Gary Farrell, President
AG Enterprise Supply, Inc.
Cheney, WA

Welcome to the National Conference on Cover Crops & Soil Health

What are the Challenges or Opportunities of growing

Cover Crops in the dryland region

Of the Inland Pacific Northwest

Long term goals

We along with our Conservation District and N R C S partners are three short years into finding ways to do what others said couldn’t be done with growing cover crops in this dry land region.

We are looking to find ways to utilize cover crops to improve soil health, manage expenses and generate new revenue streams for our customers in the dryland farming region of eastern Washington State.

CHALLENGES

- What cover crop varieties will grow in our low rain fall area?
- How will my soil moisture be affected?
- Establish a base line using soil/moisture tests.
- What will my rotation options be?
- How will the cover crop affect my rotation?
- What type seed should I use?
- What will it cost and where will I buy it?
- What is the best way to seed it?
- How will it affect my management plan?
- When will I need to terminate and how?
- What is the best way to integrate cattle for grazing?
- Will the use of Cover Crops impact my overall soil health?

Thankfully we have key growers who embrace change and are willing to find ways to integrate cover crops into their farm management systems.

That being said we have encountered challenges along the way and have experimented to see what will work best under our dry conditions.

Our annual rainfall varies from 8 – 10” in the driest area to 18 – 20” in the wetter area.

The standard rotations vary from a two year rotation of conventional fallow, now chem fallow to winter wheat. To a three year rotation of Chem fallow, canola then to winter wheat. Our hope is to replace chem fallow cycle with a cover crop. The wetter areas have a four year rotation that we want to replace spring wheat with cover crops.

Mansfield, Washington

Leslie Michel of the Okanogan Conservation District.
Funding provided through the N R C S Conservation Innovation Grant.

Grower, Dan Cavadini, Cavadini Partnership
Average rain fall 8 – 10”

After three years of trials we came up with a plan for the 2017 crop year.

There were three field plots

1) Winter wheat stubble, chem fallow, check plot
2) Fall direct seeded, winter triticale cover
3) Spring direct seeded cover for grazing

Winter Cover Crop

The fall planted winter triticale field was soil tested prior to seeding to establish a nutrient and moisture management plan for the project.

The triticale was harvested late June and yielded six tons of forage. A blend of beardless barley and oats were then direct seeded into the triticale stubble. When the seed matured it was harvested for grain to be used as livestock feed which also produced revenue. After harvest livestock were introduced to graze the remaining stubble. They supplemented the grazing with triticale forage.

The introduction of cattle is a new concept that they hope will have additional revenue generating possibilities.

We will reevaluate this field in the spring to determine what to do next.

Spring Grazing Cover Crop

The second field trial was a spring seeded cover crop for grazing.

The first step was to soil and moisture test to develop a nutrient management plan.

The seed mix consisted of Corn, Sunflowers, Sorghum Sudan grass, Purple top turnips and Millet. This mix was direct seeded into standing wheat stubble on the 20th of May. After 4 – 5 weeks of growth 42 pairs of cattle were introduced for grazing.

They were removed from grazing around the first of September after a hard frost fearing that the Prussic acid in the Sudan grass could become a problem.

Late October soil and moisture tests were taken.

Check plot, chem fallow stubble.
1.61” available moisture in top two feet, **Ph 5.61**, OM 1.39%

Fall Triticale cover grazing field.
1.39” available moisture in top two feet, Ph 6.13, OM 1.73%

Spring grazing mix cover field.
2.83” of moisture in the top two feet, **Ph 7.63**, OM 1.25%

Observations

- Cover crops provided excellent wildlife habitat.
- Will need more cattle on spring grazing cover crop.
- Need to change from field grazing to smaller grazing segments.
- Need to work closer with animal nutritionist when grazing.
- Spring grazing cover crop with sudan grass will need to test Prussic acid levels to be able to continue to graze longer in the fall.
- Find the best way to add to crop rotations.
- Look for better ways to direct seed into terminated cover crop
- Are there cost share programs available?
- Find a way to work with landlords?
- Keep the banker informed as to what is going on.

StJohn, Washington

Dan Harwood, Palouse Rock Lake Conservation District

Partial funding from Washington State Soil Health Committee

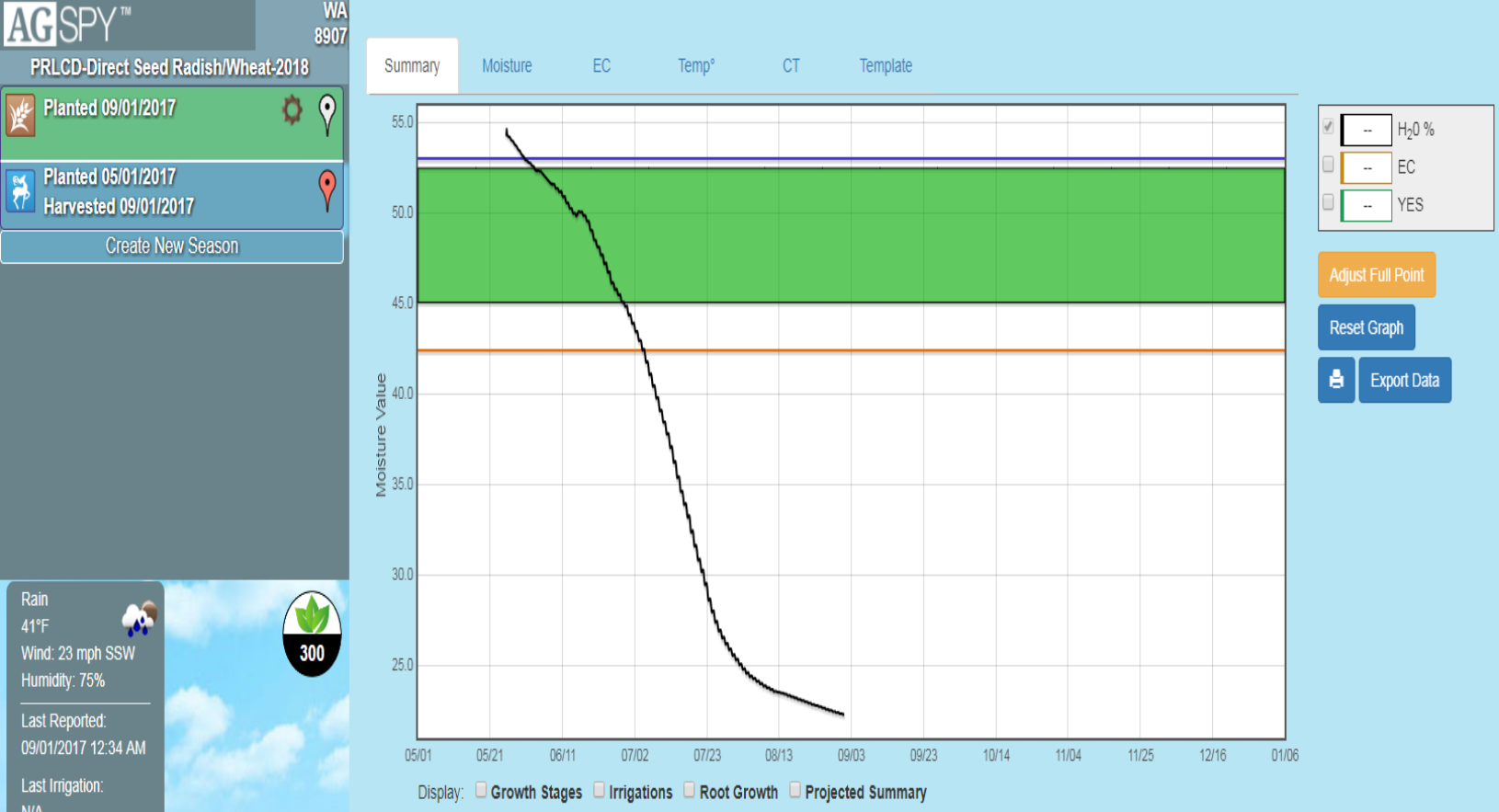
Grower, Ross Jordan, Century Farms

16 – 18” Annual rain fall

Our goal is to improve soil health by looking to change the current three year rotations of chem fallow, winter wheat, spring wheat with cover crops replacing the chem fallow cycle.

Utilize the new AquaSpy monitoring technology to chart the soil moisture, temperature and root development in the chem fallow check compared to the cover crop. The AquaSpy collected information from seeding May 5th through termination August 20th.

Program was set to monitor direct seeded chem fallow (in back ground) and direct seeded cover crop. To monitor moisture consumption; soil temperature differences and root growth depth. Also observe weed pressure differences in the two areas. Each field received an application of glyphosate late April , the direct seed fallow was sprayed an additional time (typically two more applications are made). AquaSpy Soil probes were installed in both sites 2 in direct seed fallow and 2 in the cover crop. The AquaSpy probe is solar powered and delivers soil moisture, temperature and root growth data to the cloud every 15 minutes. The data is taken every 4 inches down to 48 inches.

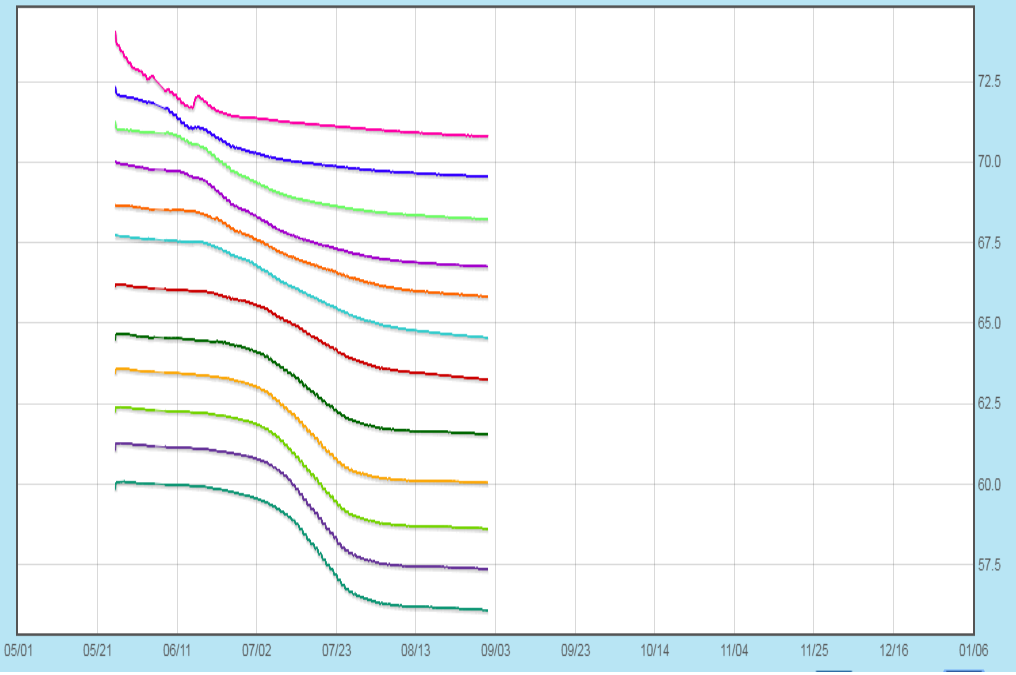


This is the summary graph of radish cover crop 2017

- Probe was placed May 26
- Only active roots show on the summary graph
  - June 26th roots reached 24”
  - July8th roots reached 48”
  - August 11th Radish reached maturation

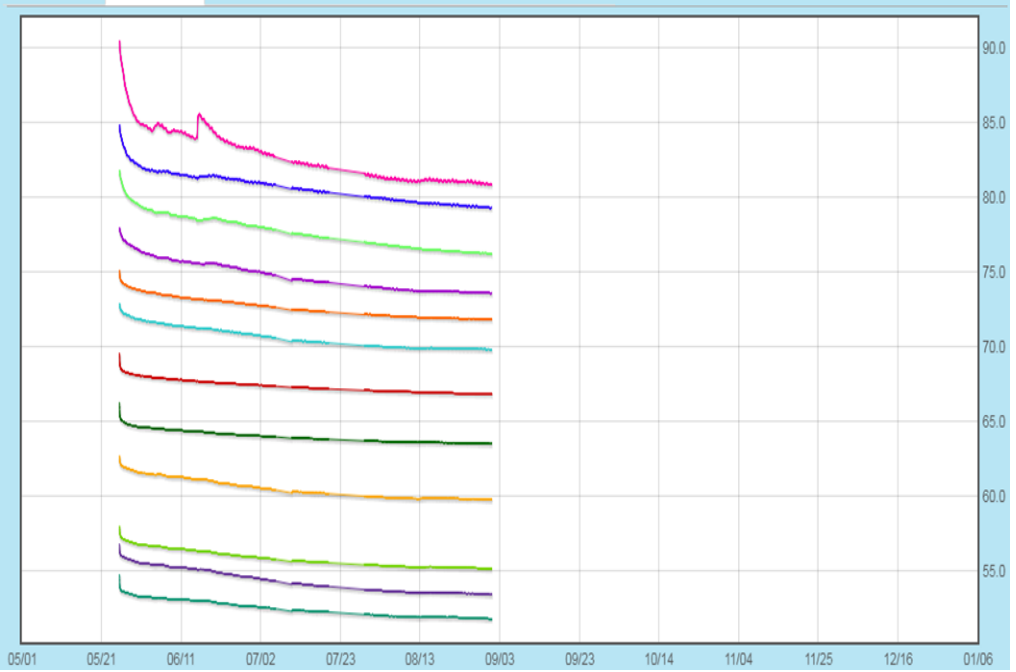
Radish individual sensor graph

- Sensors picking up root activity at 4 inches starting 1 day after probe placed



Chem Fallow Check

- All sensors basically reading flat accept for 4” sensor. Fluctuation due to temperature, rain fall and evaporation



AquaSpy AgSpy | AgSpy | ServiceSpy - Complete I

Secure | https://agspy.aquaspy.com

AGSPY™ WA 8907

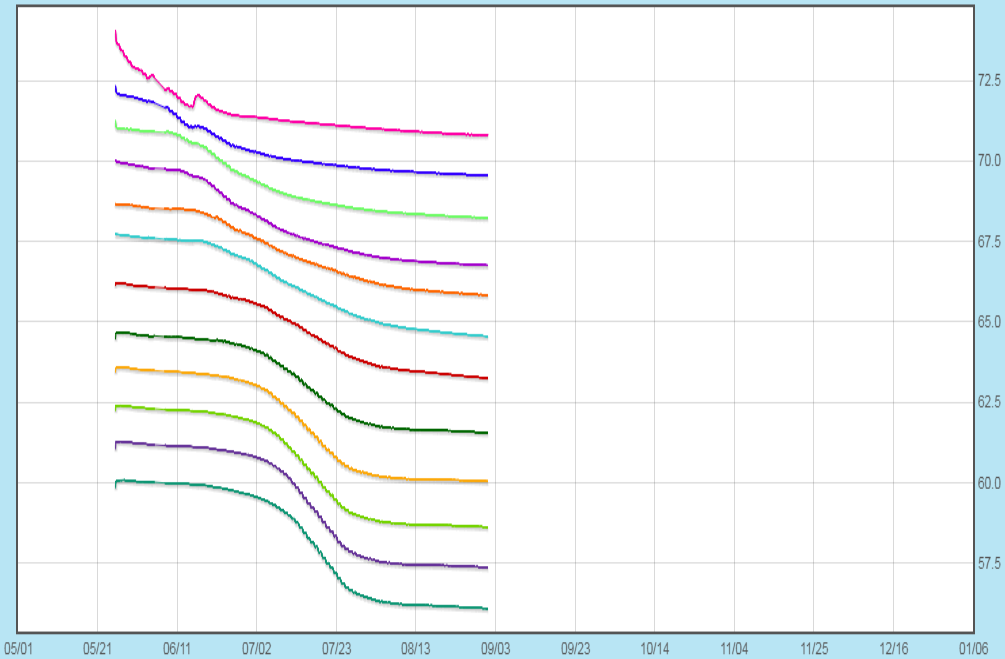
PRLCD-Direct Seed Radish/Wheat-2018

Planted 09/01/2017

Planted 05/01/2017
Harvested 09/01/2017

Create New Season

Summary | Moisture | EC | Temp° | CT | Template



- °F
- 4"
- 8"
- 12"
- 16"
- 20"
- 24"
- 28"
- 32"
- 36"
- 40"
- 44"
- 48"
- Toggle All

Reset Graph

Export Data

Display: Growth Stages Irrigations Root Growth

- Spread 5 +

Season Events

48"	07/08/2017
40"	07/07/2017
36"	07/06/2017
24"	06/26/2017
20"	06/25/2017
16"	06/21/2017
12"	06/14/2017
8"	06/12/2017
4"	05/30/2017

Conditions | Events

Graph | Tech | Location | Edit

AquaSpy AgSpy - Go... | ShoreTel Communic... | Skype | Elder Austen Frostad.... | Presentation1 - Pow... | 9:48 PM

Cover crop that was direct seeded May 5th into spring wheat residue using a John Deere 1890 10 inch spaced air drill at 10 lbs per acre.

Cover crop seed mix had 4 species: Daulken Radish; Graza Radish; Ethiopian Cabbage; Winifred Brassica

Termination

- Roundup was used to terminated August 20th.
- The cover crop was then mowed September 7th.
- September 8th winter wheat was direct seeded.
- AquaSpy probes were reinstalled to monitor moisture through out the winter wheat growing season.

Observations

- In the chem fallow from the soil surface to 12” deep the temperatures were higher and there was less moisture than in the cover crop shaded ground.
- The moisture decreased in both systems, the chem fallows loss was to evaporation and cover was to growing a crop.
- The AquaSpy probes information was used to help determine when to terminate based on soil moisture levels.
- The AquaSpy probes will continue to monitor soil moisture, temperature and root development of the winter wheat crop that was planted this fall.
- How will cover crops best fit in our rotations?
- Is there a better seed blend to use in our situation?
- Would grazing of cover crops be an advantage?
- Find what works best for overall soil health improvement.

Uniontown, Washington

Cost share project with the Palouse Conservation District
And Washington State Conservation Commission

- Grower, Ty Meyer
- Annual rain fall 18 – 20”

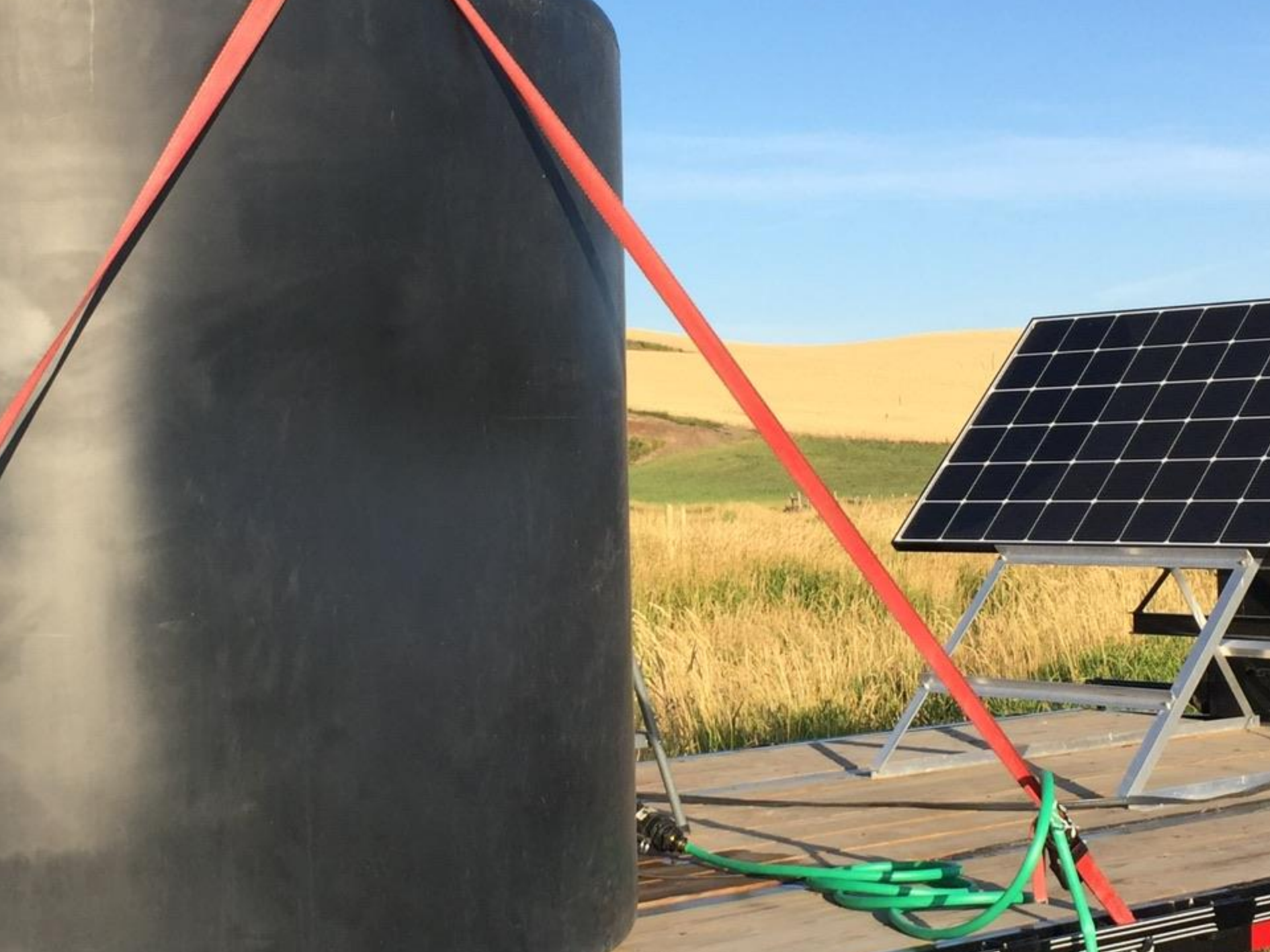
- Long Term Goal

- Improve overall soil health using cover crop grazing
- Introduce cover crop grazing into current rotation
- Generate revenue for lost crop cycle in current rotation
- Integrate cattle into current management system
- Find a specific cover crop grazing seed blend that works best

18 way grazing seed blend

- Mung beans
- Sainfoin – Shoshone
- Chinese Red
- Sweet Forever
- Sorghum Sudan grass, Sweet Six Dry Stalk
- 400 BMR
- Spring Forage Barley
- Sunflower – Peredovic
- Buckwheat – Mancan
- Okra, Clemson Spineless 80
- Clover – Yellow Sweet
- Proso Millet – Red
- White Wonder Millet (hay)
- Rapeseed – Trophy
- Broadleaf Mustard
- African Cabbage
- Turnip (purple top)
- Sesame
- Mix was seeded at 25.5 pounds per acre.

ZAGS



3713
3714
3712

Cover Crop and Grazing Trial

- Seed Costs $25/acre = $325
- Custom Seeding = $350
- Fence Costs = $5,796
- Labor Costs = $6,585
- Watering System, Total investment $12,932.00
  - Solar Pump = $2,917
  - Tank = $990
  - Trailer - $9,025
- Feed Testing Lab Analysis $150
- Additional estimated costs for Years 2 & 3 = $6,000
- Total 3 year estimated costs = $32,138

Check Soil Analysis

SOIL ANALYSIS REPORT

LAB NUMBER *316*	SAMPLE IDENTIFICATION	ORGANIC MATTER L.O.I. percent	RATE	PHOSPHORUS P_1 (WEAK BRAY) 1:7 ppm	RATE	PHOSPHORUS P_2 (STRONG BRAY) 1:7 ppm	RATE	PHOSPHORUS OLSEN BICARBONATE P ppm	RATE	NEUTRAL AMMONIUM ACETATE (EXCHANGEABLE) POTASSIUM K ppm	RATE	MAGNESIUM Mg ppm	RATE	CALCIUM Ca ppm	RATE	SODIUM Na ppm	RATE	pH SOIL pH 1:1	pH BUFFER INDEX	CATION EXCHANGE CAPACITY C.E.C. meq/100g	PERCENT BASE SATURATION (COMPUTED) % K	% Mg	% Ca	% H	% Na
45327	1	4.6	VH	109	VH	111	VH			556	VH	271	VH	2063	M	40		5.5	6.5	19.2	7.4	11.8	53.7	26.2	0.9
45328	1																								
45329	1																								
45330	1																								

LAB NUMBER *316*	NITRATE-N (FIA) SURFACE ppm	SURFACE lbs/A	SURFACE depth (in)	SUBSOIL 1 ppm	SUBSOIL 1 lbs/A	SUBSOIL 1 depth (in)	SUBSOIL 2 ppm	SUBSOIL 2 lbs/A	SUBSOIL 2 depth (in)	Total lbs/A	SULFUR S ICAP ppm	RATE	ZINC Zn DTPA ppm	RATE	MANGANESE Mn DTPA ppm	RATE	IRON Fe DTPA ppm	RATE	COPPER Cu DTPA ppm	RATE	BORON B SORB. DTPA ppm	RATE	EXCESS LIME RATE	SOLUBLE SALTS 1:1 mmhos/cm	RATE
45327	20	72	0-12							72	32	VH	2.0	M	25	H	99	VH	1.8	H	0.8	M			
45328	14	50	12-24							50															
45329	9	32	24-36							32															
45330	6	22	36-48							22															

REV. 12/03

The above analytical results apply only to the sample(s) submitted. Samples are retained a maximum of 30 days.

In Cover Crop Soil Analysis

SOIL ANALYSIS REPORT

LAB NUMBER *316*	SAMPLE IDENTIFICATION	ORGANIC MATTER L.O.I. percent	RATE	PHOSPHORUS P_1 (WEAK BRAY) 1:7 ppm	RATE	PHOSPHORUS P_2 (STRONG BRAY) 1:7 ppm	RATE	PHOSPHORUS OLSEN BICARBONATE P ppm	RATE	NEUTRAL AMMONIUM ACETATE (EXCHANGEABLE) POTASSIUM K ppm	RATE	MAGNESIUM Mg ppm	RATE	CALCIUM Ca ppm	RATE	SODIUM Na ppm	RATE	pH SOIL pH 1:1	pH BUFFER INDEX	CATION EXCHANGE CAPACITY C.E.C. meq/100g	PERCENT BASE SATURATION (COMPUTED) % K	% Mg	% Ca	% H	% Na
45331	1	4.2	H	17	M	53	H			211	H	355	VH	3505	H	76		7.0		21.4	2.5	13.8	82.2	0.0	1.5
45332	1																								
45333	1																								
45334	1																								

LAB NUMBER *316*	NITRATE-N (FIA) SURFACE ppm	SURFACE lbs/A	SURFACE depth (in)	SUBSOIL 1 ppm	SUBSOIL 1 lbs/A	SUBSOIL 1 depth (in)	SUBSOIL 2 ppm	SUBSOIL 2 lbs/A	SUBSOIL 2 depth (in)	Total lbs/A	SULFUR S ICAP ppm	RATE	ZINC Zn DTPA ppm	RATE	MANGANESE Mn DTPA ppm	RATE	IRON Fe DTPA ppm	RATE	COPPER Cu DTPA ppm	RATE	BORON B SORH. DTPA ppm	RATE	EXCESS LIME RATE	SOLUBLE SALTS 1:1 mmhos/cm	RATE
45331	8	29	0-12							29	27	VH	0.8	L	13	H	49	VH	1.4	H	0.7	L			
45332	3	11	12-24							11															
45333	2	7	24-36							7															
45334	1	4	36-48							4															

REV. 12/03

WARD Laboratories, Inc.

Ag Testing - Consulting

Account No. : 71527

Feed Analysis Report

MEYER, TY
501 WAWAWAI
COLTON WA 99113

Invoice No. : 1241516
Date Received : 08/18/2017
Date Reported : 08/21/2017

Lab Number : 7529

Results For : TY MEYER
Sample ID : HIGHWAY FIELD
Description : DROUGHT STRESSED SUDAN

	Analysis As Received	Analysis Dry Basis	
Moisture, %	73.31	0.00	
Dry Matter, %	26.69	100.00	
Nitrate, ppm NO_3-N		20	Click here for Report Interpretation
Safety Level	Safe		
Prussic Acid, ppm HCN	46		
Safety Level	Safe		

WARD Laboratories, Inc.

Ag Testing - Consulting

Account No. : 71527

Feed Analysis Report

MEYER, TY
501 WAWAWAI
COLTON WA 99113

Invoice No. : 1243485
Date Received : 09/12/2017
Date Reported : 09/13/2017

Lab Number : 8436

Results For : TY MEYER
Sample ID : HIGHWAY FIELD
Description : FORAGE

	Analysis As Received	Analysis Dry Basis
Prussic Acid, ppm HCN	35	
Safety Level	Safe	

Observations

- Cattle rate of gain was 3.1 lbs per day
- Soil organic matter in check plot 4.6%
- Soil organic matter in cover crop 4.2%
- Soil Ph in check plot 5.5
- Soil Ph in cover crop 7.0 *
- Monitor prussic acid in sudan grass
- Prussic acid 8/21/2017 46 ppm
- Prussic acid 9/13/2017 35 ppm
- Prussic acid was a non issue
- Need to increase the number of animals per area grazed.
- Possibly 15 head per 2.5 acre segment rotated more often.
- The Ph increase in cover crop is huge in relation to applying lime.
- Seeded clearfield winter wheat to be able to control cover crop regrowth in the spring.

Moving forward

- Modify the current three year rotation of W Wheat, Sp Wheat, Garbs
  - Look to replace the Sp Wheat in rotation with cover crop grazing
  - Consider a four year rotation with Cover crop grazing after Garbs
    - Look at a winter cover using W Peas, W Triticale, W Canola
      - In April put livestock in to graze for 45 – 60 days
      - Then direct seed a summer grazing cover crop
        - Continue grazing until August/September
      - After terminating then direct seed winter wheat
        - Continue rotation after wheat is harvested.

Retail Dealer, Opportunities

- Soil sampling to asses soil changes resulting from cover crop usage
- Adjust nutrient management plans to account for cover crops
- Advising on cover crop management
- Advising on cover crop seed or mixes
- Selling or help find sourcing of cover crop seed
- Provide cover crop seeding services
- Advising on crop protection that won’t affect cover crops
- Advising on cover crop termination strategies
- Provide cover crop termination services
- Design on-farm field trials to test new cover crop mixes or practices
- Work with growers to adjust their overall management plan
- Provide training on cover crop basics
- Maintain communications with the extension, NRCS and Conservation Districts with regards to the adoption of cover crops
- Promote soil health !

Find ways to do what others say can't be done.

Most of all,

Embrace Change

In the name of Soil Health!

Thank You !

farrellgr@agenterprise.com