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Horticulture Research

Quick Turnaround Cover Crops for Horticulture

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- **Rob and Tammy Faux – Tripoli**
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In a Nutshell

- **Cover crops can play an important role in fruit and vegetable systems** and bring a number of benefits such as reducing weed populations, adding organic matter, enhancing nitrogen cycling in the soil and reducing erosion.
- **Sunn hemp, millet, cow peas, sorghum- sudangrass, chickling vetch, buckwheat, clover, field pea** and a **legume mix** were tested for this project.
- This project shows that a variety of cover crops have potential to effectively suppress weeds in the window between spring and fall cash crop plantings.

Project timeline:
June 2013 to October 2013

Millet, buckwheat and sorghum-sudangrass at Scattergood Friends Farm.

Background

Crop rotations in fruit and vegetable systems are complex. Farmers strive to rotate crop families to curtail disease as well as crops with high and low nutrient needs to maintain healthy soil fertility. Cover crops can play an important role in fruit and vegetable systems and bring a number of benefits such as reducing weed populations, adding organic matter and enhancing nitrogen cycling in the soil, and reducing erosion (Creamer, 1999). The window between spring and fall plantings would benefit from all these cover crop attributes. However, with a busy and intensive schedule for vegetable producers during the limited growing season, incorporating cover crops while maximizing the amount of vegetable production can be a challenge (Sundermeier, 2009). Therefore, choosing the most appropriate cover crop species according to the climate and the desired purpose is crucial. The goal of this project was to examine potential cover crop species and evaluate their abilities to grow adequately between spring and fall crops to add a rotation, build soil, and suppress weeds in a short timeframe in Iowa's climate. Due to the weather (cold and wet spring followed by summer drought) some cooperators for this projects had to replant their cover crops for this trial. In addition, as they were interested in learning about different specific species of cover crops and the lands available for this trial were different in each farm, the details for each trial are different. They are explained under Methods and Results section. All the biomass samples are taken to Iowa State Soil and Plant Analysis Laboratory for dry matter weight, and total carbon and total nitrogen analyses.

Methods and Results

Genuine Faux Farm

The Fauxes planted four cover crops, two reps of each, **Table 1**. Each plot size was 50 feet by 20 feet. Since the first planting of cover crops did not germinate due to the lack of rain, they replanted the cover crops which resulted in later planting date (August 21). Cash crop counts were not available. Rep did not affect any measured parameters, and there were no species differences in biomass yield or carbon concentration. As expected for legume species, clover and field pea had greater nitrogen concentrations than did buckwheat and millet.

Small Potatoes Farm

The Hartmanns planted two cover crop varieties – Sunn hemp and a legume mix – each in one field (0.143 A and 0.160

Table 1

	Genuine Faux Farm			
	Millet	**Buckwheat**	**Field pea**	**Clover**
Planting Date	8/21/2013	8/21/2013	8/21/2013	8/21/2013
Planting Method	broadcast	broadcast	broadcast	broadcast
Termination Date	10/2/2013	10/2/2013	10/2/2013	10/2/2013
Days of Growth	42	42	42	42
Total Carbon (%)	35.6	41.2	41.6	36.9
Total Nitrogen (%)	2.09	2.32	3.56	3.74
Biomass yield (lb/ac of dry matter)	1686	1722	2044	1401
Carbon content (lb/ac)	600	709	851	517
Nitrogen content (lb/ac)	35	40	73	52

A respectively), **Table 2**. They doubled the seeding rate for drilling because they like to have a think stand, as their goals for planting cover crops are weed control and biomass production, rather than seed yield. The legume mix produced more biomass than the sunn hemp, despite a lower seeding rate, and had slightly lower carbon and nitrogen concentrations, though these may not be statistically significant. Weed counts were slightly lower and the following crop germination counts (hairy vetch and winter rye) were slightly higher in the legume mix as well.

Mustard Seed Community Farm

At Mustard Seed, four cover crops were planted in three replications, **Table 3**. Individual plot size was approximately 100 feet long and 15 feet wide. Some cover crops were planted at 115% of the recommended drill rate into harvested oats and then lightly tilled; others were seeded at 150% of the recommended rate into standing oats, which were then scythed to provide cover. They delayed their planting date due to the lack of soil moisture and forecast rain. No weed or subsequent crop counts were taken, as they did not plant subsequent crop.

They decided not to plant any fall crop because of the severe deficit of soil moisture and rainfall. They determined it would not be an efficient use of water and labor resources to start new crops. There were no statistically significant differences between species for biomass or nitrogen concentration. Total carbon was lower in buckwheat than in other species, and slightly greater in rep 1 compared to the other two reps.

Table 2

	Small Potatoes Farm	
	Sunn hemp	**Legume mix**
Seeding Rate (lb/ac)	112	47
Planting Date	6/28/2013	6/28/2013
Planting Method	broadcast, then disked	drill
Termination Date	8/20/2013	8/20/2013
Termination Method	mow, then tillage	mow, then tillage
Days of Growth	53	53
Previous Crop	chickling vetch	chickling vetch
Subsequent Crop	hairy vetch winter rye	hairy vetch winter rye
Weed Count	49	32
Cash Crop Germination Count	5	14
Total Carbon (%)	39.8	37.4
Total Nitrogen (%)	3.86	3.57
Biomass yield (lb/ac of dry matter)	4677	14157
Carbon content (lb/ac)	1859	5298
Nitrogen content (lb/ac)	181	506

Table 3

	Mustard Seed Community Farm							
	Sunn hemp		**Millet**		**Cowpea**		**Buckwheat**	
Termination Date	9/13/2013	9/13/2013	9/13/2013	9/13/2013	9/13/2013	9/13/2013	9/13/2013	9/13/2013
Termination Method	not terminated	not terminated	not terminated	not terminated	not terminated	not terminated	not terminated	not terminated
Days of Growth	55	55	55	55	55	55	55	55
Previous Crop	oats	oats	oats	oats	oats	oats	oats	oats
Subsequent Crop	none	none	none	none	none	none	none	none
Weed Count	n/a		n/a		n/a		n/a	
Cash Crop Germination Count	no subsequent crop		no subsequent crop		no subsequent crop		no subsequent crop	
Total Carbon (%)	40.8		42.2		41.4		40.2	
Total Nitrogen (%)	3.10		3.06		3.35		3.30	
Biomass yield (lb/ac of dry matter)	1156		369		192		553	
Carbon content (lb/ac)	472		156		79		223	
Nitrogen content (lb/ac)	36		11		6		18	

Scattergood Friends School

At Scattergood, three reps of six cover crop varieties were planted. Each plot size was 50 feet by 20 feet, **Table 4**. Statistical analysis could not be conducted on the biomass or nutrient content of the cover crops, but it seems that sorghum-sudangrass produced the most biomass and cowpeas the least; chickling vetch had the greatest nitrogen concentration and millet the least; and buckwheat had the greatest carbon concentration and cowpeas the least. Spinach was sawn on September 16 in the same field following summer cover crops. However, there were no spinach plant present as of October 2, when they took weed and cash crop germination counts. Weed counts were analyzed across species and reps; there were no differences between species but the reps differed vastly, anywhere from 7 to 22 plants per square foot.

Table 4

	Scattergood Friends School					
	Sunn hemp	**Millet**	**Cowpeas**	**Sorghum sudangrass**	**Buck-wheat**	**Chickling vetch**
Seeding Rate (lb/ac)	60	20	90	30	120	80
Planting Date	7/1/2013	7/1/2013	7/1/2013	7/1/2013	7/1/2013	7/1/2013
Planting Method	drill	drill	drill	drill	drill	drill
Termination Date	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013
Termination Method	mow, then tillage	mow, then tillage	mow, then tillage	mow, then tillage	mow, then tillage	mow, then tillage
Days of Growth	41	41	41	41	41	41
Previous Crop	hairy vetch	hairy vetch	hairy vetch	hairy vetch	hairy vetch	hairy vetch
Subsequent Crop	spinach	spinach	spinach	spinach	spinach	spinach
Weed Count	8	13	10	11	18	15
Cash Crop GermCount	0	0	0	0	0	0
Total Carbon (%)	40.7	39.5	38.6	39.5	42.1	39.7
Total Nitrogen (%)	2.72	1.29	3.47	1.41	3.79	3.99
Biomass yield (lb/ac of dry matter)	5335	5776	3262	12569	5920	3061
Carbon content (lb/ac)	2173	2280	1260	4970	2489	1214
Nitrogen content (lb/ac)	145	74	113	177	224	122

Conclusions and Next Steps

Because the variables of this trial vary greatly among the cooperators, it is not possible to make general conclusions. However, according to the feedback we collected from our participants, those who included millet and buckwheat in their trial expressed that these two species seem to be the solid choices of summer cover crops. On the other hand, those who tested cowpeas in the trial expressed they did not have good experiences with them. Nicholas Leete and Alice McGary from Mustard Seed Community Farm commented that they have tried cowpeas a number of times so far, and whether it was a dry or wet summer, cowpeas have not yet performed well for them.

References

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Sundermeier, A. 2009. Utilizing Cover Crops in Vegetable Production Systems. Fact Sheet: Agriculture and Natural Resources. Ohio State University Extension. http://ohioline.osu.edu/sag-fact/pdf/SAG709UtilizingCoverCrops.pdf

United States Department of Agriculture Natural Resources Conservation Service. May 1999. Sunn Hemp: A Cover Crop for Southern and Tropical Farming Systems. Soil Quality – Agronomy Technical Note. No. 10

About the Cooperators

Rob and Tammy Faux own and operate **Genuine Faux Farm** near Tripoli. They grow vegetables and herbs, as well as turkeys, chickens and ducks. They focus on marketing their produce directly to clients, and sell their products mainly through Community Supported Agriculture (CSA). They also sell at Waverly Farmers' Market when they have extra produce available. Their farm has been certified organic through IDALS (Iowa Department of Agriculture and Land Stewardship) since 2007.

Since 2004, Rick and Stacy Hartmann have taken an old farmstead of about 10 acres near Minburn and turned it into a vibrant business growing specialty horticultural crops; **Small Potatoes Farm**. They focus on working directly with families and individuals mostly through their Community Supported Agriculture (CSA) to market their produce raised on IDALS-certified land. They always strive to incorporate practices that are environmentally sustainable, including their efforts to conserve and restore the farm landscape to support native and wild pollinators.

Mustard Seed Community Farm near Ames is a diversified vegetable farm with a mission of healthy food accessible to everyone. Members of the farm grow vegetables and herbs to supply their CSA and food donations. They incorporate farming practices such as cover crops, permaculture, perennial crops, beneficial insects and animal habitats as they try to create a farming system that closely mimics nature.

Scattergood Friends School is a small Quaker boarding school near Iowa City, with 10 acres of IDALS-certified organic gardens and orchards and 30 acres of pastures used for grass-finish beef and lamb. Scattergood also raises a few heritage breed Guinea hogs, a small flock of turkeys, occasional broiler flocks, and a laying flock of about 100 chickens. Scattergood primarily grows food for their school, but also markets some products through New Pioneer Coop in Iowa City and Coralville.

PFI Cooperators' Program

PFI's Cooperators' Program gives farmers practical answers to questions they have about on-farm challenges through research, record-keeping, and demonstration projects. The Cooperators' Program began in 1987 with farmers looking to save money through more judicious use of inputs.