MANAGEMENT STRATEGIES FOR SOIL QUALITY
2015 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

Due to very cool temperatures in early spring no early season blanket application of herbicides were applied on the plots. On May 21 Barbarian Max (20 oz/ac) and Sharpen (2 oz/ac) + surfactant were applied to all plots except those to be planted to cover crops. Cover crop plots and alleyways were sprayed on June 10 with Barbarian Max (24 oz/ac) + surfactant. Spring wheat was sprayed post-emergent on June 24 with Tacoma (8 oz/a) + Wolfpack (16 oz/a) + Headline (3 oz/ac). Corn, soybean, and fallow plots were sprayed July 7 with Barbarian Max (22 oz/a) + surfactant. Soybean plots were sprayed a second time on July 30 with Barbarian Max (24 oz/a). Minimum tillage plots planted to spring wheat were tilled May 26 (all plots except continuous wheat) and 27 (continuous wheat). Plots planted to corn, soybeans, and cover crops were tilled June 5th. A 14.5 ft. wide Mulch Master implement was used for all tillage.

On July 6 an additional amount of the small seeded species (proso millet, winter canola, and purple top turnip) were scattered in the cover crop plots at a rate of 3.8 lb/ac due to a non-uniform stand.

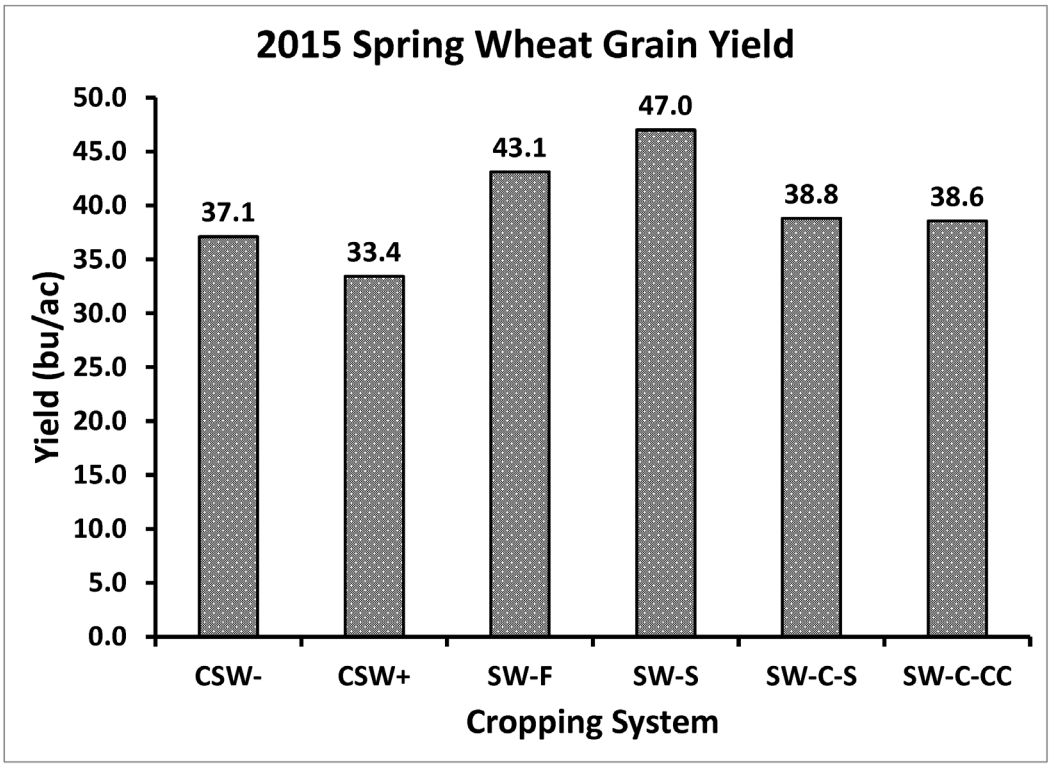
Table 2. Planting, fertilizer, and harvest documentation for 2015 crop year.

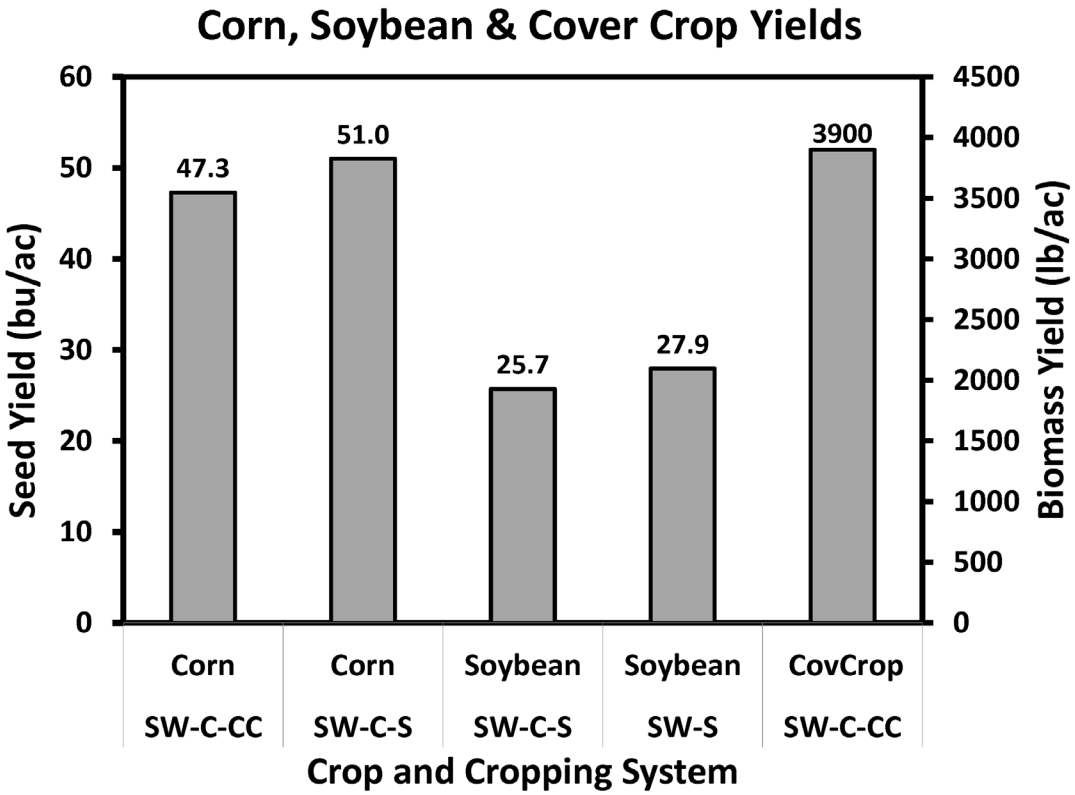
Crop	Planting date	Cultivar/ type	Planting rate – seeds/ac	Fertilizer – Urea & 11-52-0	Drill/ Planter	Harvest
Spring wheat	5/27/15	Glenn	1.3 million	60 lb N/ac recrop; 30 lb N/ac fallow + 10 lb P/ac.	JD750	8/19/15 hand harv. 9/2/15 combined
Corn	6/5/15	Pioneer P8107HR	24,500	90 lb N/ac + 10 lb P/ac	JD 1750	9/29/15 biom. harv. 10/23/15 combined
Soybean	6/5/15	Pioneer 90Y50	170,000	100 lb/ac 11-52-0	JD 1750	9/23/15 biom. harv. 10/14/15 combined
Cover crop	6/11/15	7-way mix*	34 lb (total seed)	60 lb N/ac + 10 lb P/ac as 11-52-0	JD750	8/17/15 sampled 8/18/15 swathed

* 7-way mix composed of rye, proso millet, canola, sunflower, forage pea, soybean, and purple top turnip.

Crop Yield Summary

1. The 2015 season marked the fourth year after switching rotations within this study. Thus, spring wheat returned to those same plots as in 2012 within the two 3-yr rotations, and two cycles were completed within the two 2-yr rotations. Differences among spring wheat yields spanned over 13 bu/ac, ranging from 33.4 to 47.0 bu/ac; however test weights were consistently high (most plots above 63 lb/bu). The two 2-yr rotations were the highest yielding with SW-S significantly higher than all other rotations except SW-F (Fig. .
2. Corn yields were low, in part, due to high winds in October, which caused an estimated 20% of ears to drop. There was no difference in corn yield between the two rotations (Fig. 2). Test weights averaged just under 56 lb/bu.
3. Soybean yields similarly showed no difference between the two rotations averaging about 26 bu/ac (Fig. 2).
4. This year also saw the continuing upward trend in cover crop biomass (3900 lb/ac) since the beginning of this new phase of the experiment (3280, 2530, and 2120 lb/ac for 2014, 2013, and 2012, respectively). This was again predominantly due to the cool season species in the mix (Fig. 2).
5. There were significant tillage effects on crop yields in 2015, with no-till soybean yield averaging 2.9 bu/ac higher than minimum tillage. However, no-till spring wheat yields were 4.1 bu/ac lower than minimum tillage yields. Corn yields were not significantly different between tillage systems.


2015 Spring Wheat Grain Yield
Yield (bu/ac)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
37.1
33.4
43.1
47.0
38.8
38.6
CSW-
CSW+
SW-F
SW-S
SW-C-S
SW-C-CC
Cropping System


Corn, Soybean & Cover Crop Yields
Seed Yield (bu/ac)
60
50
40
30
20
10
0
Biomass Yield (lb/ac)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
47.3
51.0
25.7
27.9
3900
Corn
SW-C-CC
Corn
SW-C-S
Soybean
SW-C-S
Soybean
SW-S
CovCrop
SW-C-CC
Crop and Cropping System