Managing Sorghum Sudangrass as a Rotational Crop

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Most of the research to figure out how to effectively incorporate sorghum sudangrass into a production system was done on onions. This does not mean that the results are good only for onions on organic soils. We have done the same work on potatoes and other upland crops and found similar results.

There are close to 5600 acres of onions grown on organic soils in Orange County, New York. Over the years, onion growers have expressed an interest in learning ways to increase fertility of their high organic (muck) soils. In some cases, fields have been in uninterrupted onion production for two or more generations. One idea is using Sorghum/Sudan grass (Sudex) as a summer cover crop. The goal of these field trials with Sorghum/Sudan grass were to figure out all the basic management considerations and document the positive and negative results. Trials initially concentrated on cultural practice questions. How do you manage the residue? How do you keep the plants from getting woody? how to get the most root growth, etc. were addressed. After 6 years of in field trials, here is what we have learned:

• Handling the large bio mass of Sudangrass takes some management. Planting rates must be adequate to smother out weeds. Mowing when the sudangrass is 2 feet tall stimulates tillering and root penetration. Fields need to be cut and incoorporated down before frost in the fall to avoid trash and nitrogen deficiency problems the following spring.

• crops following Sudangrass can expect a 20-35% average increase in stand counts.

• An average 20% increase in yield can be expected.

• Following a Sudangrass rotation, growers can reduce onion planting rates by 15-20%.

• Quality was better in the Sudangrass fields as compared to the continuous onion fields. Given the varying weather conditions, these results must be considered very good. Onion growers who employ the Sudangrass rotation say the onions following Sudangrass are their best onions. The growers also said they felt the numbers we found in our test plots were low. For most years, the growers felt they received an even bigger yield response than what we found in the test plots.

• Two years after a Sudangrass rotation, yields and stand counts were still positively affected but decreased slightly from first year after rotation.

• With a five year whole farm rotation, a grower will be ahead on return plus savings on onion seed, labor and pesticides.

Sudangrass trials were initiated in 1993. Growers who have used sudangrass always say it gives a significant yield increase. In 1996 and 1997, we conducted on-farm harvest evaluations, comparing onion yields in fields following sudangrass with onions from fields of continuous,

unbroken onion production. These two year results showed a range of yield increase from 15%-45%. Stand counts in rotated fields ranged from 30-90% higher.

We have also looked at the long term positive effects of sudangrass rotation. We evaluated onion fields two years after a sudangrass rotation. It appears there is still a significant yield and stand count increase, but it is not as great compared to the first year after rotation. We found an average yield increase of 18% and a 13% increase in stand counts. With increased water penetration, better aeration in the root zone and increased organic matter, onions grow better.

We did find a difference concerning black mold. In four out of five comparison plots black mold was higher in non-rotated fields than rotated fields. As might be expected, stand counts and yields were higher in rotated fields while size was slightly smaller in rotated fields considering the greater stand counts.

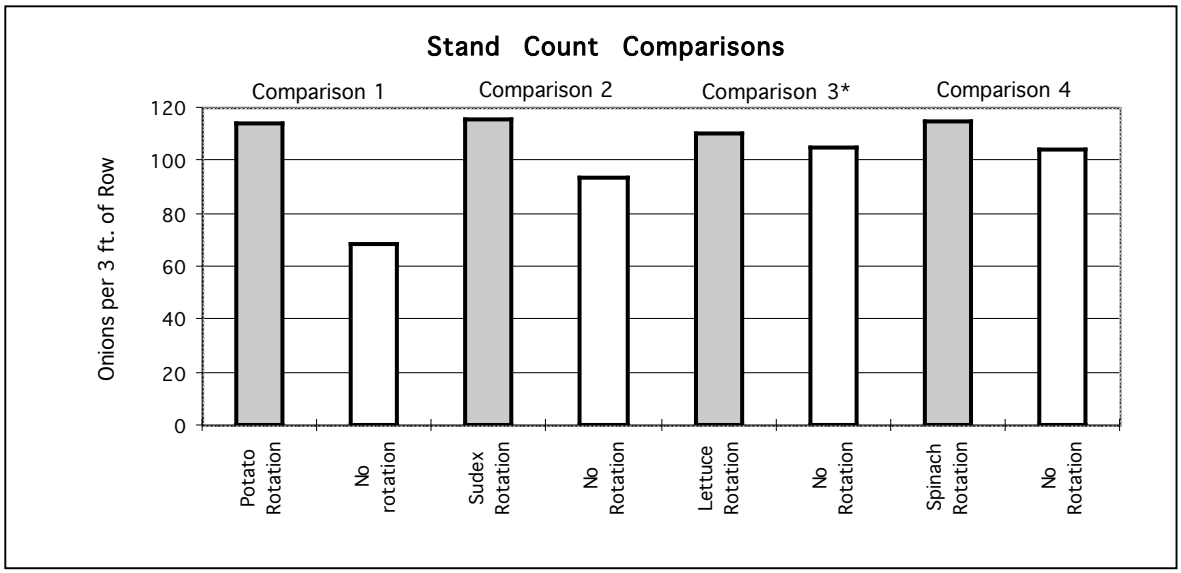
Rotation Comparison:

Comparison 1 - Potato rotation
Comparison 2 - Sudangrass rotation, two fields averaged together
Comparison 3* - Lettuce rotation, not comparable soils
Comparison 4 - Spinach rotation

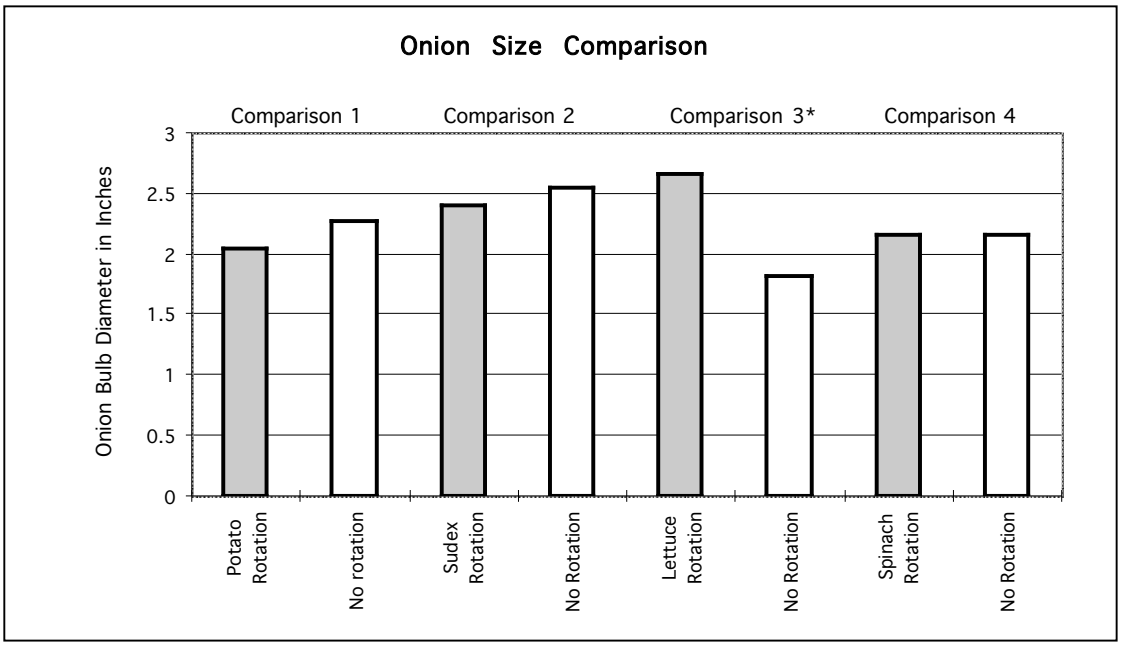
It almost goes without saying, all four rotational crops gave a yield increase over non-rotation. It always helps to break the same-crop cycle. We've learned from previous years the impact from rotation will be greater the poorer the soil. The better the soil, the less difference you will see between rotation and non-rotation. Still, across the board, rotation gave significant yield and stand count increases in all 5 comparison plots

When looking at any yield results, the weather conditions have to be considered. The summer we did this trial was very dry. In total yield, sudangrass was almost 7% higher than the next closest rotation crop (spinach). The percent difference between rotation and non-rotation was also highest with sudangrass, 30% compared to the next best yield increase of 13% with the spinach rotation. Talking to all the growers about the trial, each grower said yield results are not as high on dry years as compared to wet or normal years. Rotated onions will do much better with normal moisture levels.

<u>Stand Count Comparison:</u> Again the stand counts are all greater in rotated fields compared to non-rotated fields. It is interesting to note how all the rotation stand counts range between 110 and 115 plants per 3 ft. of bed. They are consistent. The non-rotation stand counts range from 68 to 104 plants per 3 ft. of bed. With rotation, basically, what's planted is there at the end of the season. With non-rotation, plants are lost due to a variety of disease problems.



Onion Size Comparison: Onion size in relation to rotation is a little harder to analyze. The first thing to look at is the stand count. When the stand count is high, there are more onions and size can be affected. With rotation, the onions are growing with more vigor and sizing up better. In general, size is not that much smaller and the total yield is greater to make up the difference. For example, yield is 30% greater with sudangrass rotated onions averaging 2.4 inch bulbs compared to a 2.55 inch average for non-rotation. The higher stand counts have been consistent with all our previous tests. We feel a 10-20 percent decrease in planting rates after rotation will maintain adequate bulb size.



Any rotation is better than no rotation. If a grower can manage moving a percentage of their onion crop into rotation, than the following years onions will be better. Growers have to make the decision. While sudangrass gives the most onion return, it may not be practical to sacrifice a year out of onions. A ballpark gross return per acre for processing spinach is $800-$1300. With overproduction everywhere, potatoes are hard to sell, but a ballpark estimate of gross return is $2400-$2900. Lettuce (salad mix) gross return is $4500-$5500 but you have to factor in the high cost of hand labor. The actual return may not be as high and the market is soft with competition

from California and Canada. With gross return for onions between $3000-$4500, there are no easy answers to the rotation problem.

Fall Cover Options

Over the last few years, onion bulb mites have increased as a problem. Growers feel the mites over-winter on the traditional grass cover crops of oats and barley. This study attempted to evaluate alternative fall planted cover crops. Annual crimson clover, field peas, yellow mustard, hairy vetch, marigold and buckwheat were evaluated. Three growers in the onion growing region of Orange county and one grower from Oswego participated. Plots were 90' by 90' and replicated 3 times. We evaluated for ease of establishment, root depth, bio mass and trash levels in the following spring. Prof. Dick Straub evaluated these crops as over-wintering hosts for bulb mites.

Fall Cover Crop

The disease and insect cycle needs to be broken by some crop and the reason annual crimson clover, field peas, yellow mustard, hairy vetch and buckwheat were selected for evaluation is because they each have strengths. There may not be a "silver bullet" rotational cover but by looking at different crops, it is possible a specific crop may work for a specific grower.

	Planting date	top growth	root length	cost per acre
Field one	8/30/01			
Field peas		12"	6"	$150-200
Hairy vetch		7"	5"	$140
Yellow mustard		21"	5"	$6
Buckwheat		16"	5"	$32
Crimson clover		2"	4"	$80
Field two	9/4/01			
Field peas		8"	5"	
Hairy vetch		3"	2"	
Yellow mustard		13"	4"	
Buckwheat		8"	4"	
Crimson clover		2"	3"	

Conclusions

All the participating growers were surprised at how well the cover crops established in the fall. The growers were also happy someone was looking at this aspect of production and were looking forward to how well the onions performed after each particular cover. The major concerns for the growers were spring trash and volunteer weeds. The field peas grew well into the fall and established a large amount of bio-mass. The yellow mustard produced a carrot like tap root.

While it will help in hard pan breakup, we will evaluate if it will cause a trash problem with the small seeded onion planting. Mustards are a serious weed for onion growers. While the yellow mustard used in this trial is not the same as the weed species, growers were still weary. Yellow mustard needs long days and warm temperatures to produce seed. Planting the yellow mustard when we did in the fall was giving it short days and cool temperatures. Just the opposite of what it needs for seed production. We will look at the weed and trash aspects next spring. We will also evaluate onion performance following the specific covers.

Fall is a busy time of year for onion growers and they are deep into harvest. Grass cover crops are the traditional option for fall establishment. If it is true that mites prefer grass species for winter carryover, than a broadleaf cover crop is needed. The covers chosen for this evaluation were picked because of their ease of establishment.

Annual crimson clover	25 lbs./acre -	$81.50
Field peas	200 lbs./acre -	$200.00
Yellow mustard	10 lbs./acre -	$15.00
Hairy vetch	40 lbs./acre -	$142.50
Marigold	6 lbs./acre -	$135.50
Buckwheat	60 lbs./acre -	$32.50