.



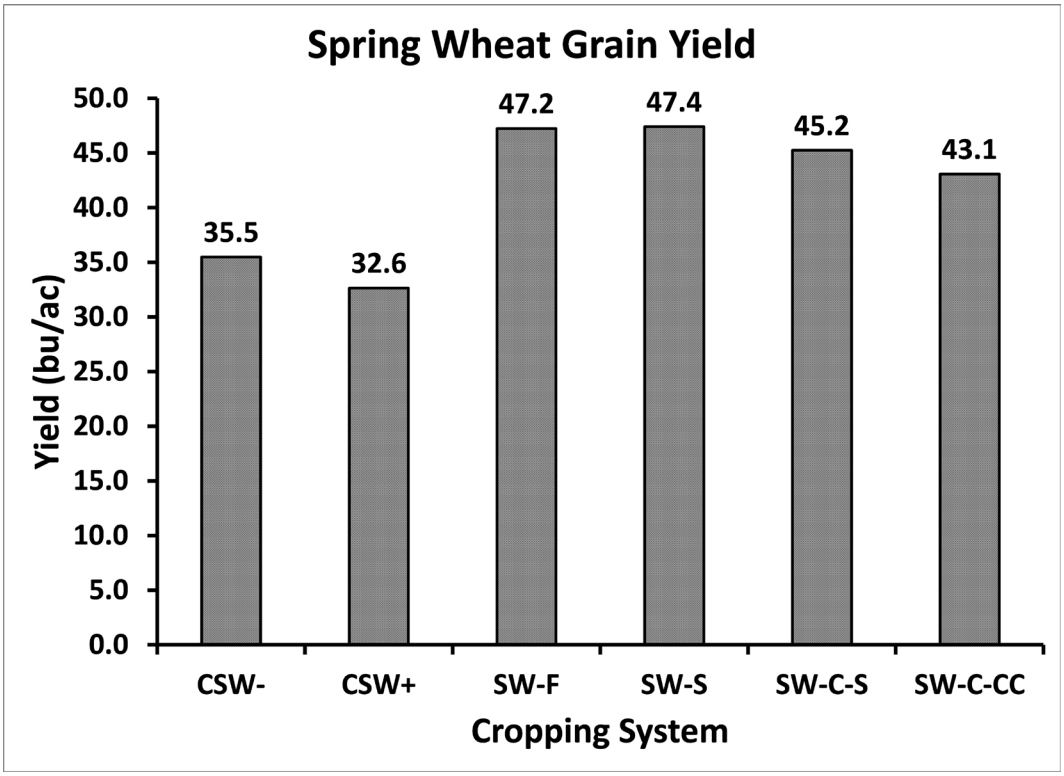


Figure 1. Spring wheat seed yield as influenced by cropping system. Yields are the average of minimum and no-till.

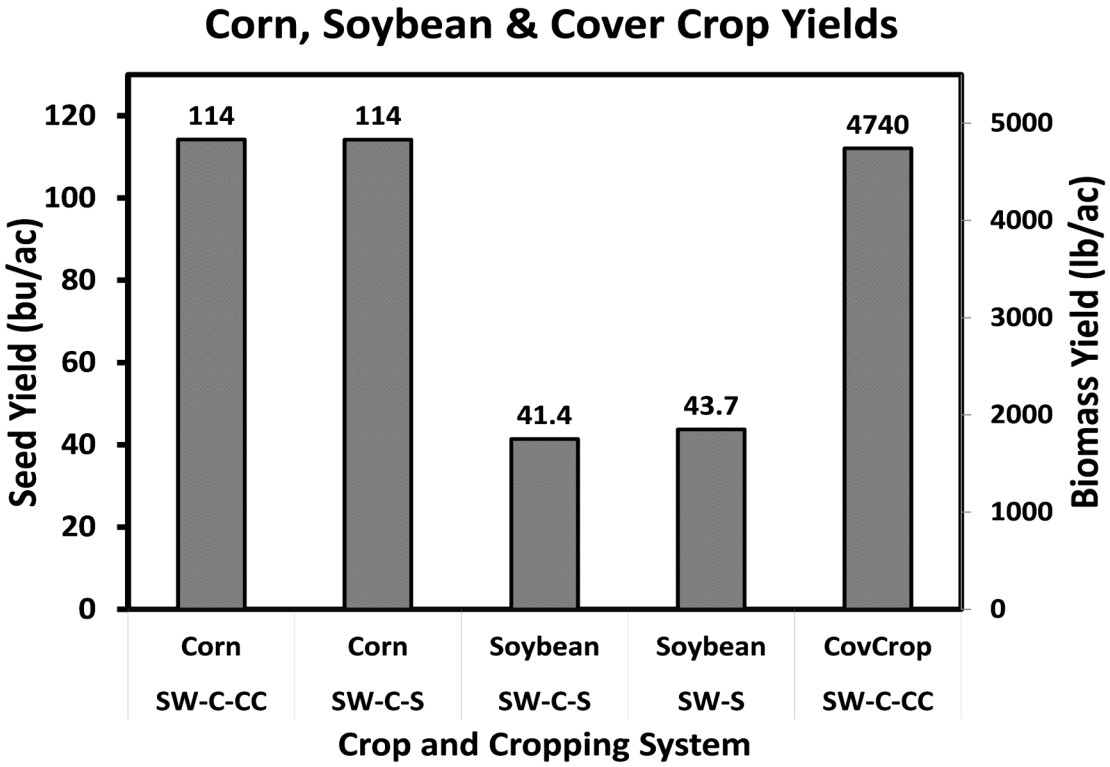


Figure 2. Corn and soybean seed yield and cover crop biomass yield within cropping system. Yields are the average of minimum and no-till.

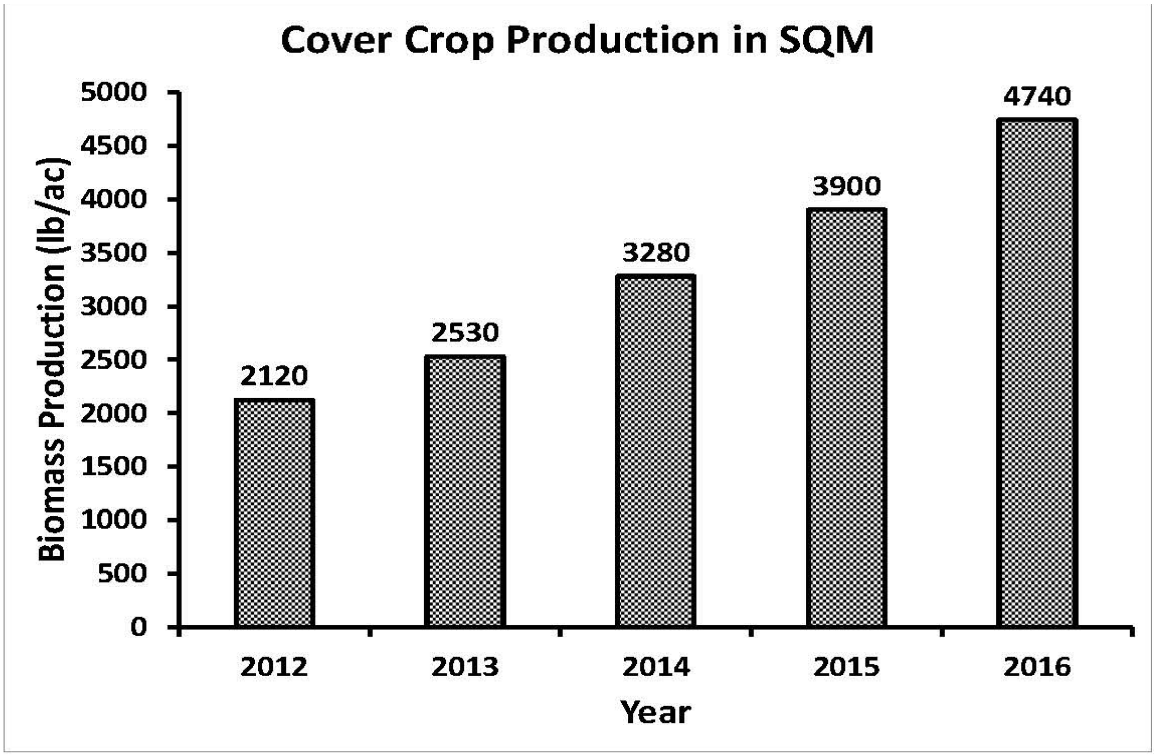


Figure 3. Production over time of cover crop treatment in the SQM study.