# Sorghum Sudangrass Residue as Mulch for No-Till Organic Tomatoes


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**Key Findings**

- Even with 10,000 or more pounds of dry cover crop biomass in the fall, the remaining spring residue covered only 20% - 60% of the ground and was not adequate for use as a no-till mulch.
- Rolling the sorghum sudangrass with a disengaged tiller just prior to frost was quick, easy, and did a good job of aligning the residue.
- Sorghum sudangrass smothered not only weeds but also the sunn hemp and cow peas planted as leguminous companion cover crops.
- The sunn hemp attracted Japanese beetles, which makes it a less desirable cover crop on farms with vegetables that are susceptible to Japanese beetle damage.

Project Timeline:
2016—2017

## Background

Using cover crops to create an in situ mulch is one way that organic farmers can explore no-till techniques. While there has been some success with organic no-till row crops, organic no-till vegetables remain a conundrum. Inadequate weed control, narrow cover crop termination windows, and planting delays related to termination are all challenges. This project explored the use of season-long managed fallow concluding with high-residue, winter-killed cover crops to create a weed free mulch that does not need exact timing or special equipment for termination. The primary cover crop was sorghum sundangrass, which is known for producing large amounts of biomass. Farmer cooperators chose tomatoes as the vegetable crop because they generally benefit from mulch and have high value.

## Methods

Three diversified vegetable farms in Dane County, Wisconsin participated in this project. All the farms are certified organic. Following two rounds of weed-smothering cover crops, each farm was planted to three replicates of three treatments (1) sorghum sudangrass, (2) sorghum sudangrass and sunn hemp, and (3) sorghum sudangrass and cow peas. The control was sorghum sudangrass to be managed with conventional tillage and plastic mulch.

Timeline 2016

- 4/26: Broadcast seeded oats (80 lbs/acre) and chickling vetch (50 lbs/acre); tilled to kill weeds and work in seed.
- 6/20: Mowed oats and chickling vetch; seeded buckwheat (80 lb/acre); tilled to kill oats/vetch and work in seed.
- 7/13: Broadcast seeded sorghum sudangrass (80 lb/acre), sunn hemp (80 lb/acre), and cow peas (80 lb/acre) into standing buckwheat according to randomized treatment plot map; tilled to kill buckwheat and work in seed.
- 7/27: Reseeded Blue Moon and Crossroads where sorghum sudangrass did not germinate well.
- 10/4: Rolled cover crops with a disengaged rotovator to knock over and align biomass into an even mulch mat.

Population counts and biomass for weeds and all cover crops were recorded just before termination of the oat/ chickling vetch mix and the buckwheat. Population counts for weeds and cover crops were taken within two weeks of germination in the final treatment plots and again just prior to rolling.

## Results

*Smothering Effect of Sorghum Sudangrass*

Weed population counts taken just before rolling the sorghum sudangrass showed that weeds were well controlled. The average weed count on all farms over all treatments and reps two weeks after germination of the final treatment plots was 11.6 weeds/square foot. Just before rolling, the average weed count was 2 weeds/square foot, thus indicating that the sorghum sudangrass did act as an effective smother crop.

Unfortunately, the sorghum sudangrass also tended to smother out both the sunn hemp and the cow peas that were used in treatments 2 and 3. The average sunn hemp population count on all farms two weeks after germination was 10.3/square foot; for cow peas the number was 6.4/square foot. Just before rolling, the average sunn hemp population count on all farms was 2.6/square foot; for cow peas the number was 1.6/square foot.

*Sorghum Sudangrass Biomass and Residue*

A thick mulch layer is key to suppressing weeds in the cash crop production season. The goal was to produce at least 10,000 lbs. of cover crop dry matter per acre to allow for some decomposition over winter and to have an adequate mulch layer in place for the following cash crop season. Just before rolling, the average dry matter per acre across all farms and treatments was 13,165 lbs. All plots on all farms produced more than 10,000 lbs. dry matter per acre with the exception of two plots producing just 7,577 lbs. and 9,088 lbs. The high end of the range was 19,693 lbs dry matter per acre.

*Sorghum sudangrass mulch mat, post rolling. Blue Moon Community Farm 10/4/16*

*Sorghum sudangrass residue did not provide adequate weed control for no-till planting. Equinox Community Farm 5/12/17.*

Visual inspection of the plots just before scheduled tomato planting in May 2017 showed that the remaining cover crop residue was covering only 20% to 60% of the ground leaving a high percentage of the soil exposed. Weed population counts at the same time averaged between 8 and 37 weeds per square foot, depending on the farm. Finally the cover crop biomass had dropped dramatically on all the farms (Figure 1). The warm February 2017 temperatures and the wet spring likely contributed to accelerated decomposition. Clearly the remaining residue would not be enough to suppress weeds during the tomato cropping season.

| Sorghum Sudangrass Dry Biomass lb/acre | | |
|---|---|---|
| | 9/29/16 | 5/25/17 |
| Blue Moon | 9,842 | 3,628 |
| Equinox | 11,565 | 4,069 |
| Crossroads | 17,470 | 3,002 |

Figure 1: Sorghum sudangrass dry biomass measured in lb/acre. Samples were taken just before the first fall frost and again the following May.

*Sorghum sudangrass residue did not leave an even mat where fall winds caused the cover crop to lodge before rolling. Crossroads Community Farm 5/11/17.*

Based on these observations and numbers, the farmers and researchers decided to abandon the original project prior to tomato planting. Instead the project pivoted to a comparison of mulches used with no-till planted tomatoes. (See "Plastic, Fabric, and Marsh Hay Mulch with No-Till Organic Tomatoes")

## Recommendations for Farmers

1. A disengaged rotovator can work to knock down and align sorghum sudangrass residue just prior to frost. Since the cover crop will winter-kill, the action of the disengaged rotovator is not to terminate the crop, but simply to create an aligned mulch mat that will be easy to plant into the following spring.
2. Fall winds can cause the sorghum sudangrass to lodge prior to rolling, making it difficult to create an even mulch mat. Rolling prior to predicted windy conditions may be beneficial.
3. Though sorghum sudangrass can produce a great deal of biomass, and is easy to align in the fall, the resulting mulch layer will not likely be enough to prevent weeds the following season. It may be suitable for no-till vegetable crop management if additional mulch is used to smother weeds.
4. Be cautious of seeding cow peas or sunn hemp as leguminous companions with sorghum sudangrass. The sorghum sudangrass can smother these crops in addition to the weeds.
5. Be cautious of using sunn hemp as a cover crop if you grow crops that are susceptible to Japanese beetle damage.

*Rolling sorghum sudangrass with a disengaged rotovator. Equinox Community Farm 10/14/16.*

*Japanese Beetles on sunn hemp 8/3/16.*