Management Strategies for Soil Quality – 2017 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

Wheat stubble plots were sprayed April 28 with Durango (32 oz/ac), 2,4D LV6 (16 oz/ac) and surfactant. The rest of the plots were sprayed May 4 with Durango (32 oz/ac) plus surfactant. Spring wheat was sprayed post-emergent on June 16 with Tacoma (8 oz/ac), Wolfpack (16 oz/ac) and Headline (3 oz/ac). Corn, soybean and fallow plots were sprayed June 20 and July 13 with Durango (28 and 24 oz/ac, respectively) plus surfactant. Due to weed and maturity issues, spring wheat plots were desiccated Aug 18 using Cornerstone 5 Plus (32 oz/ac). This was also applied to soybean and fallow plots. Minimum tillage treatment plots for each crop were tilled with a 14.5 ft. Mulch Master cultivator just prior to planting to a depth of 3 to 4 inches.

Table 2. Planting, fertilizer, and harvest documentation for 2017 crop year.

Crop	Planting date	Cultivar/ type	Planting rate – seeds/ac	Fertilizer – Urea & 11-52-0	Drill/ Planter	Harvest
Spring wheat	5/5/17	Glenn	1.3 million	60 lb N/ac recrop; 30 lb N/ac fallow + 10 lb P/ac.	JD 750	8/8/17 hand harv. 8/29/17 combined
Corn	5/25/17	Mycogen 2R158b	24,500	90 lb N/ac + 10 lb P/ac	JD 1750	10/12/17 biom. harv. 10/25/17 combined
Soybean	5/25/17	Mycogen 5B024 R2	180,000	100 lb/ac 11-52-0	JD 1750	9/26/17 biom. harv. 9/29/17 combined
Cover crop	6/12/17	7-way mix*	34 lb (total seed)	60 lb N/ac + 10 lb P/ac as 11-52-0	JD 750	9/1/17 sampled 9/1/17 swathed

* 7-way mix composed of triticale, proso millet, winter canola, sunflower, forage pea, soybean, and pasja turnip.

Crop Yield Summary

1. Seasonal precipitation from April through July was over 50% less than the long-term average (4.46 vs. 9.67 in., Fig. 5). Average monthly temperatures for the same period were slightly higher than the long term average (Fig. 6).

2. The 2017 season marked the completion of three cycles of the two year rotations and two cycles of the three year rotations in this new phase of the study.

3. Early season drought resulted in poor spring wheat yields with the wheat-fallow rotation yielding significantly higher than all other rotations (Fig. 1).

4. Corn and soybean yields were more resistant to drought stress than wheat (Figs. 2 & 3); however, test weights were low (51.7 to 54.4 for corn, 54.2 to 55.7 for soybean). Yields in no-till were significantly higher than minimum till for both crops.

5. Even though the cover crop treatment remained standing through the high rainfall in August, biomass production was not as high as 2016 (4290 vs. 4740 lb/ac, Fig. 4) indicating the importance of early season precipitation.

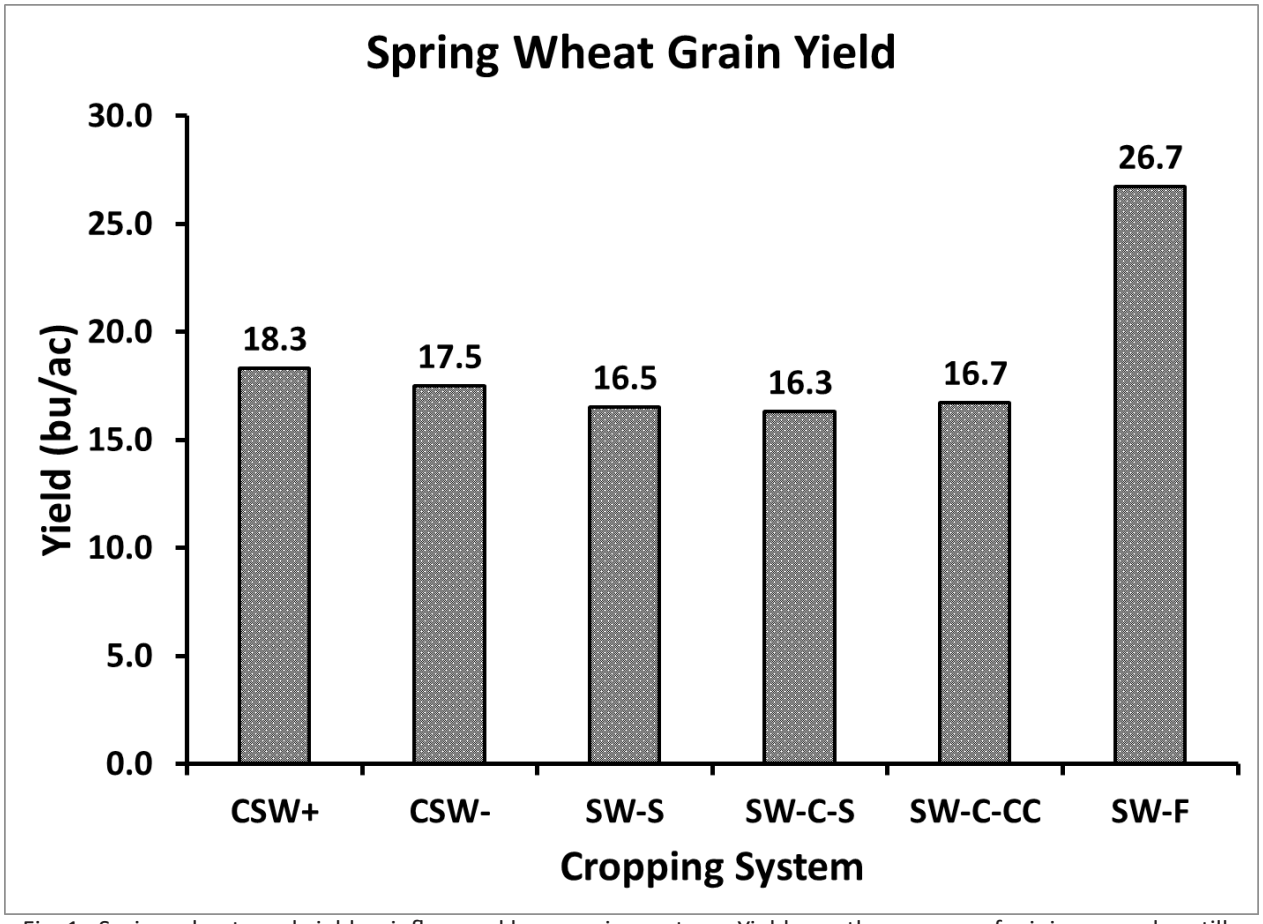

Fig. 1. Spring wheat seed yield as influenced by cropping system. Yields are the average of minimum and no-till.

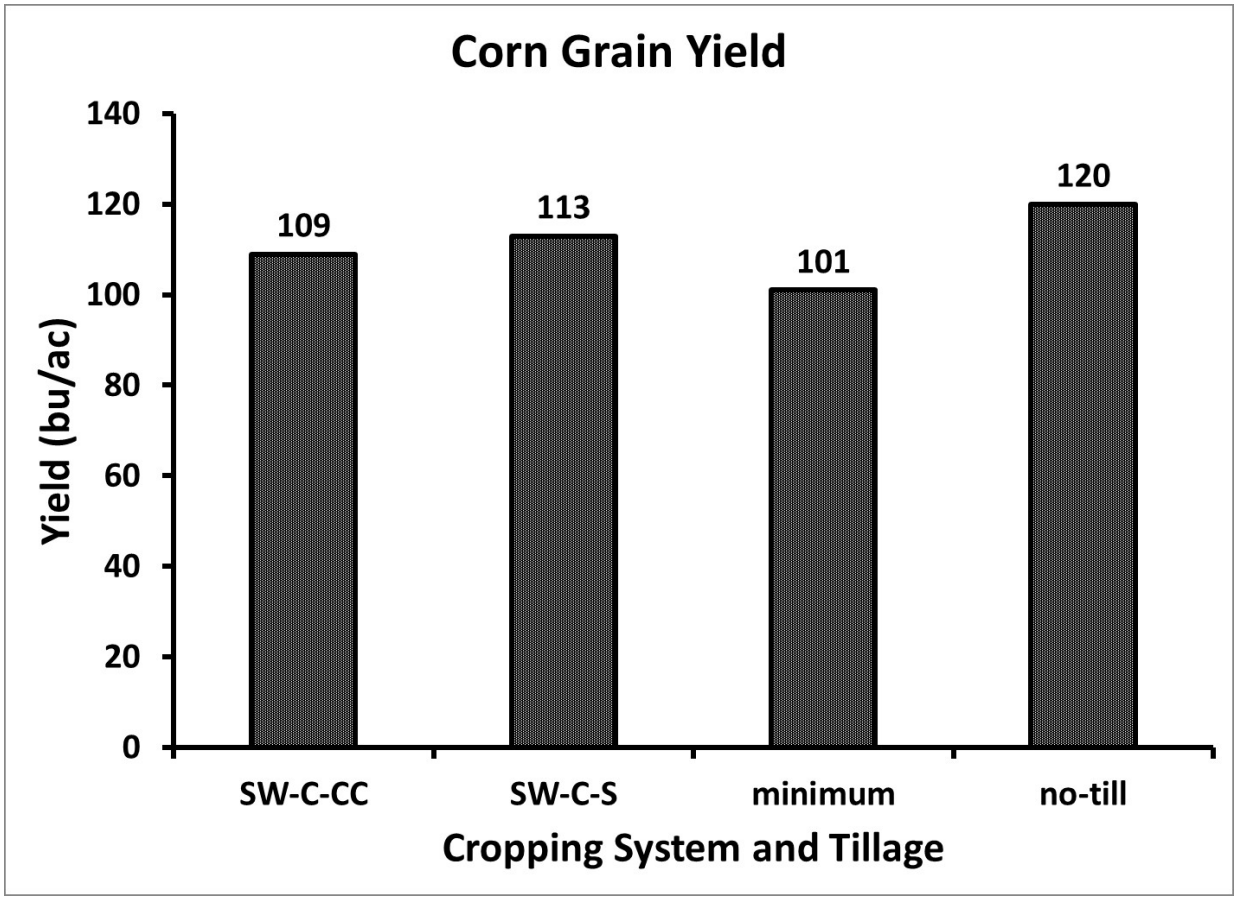

Fig. 2. Corn grain yield showing cropping system and tillage comparisons. Yields of cropping system are averaged across tillage and vice versa.

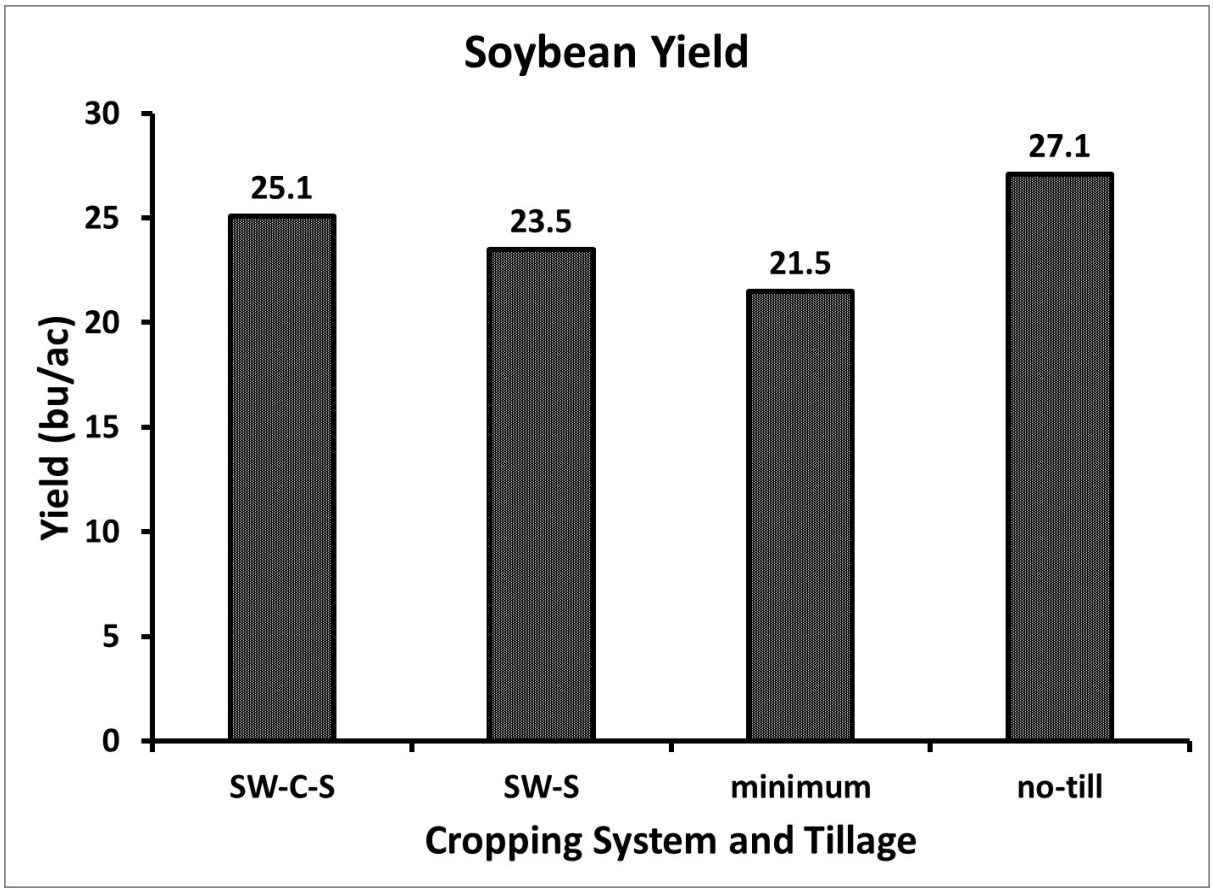

Fig. 3. Soybean yield showing cropping system and tillage comparisons. Yields of cropping system are averaged across tillage and vice versa.

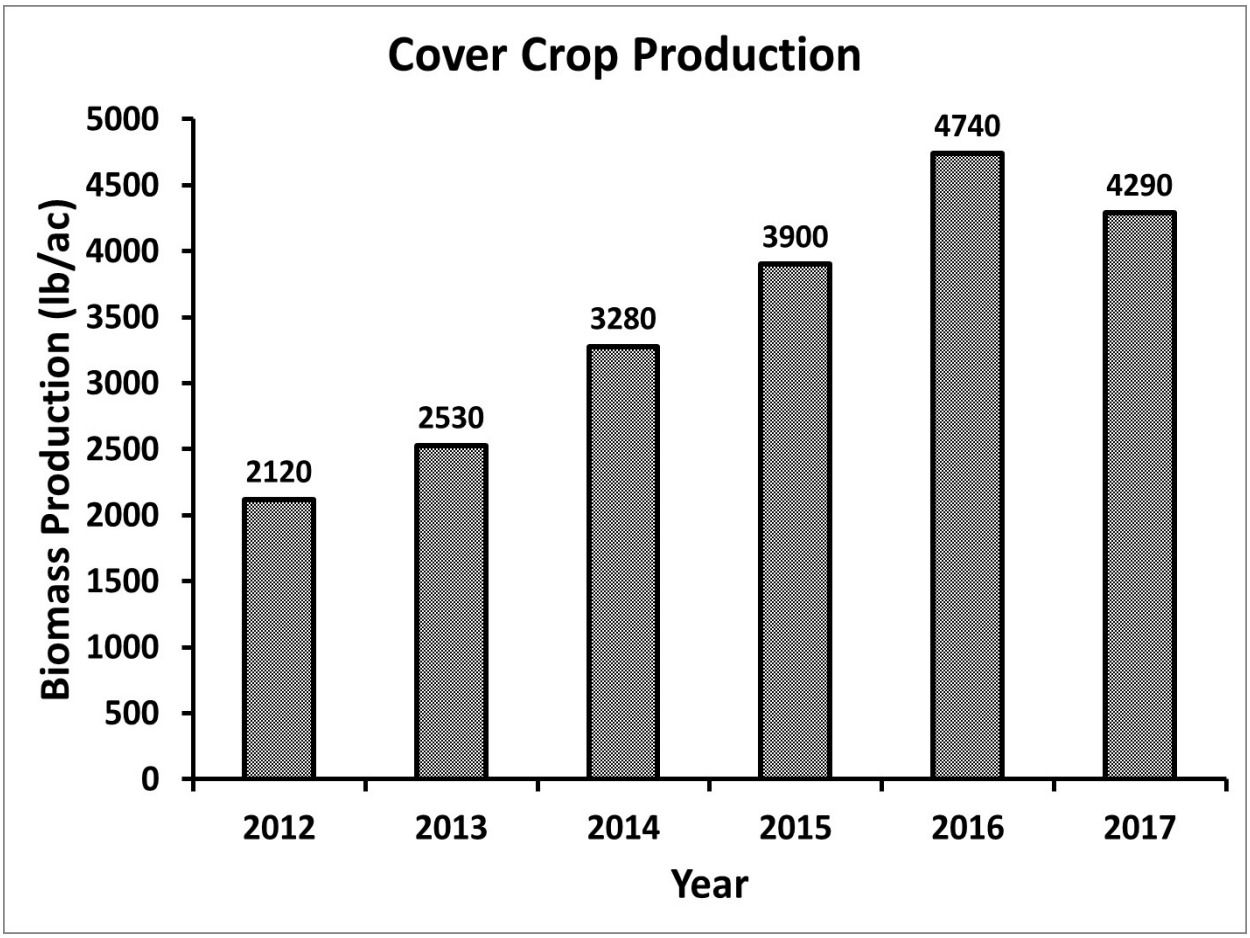

Fig. 4. Production over time of cover crop treatment in the SQM study.