

# Alternate Weed Control Strategy in Sorghum Utilizing Companion Crops

## Final report for ONC19-065

Project Type: Partnership

Funds awarded in 2019: \$32,187.00

Projected End Date: 03/31/2020

Grant Recipient: No-Till On The Plains Inc

Region: North Central

State: Kansas

Project Coordinator:

[Steve Swaffar](#)

No-Till On The Plains Inc

## Project Information

### Summary:

Grain sorghum is a primary crop in the High Plains and is frequently planted in a no-till system. Weed management in all cropping systems is expensive for farmers due to fuel and/or herbicide costs. Kansas has documented resistance in 15 species, to six different modes of action<sup>1</sup>. Even in the most diverse cropping systems, weed management is expensive. Four Kansas farmers will plant grain sorghum with a mix of companion crops selected specifically to suppress weed emergence and growth. Each grower will plant 15 dryland acres of the sorghum/companion mix adjacent to a field with only sorghum. The companion crops will be selected to suppress both the density and biomass of weeds. Each plot will be located in a cover-cropped, no-till field. Cover crops will be terminated at (or just prior to planting), before the sorghum/companion mix emerges. No pre-emergent herbicides with residual will be used. Herbicides or insecticides will not be used during the growing season. Comparisons will be made to the adjacent fields. Soil health will be analyzed by studying different indicators that demonstrate improvement. Soil moisture levels will be measured to assess the water use of the companion crops versus the weeds.

### Project Objectives:

- Demonstrate appropriate companion crops can be a viable weed management alternative
- Provide demonstration plots available for others to observe and host field days
- Document results of yield variance and economic differences between companion plots and non-companion fields along with soil health benefits (ie: total carbon, infiltration, bulk density, penetration resistance, soil respiration, and macro-invertebrate population counts)
- Measure the difference in available soil moisture for the sorghum inside and

outside of the plots over the growing season

- Share results of the project through the No-till on the Plains network of producers and professionals

## Cooperators

- [Candy Thomas](#) (Educator)

[candy.thomas@usda.gov](mailto:candy.thomas@usda.gov)

Regional Soil Health Specialist

USDA-NRCS (Government agency)

760 S. Broadway

Salina, KS 67401

(785) 823-4553 (office)

## Research

### Materials and methods:

Sorghum will be planted with companion crop species to suppress weeds in lieu of crop protection chemicals. The companion crop mix was designed to provide weed suppression. No-till on the Plains will work with the participating producers and a cover crop seed provider to determine the best species to meet the needs of the project objectives. Most of the companion species/mixes will be kept consistent at all of the sites, but if there are particular species that are better adapted to the local area or moisture conditions, those may be substituted or added to the mix.

The sorghum/companion plots were planted separately, but synchronized with (May/June 2018) the rest of the sorghum field. The plot acres will receive the same pre-plant treatments as the rest of the field. Once planted the plots will not receive any applications of herbicides, insecticides or post-plant fertility.

Collection of soil samples and analysis for improvement in soil health indicators will be taken to determine the benefit of using the agro-ecological principles vs the conventional system and presented at the field day and the 2020 No-till on the Plains Winter Conference.

Soil moisture probes will be used at two of the sites to determine water use by the companion crops. One probe will be placed inside the plot, another probe outside the plot.

### Research results and discussion:

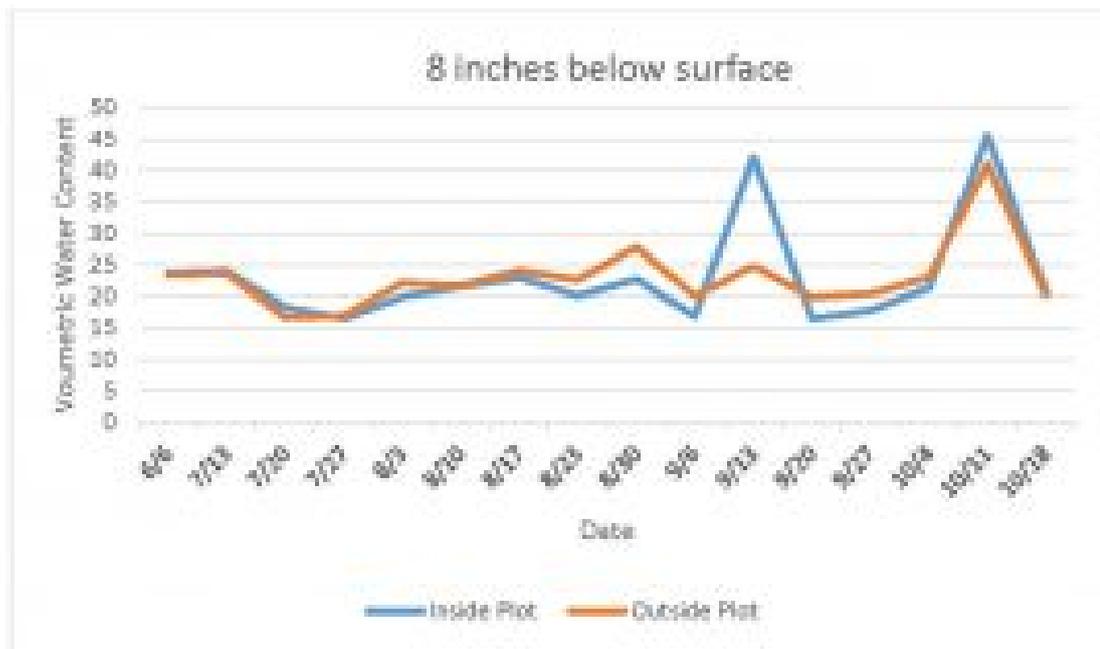
#### Yield Results

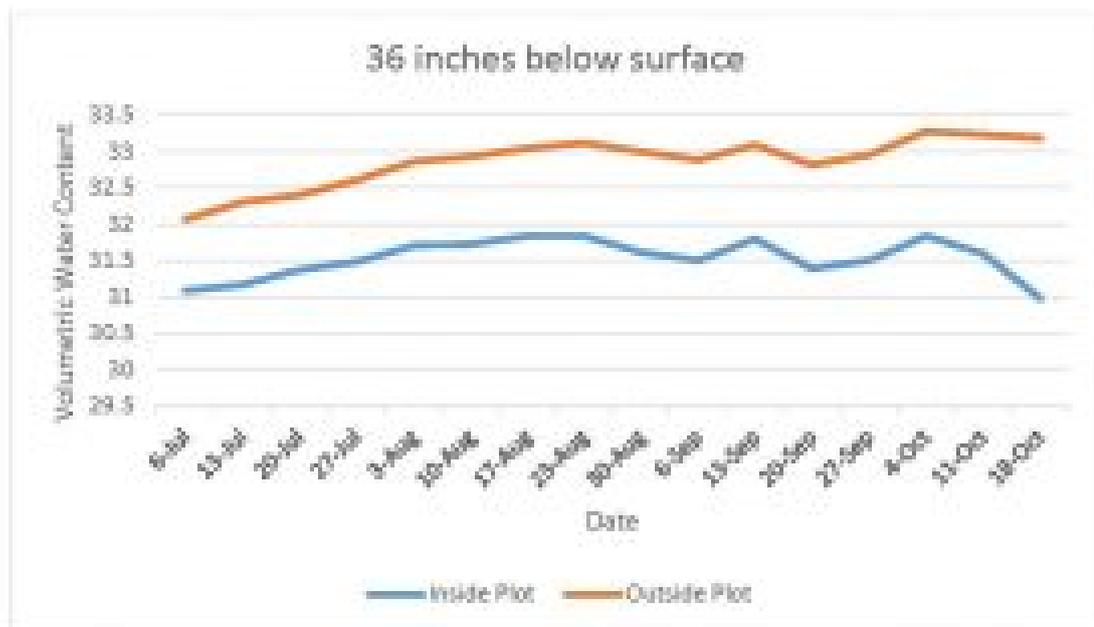
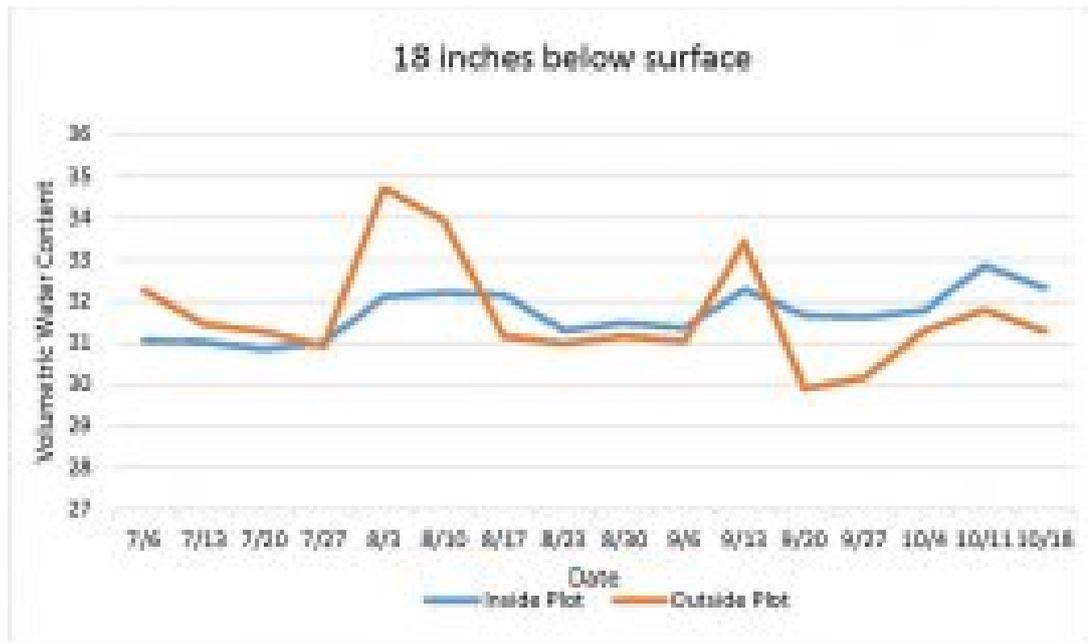
Site	Yield Inside Plot, bu/acre	Yield Outside Plot, bu/acre
Ford County	70	78
Mitchell County	71.7	77.2
Osage County	24.84	35.29
Saline County	103	121

Table 2. Soil Sampling Results Inside and Outside the Test Plots

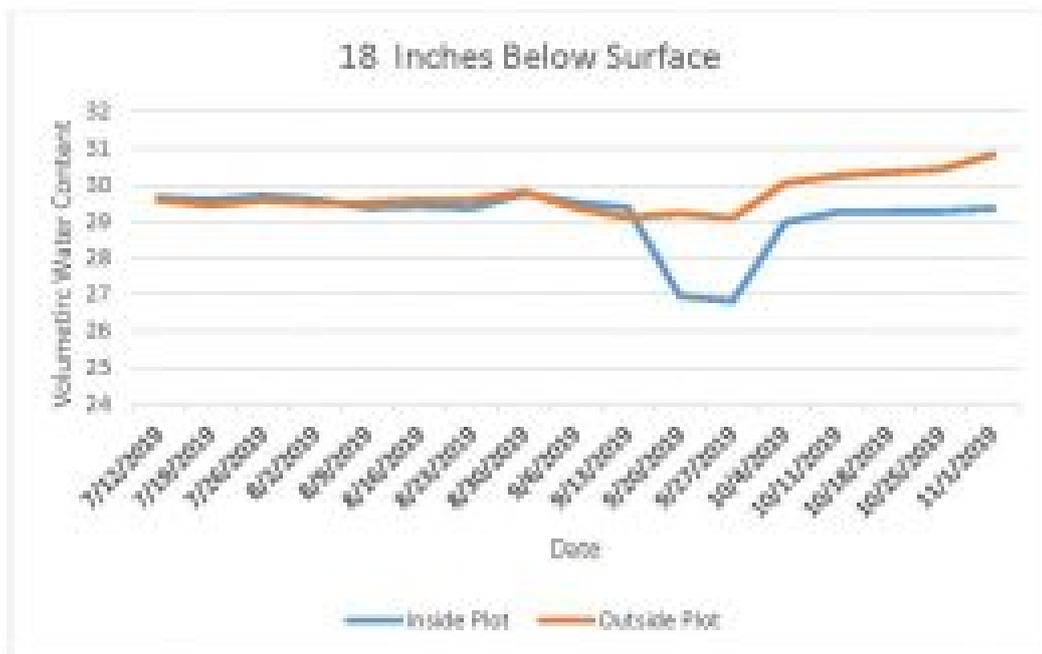
		July 19			November 19		
Sample	Management	% Aggregates	Total Carbon	Active Carbon	% Aggregates	Total Carbon	Active Carbon
Mitchell Co	No Companion Crops	58.84	2.5	493	36.66	2.0	415
	Companion Crops	53.47	2.2	477	22.63	2.1	440
Ford Co.	No Companion Crops	69.42	2.9	479	64.03	2.7	406
	Companion Crops	25.13	1.2	344	18.29	1.4	369
Osage Co.	No Companion Crops	64.05	2.7	678	54.99	2.0	676
	Companion Crops	57.22	3.3	687	58.65	1.4	703
Saline Co.	No Companion Crops	26.75	2.5	556	28.03	2.0	528
	Companion Crops	26.33	2.6	530	16.79	1.8	432

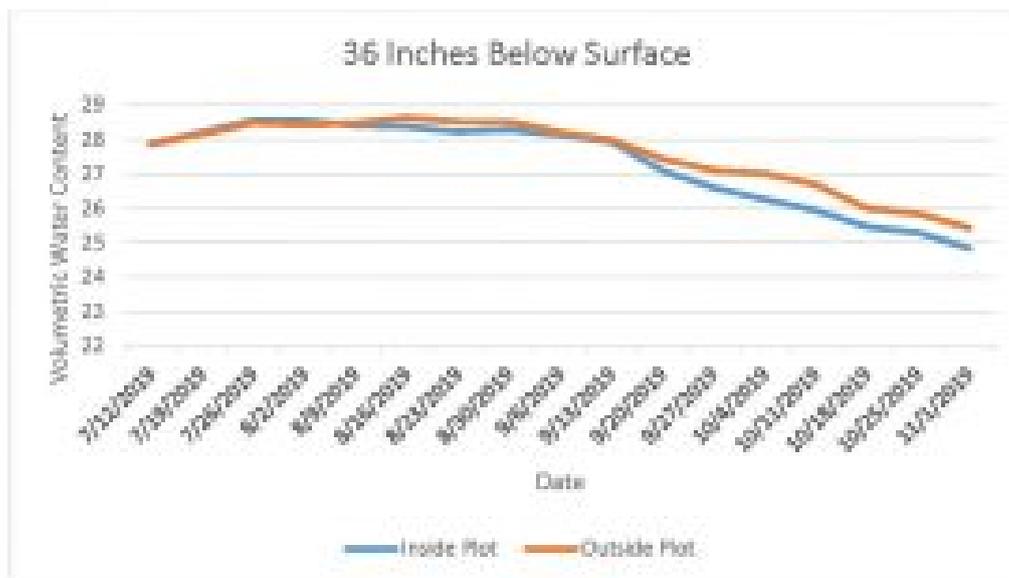
Osage County Soil Moisture Results





Mitchell County Soil Moisture Results





### General Observations from the Project

- Planting date makes big impact on the success of this combination
- Pre-plant soil cover maybe the most important factor for early weed control without a quick germinating companion species
- Plot with companion crops did show greater moisture use even with early saturated soil conditions
- The mix did have positive benefits on weed populations in some of the demonstration plots, but not in every case
- Companion mix did have benefit to soils

### Participation Summary

4 Farmers participating in research

### Educational & Outreach Activities

2 Curricula, factsheets or educational tools

4 On-farm demonstrations

1 Published press articles, newsletters

2 Tours

1 Webinars / talks / presentations

2 Workshop field days

## **PARTICIPATION SUMMARY:**

**175** Farmers

**15** Ag professionals participated

Education/outreach description:

Education/outreach description:

Field day in Glen Elder, Kansas

62 individuals attended a field day featuring one of the sorghum/companion plots on Doug Palen's farm. Participants were given the opportunity to view and walk in the 15 acre plot, along with the rest of the field. Each of the companion species was identified along with the differences in soil and insect communities. Doug's plot had a significant amount of weed pressure on the edges but not excessive. The group also observed other fields of Doug's sorghum, several corn management plots, and a field that has been planted to a perennial mix for grazing. NRCS regional soil specialist Candy Thomas presented several soils demonstrations showing the benefits of soil residue, soil structure and long-term no-till versus conventional tillage methods.

Field day in Osage City, Kansas

55 individuals attended a field day featuring one of the sorghum/companion plots on Keith Thompson's farm. Participants were given the opportunity to view and walk in the 15 acre plot, along with the rest of the field. Each of the companion species was identified along with the differences in soil and insect communities. Keith explained how the field had been previously grazed, planted to a cover crop then grazed in the spring. Extremely wet conditions kept Keith from planting his sorghum until June 29. The group also toured Keith's sunflower companion crop field and a field planted to a perennial mix for grazing. NRCS regional soil specialist Candy Thomas presented several soils demonstrations showing the benefits of soil residue, soil structure and long-term no-till versus conventional tillage methods.

2020 No-till on the Plains Winter Conference

Sixty individuals attended the one-hour breakout session on January 29, 2020 at the No-till on the Plains Winter Conference. The four cooperators and Candy Thomas presented the results of the project. Each producer shared his experience with growing the companions and perspective for using the practice in the future. Candy Thomas talked about the soil sampling results. All 5 answered numerous questions at the end. Here's the summary presentation from 4 cooperators and soil health specialist for 2020 No-till on the Plains Winter Conference: [SARE-presentation](#)

## **Learning Outcomes**

**112** Farmers reported changes in knowledge, attitudes, skills and/or awareness as a result of their participation

Key changes:

- Most of the attendees at the field days and Winter Conference had never seen companion cropping before the field days. Several had never heard of the practice. Awareness of the opportunities for this type of production was greatly increased.

## Project Outcomes

**20** Farmers changed or adopted a practice

**2** New working collaborations

Project outcomes:

The concept of using a living plant to replace crop protection chemicals is one that is gaining momentum. Driven by the economic realities of crop production and the increasing questions by the consumer public, producers are looking for alternatives and seeking out more information about soil health and ecosystem services.

These types of demonstrations make these concepts more readily accessible to the local producers.

## Information Products

- [Alternative Weed Control Strategies in Sorghum Using Companion Crops \(Fact Sheet\)](#)

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This site is maintained by SARE Outreach for the SARE program and is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award No. 2019-38640-29881. SARE Outreach operates under cooperative agreements with the University of Maryland to develop and disseminate information about sustainable agriculture. [USDA is an equal opportunity provider and employer.](#)