

SARE Cover Crop Project Report – January 2014 **By Diana Roberts, WSU Extension**

Summary

Innovative, dryland grain farmers in Lincoln and Spokane Counties, WA, want to include a cover crop or companion crop in their rotation to raise soil organic matter levels, break disease cycles, suppress weeds, penetrate soil compaction layers, and improve soil fertility by fixing atmospheric nitrogen.

In addition, they want to make this system work with the winter precipitation (Mediterranean climate) of the area. So far, seeding cover crops in the spring in place of fallow, results in excessive loss of soil moisture so that getting a crop germinated that fall has proven tricky. Consequently, the group is exploring other options.

The model for this project is that the farmer collaborators develop the ideas for which cash cover crops to try, and they grow a demonstration block on their farms. The Extension professional repeats these tests in replicated strips (about 18 ft wide by 200 ft long) on the WSU Wilke Research Farm at Davenport, WA.

The project began (prior to funding from Western SARE) in the spring of 2011. While interest in the project from around the region has been high, we do not yet have “proven recipes” to share with other growers. It is truly a work in progress.

While the Wilke Farm and most of the farmers in the group use direct seeding/no-till farming, we believe that these cover crop methods should benefit any type of farming system.

Objectives

Experiment with cover crop cocktails and companion/intercropping to develop mixtures and places in the rotation where they benefit soil health and moisture retention.

In all the following trials, we are taking soil tests each season to track changes in soil moisture, organic matter, and nutrients.

Accomplishments/Milestones

Wilke Cover Crop A

The group started the project in 2011 by growing a cover crop cocktail that was a 9-way mix: oats, peas, crimson clover, hairy vetch, mustard, safflower, sunflower, purple top turnip, and a sorghum-sudangrass hybrid. Details of the trial at the Wilke Farm are included in the table for Wilke Cover Crop A.

The cover crop plots were seeded in the place of no-till fallow, and there was a fallow check. The crop grew well but did not canopy enough to prevent evapotranspiration. It was terminated at flowering

We tried to use a roller-crimper that will crush the stems of the plants and prevent further moisture loss (compared with mowing). However, the oats were so resilient that by the next day they were standing vertical and brought everything else back upright with them. So we sprayed out the crop with glyphosate.

In 2012 the plots were seeded to a winter or spring wheat (See table). The cover crop removed so much moisture from the soil that seeding winter wheat into it was delayed compared with the winter wheat on fallow ground. The disparity in wheat development resulted in herbicide damage when this was applied – thus the zero yield for that treatment. The spring wheat following cover crop yielded average for the area, so did not appear to benefit from the previous cover crop.

In 2013, the plots were all seeded to spring mustard. The intent was to harvest them separately but this didn't happen. In 2014 there will be a spring cereal on the ground, and plots will be separated. In 2015 we will seed them back to some sort of cover crop – following the original treatment plots. But due to the

excessive removal of water by the spring cover crop it is unlikely we will use that sort of time and mixture again.

Wilke A Cover Crop Trial			
Year: 2011 - present			
Location: Block 4 Wilke Farm			
	Treatments		
2011	No-till fallow	9-way Cover Crop Cocktail	9-Way Cover Crop Cocktail
4 reps		May 18 - July 22	May 18 - July 22
Roller-crimp not work		Fert: 8-10-0-7 starter Seed 80 lb/A Inoculant	Fert: 8-10-0-7 starter Seed 80 lb/A Inoculant
2012	Winter wheat - Xerpha	Winter wheat - Xerpha	Spring wheat - JD
4 reps	55 bu/A	0 bu/A (herbicide damage)	44 bu/A
	Sept 16 - Aug 28	Oct 10 - Aug 28	April 28 - Aug 28
	Fert: 88-10-0-19 Seed 80 lb/A	Fert: 88-10-0-19 Seed 80 lb/A	Fert: 60-10-0-15 Seed 70 lb/A
2013	Spring canola - RR 4551 - harvested together in error	Spring canola - RR 4551 - harvested together in error	Spring canola - RR 4551 - harvested together in error
4 reps	April 17 - Aug 22	April 17 - Aug 22	April 17 - Aug 22
	Fert: 60-15-1-9 Seed 5 lb/A hoe drill	Fert: 60-15-1-9 Seed 5 lb/A hoe drill	Fert: 60-15-1-9 Seed 5 lb/A hoe drill
2014 Plans	Spring wheat - harvest separately	Spring wheat - harvest separately	Spring wheat - harvest separately
2015 Plans		Some sort of cover crop	Some sort of cover crop

Wilke Cover Crop B

In 2012 we used a 5-way cover crop mix – per the recommendation of Jill Clapperton to have fewer species in this drier (than the Midwest) climate. There were more warm season species in the mix – proso millet and buckwheat – as well as faba bean, flax, and crimson clover. The treatments and details are shown in the table for Wilke Cover Crop B.

The summer of 2012 was the closest to a “summer rainfall” that we’ve had in the past 20 years – as evidenced by widespread incidence of stem rust across the region. Stem rust depends on summer

moisture for development and spread. The cover crops grew well, and canopied better at the Wilke Farm than the mixture the previous year (Trial A).

In 2013, the plots were seeded to winter and spring wheat (see Table B). The winter wheat following cover crop was lower than that seeded on fallow ground – but it wasn't horrible.

In 2014, we will grow spring cereals across the plots and harvest them separately to continue to track the effects of the cover crop.

Wilke B Cover Crop Trial			
Year: 2012 - present			
Location: Misc. Block Wilke Farm			
	Treatments		
2012	No-till fallow	5-Way Cover Crop Cocktail (Warm Season)	5-Way Cover Crop Cocktail (Warm Season)
4 reps		May 17 - July 31	May 17 - July 31
		Fert: 8-10-0-7starter Seed 45 lb/A Inoculant	Fert: 8-10-0-7 starter Seed 45 lb/A Inoculant
2013	Winter wheat - Xerpha	Winter wheat - Xerpha	Spring wheat - Diva
4 reps	61 bu/A	52 bu/A	39 bu/A
	Sep 14 - Sep 3	Oct 10 - Sep 3	April 25 - Sep 3
	Fert: 88-10-0-7 Seed 80 lb/A	Fert: 88-10-0-7 Seed 80 lb/A	Fert: 68-10-0-7 starter Seed 60 lb/A
2014 Plans	Spring barley - harvest separately	Spring barley - harvest separately	Spring barley - harvest separately
4 reps			

Wilke Cover Crop C

After 2011, the farmer group decided we need to focus on growing cover crops that fit with our rainfall patterns and do not detract from establishing cash crops.

Prior to the development of synthetic fertilizers, farmers in the area grew yellow sweet clover (legume) to provide nitrogen for their soil. The plant fell out of use due to insect infestations, but it has naturalized in the region and grows in ditches and waste areas. We decided to try growing it as a companion crop – as used by Bob Quinn at Big Sandy, MT.

Yellow sweet clover (YSC) is a biennial. In 2012 we seeded YSC (broadcast with a hand-held fertilizer spreader) and cross-seeded the field with barley using a direct seed drill. Details are in the table for Wilke Cover Crop C.

The barley grew and was harvested as normal – except we used no fertilizer (we should have done) and there was no in-crop herbicide (field was very clean). The YSC was short under the barley. It went dormant in the fall and winter, and started growing again the next spring (2013).

We sprayed the YSC out at 2 treatment stages: bolting and flowering. The theory is that rhizobia nodules slough off the roots of legume crops at flowering so they stop fixing nitrogen. We wanted to compare the effects of delaying the crop termination.

In 2014 we will compare winter and spring cereals across these treatments – see table.

Wilke C Cover Crop Trial				
Year: 2012 - present				
Location: Misc. Block Wilke Farm				
	Treatments			
2012	Spring barley - Lenatah - Companion crop Yellow sweet clover - Madrid			
	Barley May 9 - Aug 28 1 ton/A			
	Fert: Zero :(Seed barley 70 lb/A.			
2012/13	YSC biennial			
	Fert: Zero :(Seed 10-15 lb/A Broadcast Cost \$3.00 - \$3.60 per lb No Inoculum :(
3 reps	May 9, 2012 - May 28, 2013 Bolting		May 9, 2012 - July 9, 2013 Full flower	
2014	Winter wheat - Xerpha	Spring wheat	Winter wheat - Xerpha	Spring wheat
3 reps	10-Sep		10-Sep	

Wilke Cover Crop D

This trial is a repeat of YSC interseeded with barley, with details in the table for Wilke Cover Crop D.

We seeded the block in 2013, broadcasting the YSC as before. But as too much expensive seed was being buried by the barley seeding operation, we came in later (barley at 4-leaf stage) and cross-drilled more YSC into the stand. One of the farmers in the group (Ed Warner) recommended this from his experience.

We did not, however, use inoculant. We should have done so as even though the YSC grows naturally in the area it does not nodulate well. We should use species-specific inoculant with every legume grown!

In 2014 we will spray out the YSC at bolting and flowering and compare subsequent crops in 2015.

Wilke D Cover Crop Trial				
Year: 2013 - present				
Location: Block 5 Wilke Farm				
	Treatments			
2013	Spring barley - Lenatah - Companion crop Yellow sweet clover - Madrid			
	Barley April 25 - Aug 24 1.6 ton/A			
	Fert: 68-10-0-7 Seed 70 lb/A			
2013/14	YSC biennial			
	May 25, 2013 Seed 20 lb/A Broadcast No inoculant :(
	May 30, 2013 10 lb/A Drilled No inoculant :(
2014 Plans	Spray out at bolting		Spray out at flowering	
2015	Winter wheat	Spring wheat	Winter wheat	Spring wheat
3 reps				

Wilke Cover Crop E

In the fall of 2013 we seeded a companion crop mixture with winter canola, following the lead of farmer collaborator Charles Gross. Details are in the table for Wilke Cover Crop E.

The idea here is that the companion crop: buckwheat (makes phosphate available), tillage radish, and peas will grow in the fall then die out over winter and hopefully not detract from the cash crop. We used a Roundup Ready canola – but that might not be the best choice and they are not as well adapted to the area as other varieties. We should have stuck to the belief that the companion crops will winterkill and no spraying out be necessary.

The fall was the best in years for seeding and the plots looked fabulous! One concern is the seeding rate of the companion crop being a little high and detracting from winter canola growth... We will follow them through next season and make comparisons among treatments (see table)

Wilke E Cover Crop Trial			
Year: 2013 - present			
Location: Block 4/5 Wilke Farm			
	Treatments		
Fall 2013	No-till fallow	Winter canola - RR Camas	Winter canola - RR Camas. Companion Crop - Buckwheat + Nitro Radish + Spring Peas
4 reps		Canola Aug 6, 2013 Fert 16-20-0-14 Seed 4.6 lb/A	
4 reps			Radish 5.7 lb/A Buckwheat 9.8 lb/A Peas 21 lb/A. Seeded Aug 6, 2013. Inoculant
2014 Plans	Spring canola	Winter canola - RR Camas	Winter canola - RR Camas
4 reps			
2015	Winter/spring wheat	Winter/spring wheat	Winter/spring wheat
4 reps			

Impacts/Contributions/Outcomes

We have learned the following so far:

- Always inoculate when seeding legume with species-appropriate inoculant
- With companion crops, use seeding rates that won't "smother" the cash crop
- Use starter fertilizer at least with cover or companion crop seedings
- Legume companion crops may not provide nitrogen to the current crop (only to subsequent crops)
- Cover crops seeded in the spring may reduce moisture availability for germinating the subsequent fall cash crop.

Regional interest in this project has been high, especially as NRCS is offering EQIP contracts for cover crops. We recommend that growers start out with small areas (less than 30 acres) of cover crops as this is not a proven methodology for the area.

In 2013 we offered 3 field tours of the Wilke Farm and some of the cooperating farms; June 14, September 26, and October 18 – with 48 participants.

We spoke at 3 workshops, including the tristate (WA, OR, ID) Pacific Northwest Direct Seed Association conference with a total of 80 participants. A survey at the PNDSA conference showed that 70 % of attendees were interested in trying cover crops prior to the talk, and this level rose to 75% after that talk. 62% rated continuation of the research Highly Important (5) and 23% rated it Fairly Important (4) on a ranking scale of 1 to 5.

We did not set up a Facebook page as a regional survey of Extension clientele showed that this media was not important/useful to them in obtaining research and Extension information