



HARVEST WEED SEED CONTROL UNIT

Results from year 1

Uhlorn Family Farms

What are they?

- ▶ Seed Destroyers are a mechanical device that attaches to a harvester.
- ▶ They take the chaff (Non-Straw) residue and run it through a pulverizer/hammer mill
- ▶ These seed destructors provide up to a 99% kill on not only weed seeds, but any crop seed that did not make it into the bulk tank.



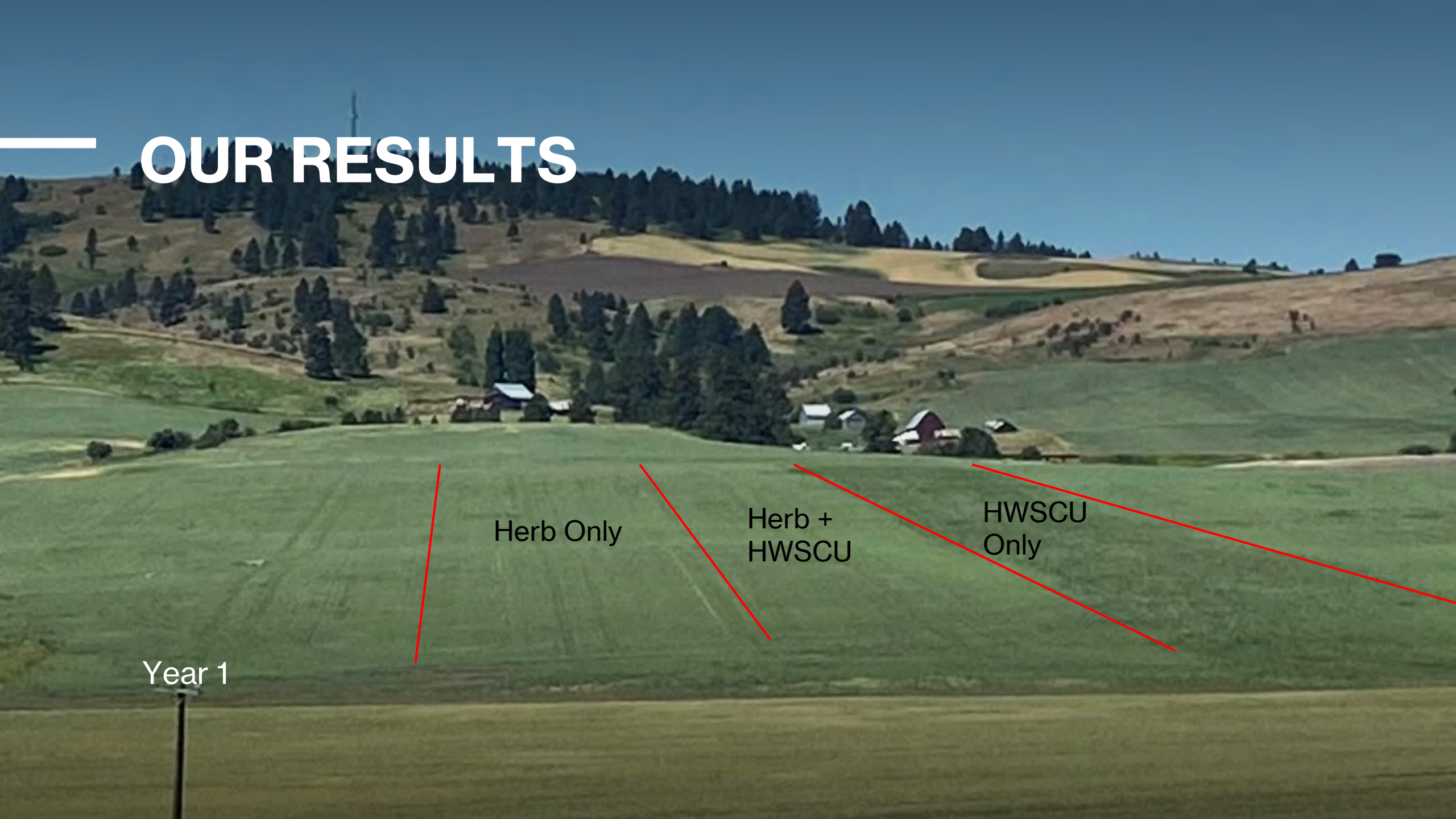
OUR RESULTS

Herb Only

Herb +
HWSCU

HWSCU
Only

Year 1



Year 1

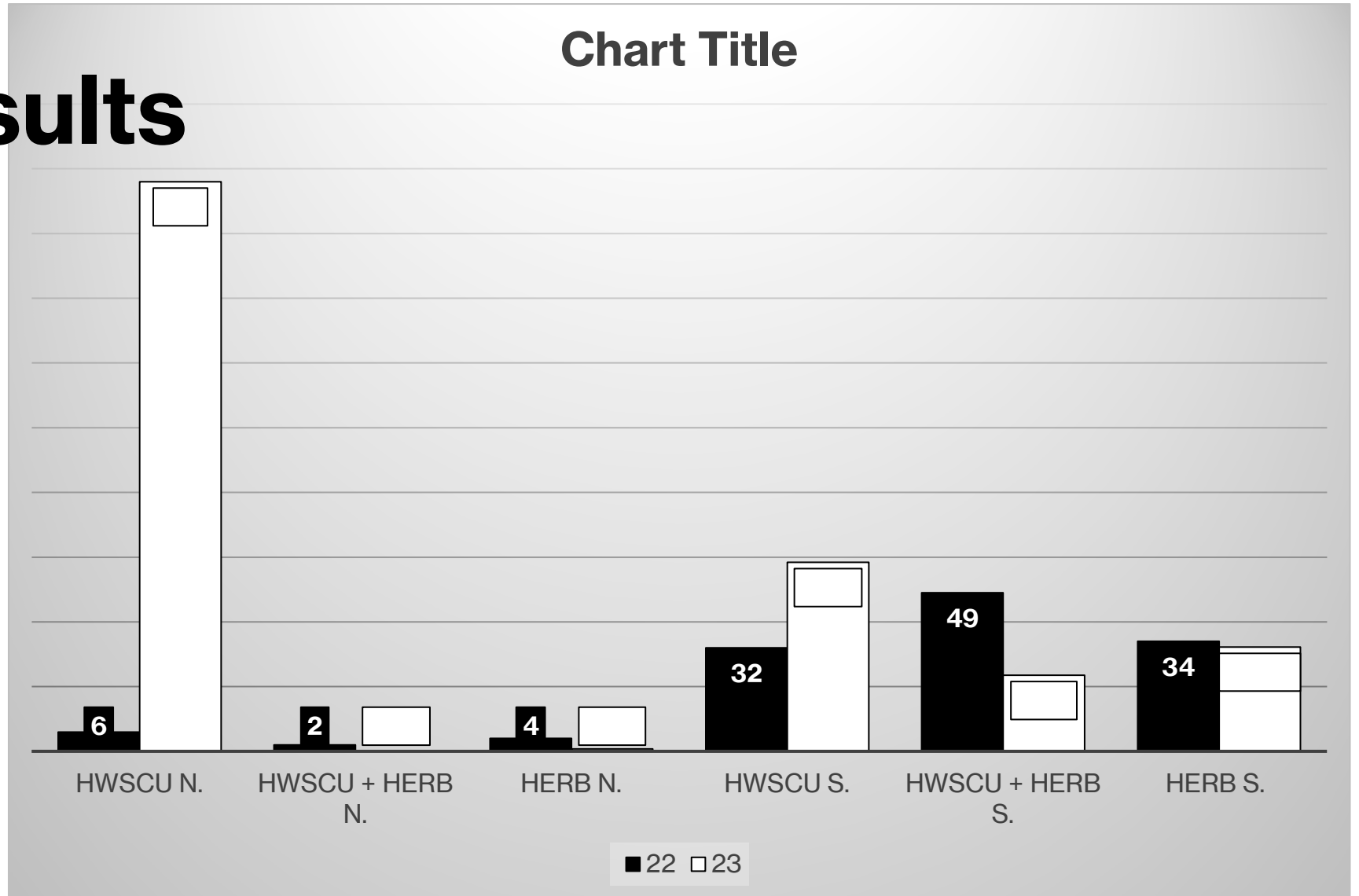
**OUR
RESULT**





Our Results

- Year 1.2







INFRARED BLUELIGHT TECHNOLOGY

- Research being done by Joan Campbell at the University of Idaho
- Low horsepower requirement compared to impact mills
- Very effective on small seeds
- Effectiveness goes down on larger seeds
 - Wild Oats
 - Goat Grass
- Redesign on light placement to help with larger seed control
- Estimated 3-5 years before commercial units are available



JOAN CAMPBELL-
UNIVERSITY OF IDAHO



	Check	300 F	350 F
	number of plants		
Ryegrass	543	74	0
Downy brome	471	75	0
Rattail fescue	269	33	0
Wild oat	363	218	146
Prickly lettuce	333	0	0
Russian thistle	197	0	0
Kochia	314	0	0

FINAL THOUGHTS



— OUR REGENERATIVE JOURNEY

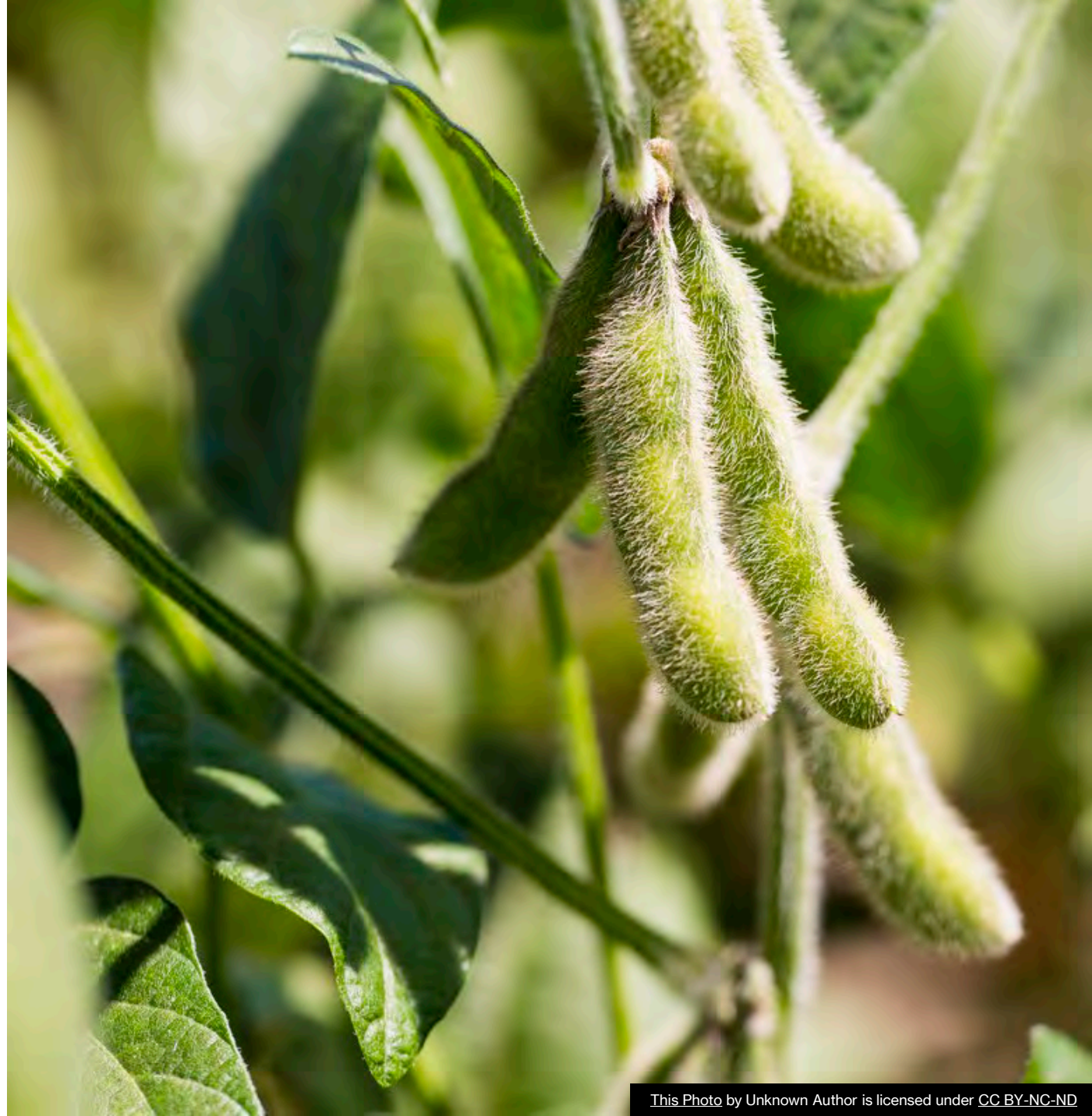
Brentley Uhlorn- Uhlorn Family Farms

**A WEED IS
NATURE'S
BAND-AID**



How did we start?

- Ray Archuleta Cover Crop
- Invitation to meet with a World Soybean Yield Record Holding Grower



**Moved away
from the
largest
microbe
destroyers**

Most dry fertilizers

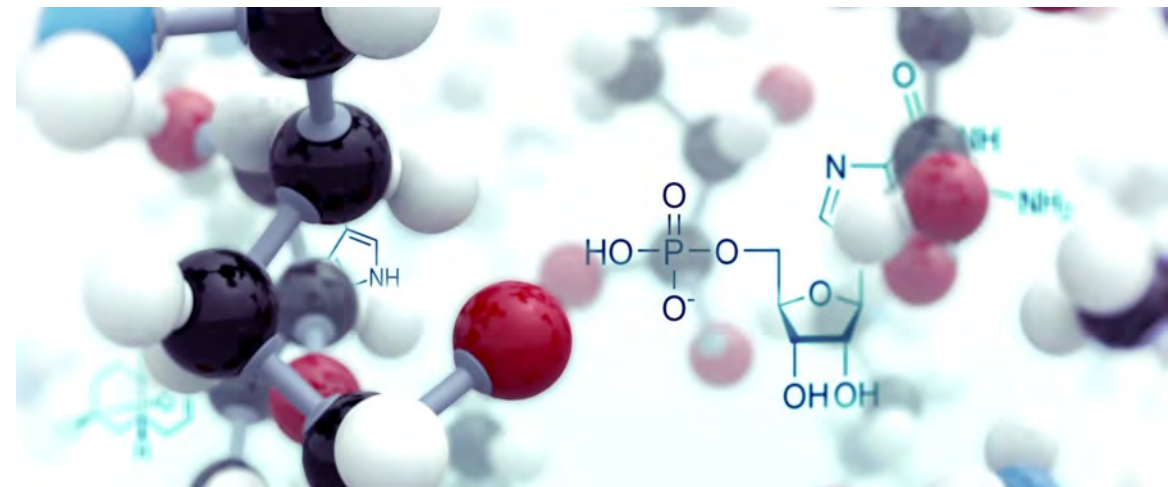
- MAP
- DAP
- Potash
- 16-20-0
- Sulfur***

Anhydrous Ammonia

Went to liquid fertilizers

Bring in gentler, lower salt fertilizers

- First- pH neutral or close to it
- Then look at salt content to pH ratio
 - 3-18-18
 - Most Nachurs products
 - Conklin products
- Plant available nutrients
 - Orthophosphates
 - Potassium Hydroxide, Acetates



Begin experimenting with biologicals

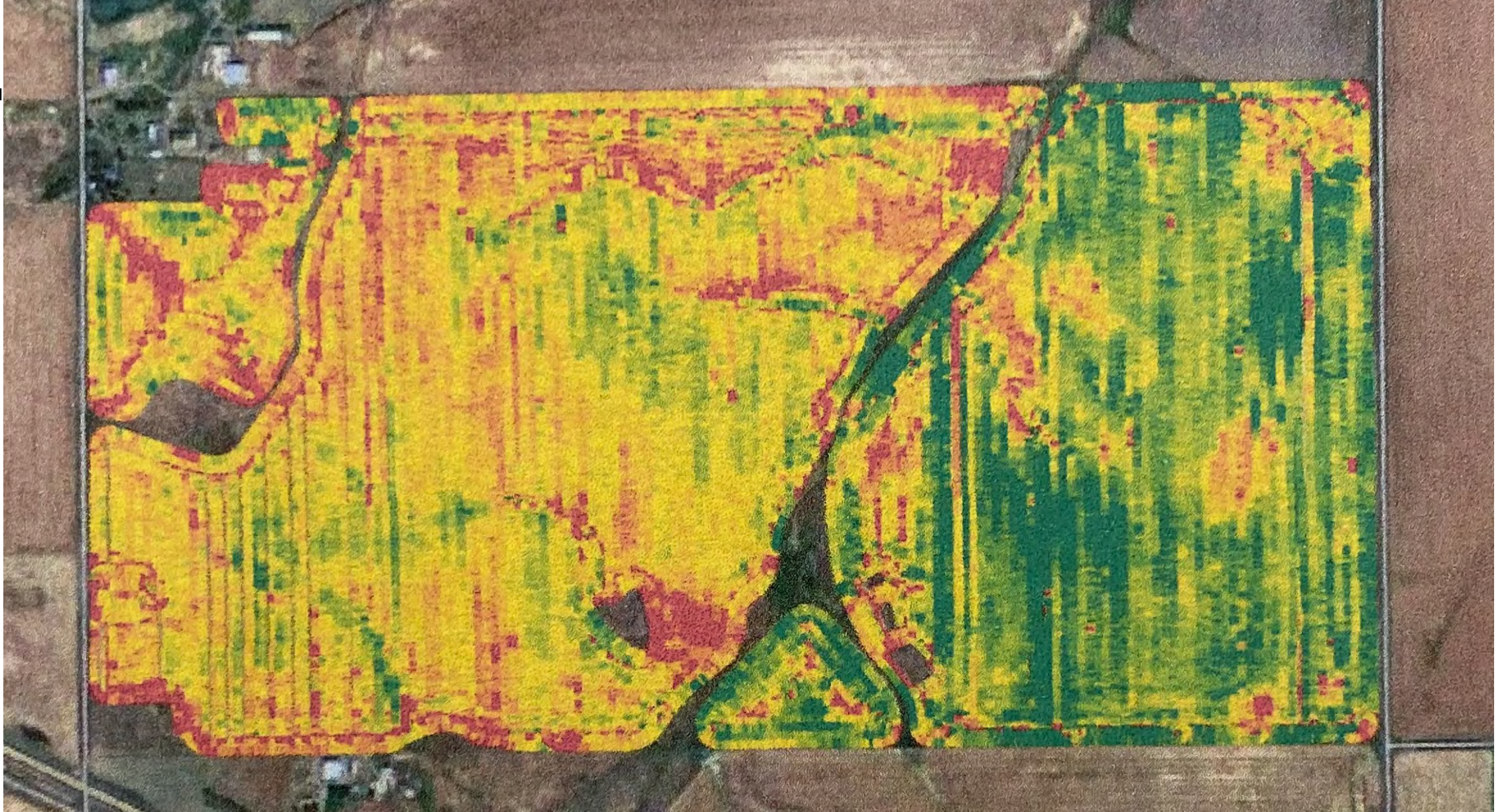
- Nachurs
 - BioK product
 - Ryhzo-Link technology
 - 7 Beneficial Bacterial Species



Trials with heavy biologicals

- Biovante
 - Biological Company out of Missouri
 - Products
 - BioMate
 - Contains the 4 types of sugar- Fructose, Dextrose, Maltose, Glucose plus Lactobacillus and Azotobacter
 - BioRed
 - Bacterial Based
 - BioFlex
 - Fungal Based (Swamp Water)







NO MORE NEED FOR FUNGICIDES

- Started using nutrient based products
 - PikSi Dust
 - Potassium Silica
 - Forms a protective barrier over the leaf surface that Fungal Spores can't penetrate
 - Longer protective period than standard fungicides
 - 4-6 weeks
 - Since nutrient based, pathogens can't become resistant
 - Same price

Found a local company that understands our climate

- Soilcraft
 - Working more with biologicals tailored to our environment
 - Biostimulants
 - Live biological products
 - Denver Black- agronomist



Compost teas and removal of fertilizers

- Tom Poole
 - Toured Tom's farm and was amazed at the difference between his soils and the neighbors right across the road
 - Was a simple dairy compost soaked in water in a tote
 - Eventually added a fish tank aerator
- Bought a specialized compost brewer
 - Ran Vermiculture and Fungal dominated composts
- Started to reduce and eliminate fertilizers
 - Reduce Nitrogen Rates by 5-10%
 - Virtually Eliminate P and K
- Compost Extraction Machine
- Start taking our first SAP Samples



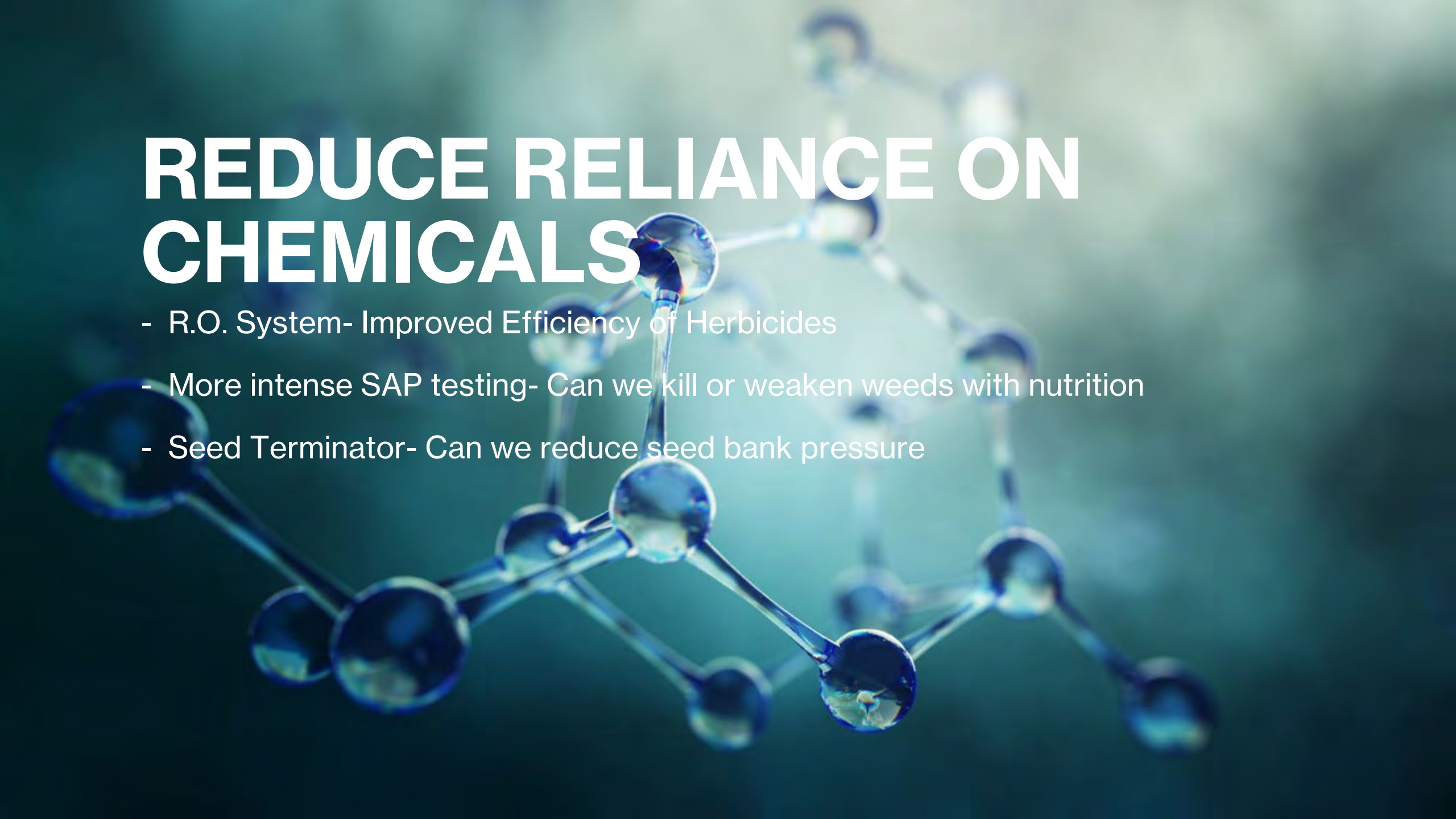
Biological Seed Inoculants

- BioMinerals Technologies
 - Utah
 - Broad Spectrum seed inoculant
 - Natural "Fungicides"
 - Natural "Insecticides"



Bring in more expertise

- PNDSA Advance Soil Health Workshops
 - Jill Clapperton
 - Joel Williams
 - John Kempf
- Apical Labs
- Ag Enterprise
- BioFarming Group
 - Ty Meyer and the Spokane Conservation District
 - Other Members
- AEA
- Mike Nestor- Sterling Valley
- Brian Bohnhoff- Precision Bio
- Dave

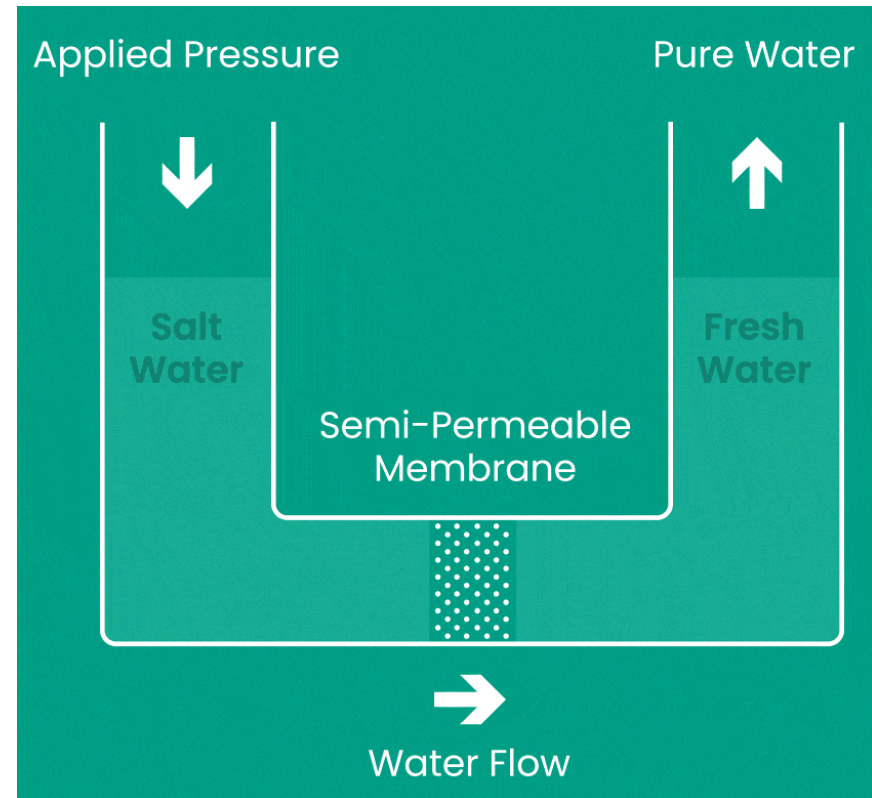


REDUCE RELIANCE ON CHEMICALS

- R.O. System- Improved Efficiency of Herbicides
- More intense SAP testing- Can we kill or weaken weeds with nutrition
- Seed Terminator- Can we reduce seed bank pressure

R.O Water and Plant nutrition

- What is R.O. Water
 - Reverse Osmosis
 - Reverse Osmosis is a technology that is used to remove a large majority of contaminants from water by pushing the water under pressure through a semi-permeable membrane.
 - This semi-permeable membrane has a pore size of around 0.0001 microns, effectively only allowing the small water molecules through and catching any larger molecules of contaminants, organic materials or even salt





R.O. WATER AND PLANT NUTRITION

- Natural nutrients and minerals are removed
- Fertility/Hard Water reactions
 - Reduces Tie up
- Fertilizers are stabilized in the water solution

R.O. Water and Plant Nutrition using SAP Sampling

- Like a blood test for crops
- Snapshot of nutrient in play at the time of sampling
- Measurement of excesses, deficiencies, and imbalances of nutrients within plant
 - Can indicate problems 2-3 weeks before visual symptoms occur
 - Nutrient requirements to address imbalances are smaller when caught early



R.O. WATER AND PLANT NUTRITION USING SAP SAMPLING

- Labs
 - Apical Labs
 - New Age Labs
 - Crop Health Labs
 - Nova Crop
- Measurement of over 20 nutrients and plant health indicators



ANALYTE			
PRIMARY INDICATORS	VALUE	GRADIENT	% DIFF
pH New	6.22	-0.01	-0.16%
pH Old	6.23	0.01	0.16%
Total N New (ppm)	1958.01	-3.06	-0.16%
Total N Old (ppm)	1961.07	3.06	0.16%
MAJOR CATIONS	PPM	GRADIENT	% DIFF
NH4-Ammonium New	161.45	96.84	59.98%
NH4-Ammonium Old	64.61	-96.84	-149.88%
K-Potassium New	3356.34	-474.09	-14.13%
K-Potassium Old	3830.43	474.09	12.38%
SECONDARY CATIONS	PPM	GRADIENT	% DIFF
Mg-Magnesium New	391.69	18.92	4.83%
Mg-Magnesium Old	372.77	-18.92	-5.08%
Ca-Calcium New	1003.99	-975.83	-97.20%
Ca-Calcium Old	1979.82	975.83	49.29%
Na-Sodium New	56.57	-46.37	-81.97%
Na-Sodium Old	102.94	46.37	45.05%
MINOR CATIONS	PPM	GRADIENT	% DIFF
Fe-Iron New	7.75	1.34	17.29%
Fe-Iron Old	6.41	-1.34	-20.90%
Mn-Manganese New	3.97	-3.35	-84.38%
Mn-Manganese Old	7.32	3.35	45.77%
Zn-Zinc New	8.22	6.04	73.48%
Zn-Zinc Old	2.18	-6.04	-277.06%
Cu-Copper New	1.12	0.77	68.75%
Cu-Copper Old	0.35	-0.77	-220.00%
Co-Cobalt New	0.53	0.02	3.77%
Co-Cobalt Old	0.51	-0.02	-3.92%

ANALYTE			
PRIMARY INDICATORS	VALUE	GRADIENT	% DIFF
EC New (mS/cm)	7.96	-0.73	-9.17%
EC Old (mS/cm)	8.69	0.73	8.40%
Total Sugars New (%)	0.89	-0.97	-108.99%
Total Sugars Old (%)	1.86	0.97	52.15%
MAJOR ANIONS	PPM	GRADIENT	% DIFF
NO3-Nitrate New	34.73	-83.50	-240.43%
NO3-Nitrate Old	118.23	83.50	70.63%
P-Phosphorous New	463.82	302.09	65.13%
P-Phosphorous Old	161.73	-302.09	-186.79%
SECONDARY ANIONS	PPM	GRADIENT	% DIFF
S-Sulfur New	797.93	517.04	64.80%
S-Sulfur Old	280.89	-517.04	-184.07%
Cl-Chloride New	899.10	614.20	68.31%
Cl-Chloride Old	284.90	-614.20	-215.58%
Si-Silicon New	9.61	-9.96	-103.64%
Si-Silicon Old	19.57	9.96	50.89%
MINOR ANIONS	PPM	GRADIENT	% DIFF
I-Iodine New	4.15	0.86	20.72%
I-Iodine Old	3.29	-0.86	-26.14%
B-Boron New	5.82	2.77	47.59%
B-Boron Old	3.05	-2.77	-90.82%
Mo-Molybdenum New	0.00	0.00	0.00%
Mo-Molybdenum Old	0.00	0.00	0.00%
Al-Aluminum New	3.65	-1.33	-36.44%
Al-Aluminum Old	4.98	1.33	26.71%
Se-Selenium New	1.12	0.26	23.21%
Se-Selenium Old	0.86	-0.26	-30.23%

NEW LEAF / OLD LEAF RATIOS (% DIFFERENCE)

NEW LEAF / OLD LEAF RATIOS (% DIFFERENCE)

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ANALYTE			
PRIMARY INDICATORS	VALUE	GRADIENT	% DIFF
pH New	5.94	-0.12	-2.02%
pH Old	6.06	0.12	1.98%
Total N New (ppm)	3345.28	511.51	15.29%
Total N Old (ppm)	2833.77	-511.51	-18.05%
MAJOR CATIONS			
	PPM	GRADIENT	% DIFF
NH4-Ammonium New	730.12	540.17	73.98%
NH4-Ammonium Old	189.95	-540.17	-284.37%
K-Potassium New	3827.36	292.03	7.63%
K-Potassium Old	3535.33	-292.03	-8.26%
SECONDARY CATIONS			
	PPM	GRADIENT	% DIFF
Mg-Magnesium New	807.14	305.50	37.85%
Mg-Magnesium Old	501.64	-305.50	-60.90%
Ca-Calcium New	4361.38	1176.61	26.98%
Ca-Calcium Old	3184.77	-1176.61	-36.94%
Na-Sodium New	59.88	2.39	3.99%
Na-Sodium Old	57.49	-2.39	-4.16%
MINOR CATIONS			
	PPM	GRADIENT	% DIFF
Fe-Iron New	8.51	1.88	22.09%
Fe-Iron Old	6.63	-1.88	-28.36%
Mn-Manganese New	14.20	3.81	26.83%
Mn-Manganese Old	10.39	-3.81	-36.67%
Zn-Zinc New	4.82	2.78	57.68%
Zn-Zinc Old	2.04	-2.78	-136.27%
Cu-Copper New	1.30	0.51	39.23%
Cu-Copper Old	0.79	-0.51	-64.56%
Co-Cobalt New	0.50	0.00	0.00%
Co-Cobalt Old	0.50	0.00	0.00%

ANALYTE			
PRIMARY INDICATORS	VALUE	GRADIENT	% DIFF
EC New (mS/cm)	10.42	0.16	1.54%
EC Old (mS/cm)	10.26	-0.16	-1.56%
Total Sugars New (%)	1.45	0.42	28.97%
Total Sugars Old (%)	1.03	-0.42	-40.78%
MAJOR ANIONS			
	PPM	GRADIENT	% DIFF
NO3-Nitrate New	1.22	-95.61	-7836.89%
NO3-Nitrate Old	96.83	95.61	98.74%
P-Phosphorous New	402.91	277.17	68.79%
P-Phosphorous Old	125.74	-277.17	-220.43%
SECONDARY ANIONS			
	PPM	GRADIENT	% DIFF
S-Sulfur New	770.60	513.20	66.60%
S-Sulfur Old	257.40	-513.20	-199.38%
Cl-Chloride New	674.09	254.03	37.68%
Cl-Chloride Old	420.06	-254.03	-60.47%
Si-Silicon New	32.03	8.69	27.13%
Si-Silicon Old	23.34	-8.69	-37.23%
MINOR ANIONS			
	PPM	GRADIENT	% DIFF
I-Iodine New	2.46	2.46	100.00%
I-Iodine Old	0.00	-2.46	0.00%
B-Boron New	11.38	7.07	62.13%
B-Boron Old	4.31	-7.07	-164.04%
Mo-Molybdenum New	0.40	0.11	27.50%
Mo-Molybdenum Old	0.29	-0.11	-37.93%
Al-Aluminum New	3.49	-1.18	-33.81%
Al-Aluminum Old	4.67	1.18	25.27%
Se-Selenium New	0.34	-0.24	-70.59%
Se-Selenium Old	0.58	0.24	41.38%

NEW LEAF / OLD LEAF RATIOS (% DIFFERENCE)

K New/Old	Mg New/Old	Ca New/Old
10	100	50

NEW LEAF / OLD LEAF RATIOS (% DIFFERENCE)

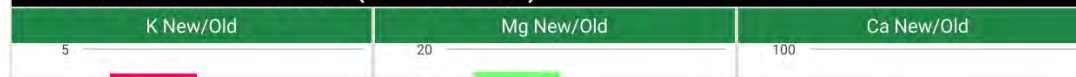
P New/Old	S New/Old	Cl New/Old
500	200	100

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ANALYTE			
PRIMARY INDICATORS	VALUE	GRADIENT	% DIFF
pH New	6.00	-0.27	-4.50%
pH Old	6.27	0.27	4.31%
Total N New (ppm)	6475.95	3259.63	50.33%
Total N Old (ppm)	3216.32	-3259.63	-101.35%
MAJOR CATIONS			
	PPM	GRADIENT	% DIFF
NH4-Ammonium New	213.92	-33.27	-15.55%
NH4-Ammonium Old	247.19	33.27	13.46%
K-Potassium New	2549.32	82.90	3.25%
K-Potassium Old	2466.42	-82.90	-3.36%
SECONDARY CATIONS			
	PPM	GRADIENT	% DIFF
Mg-Magnesium New	1364.43	182.51	13.38%
Mg-Magnesium Old	1181.92	-182.51	-15.44%
Ca-Calcium New	8569.68	3375.47	39.39%
Ca-Calcium Old	5194.21	-3375.47	-64.99%
Na-Sodium New	54.46	2.47	4.54%
Na-Sodium Old	51.99	-2.47	-4.75%
MINOR CATIONS			
	PPM	GRADIENT	% DIFF
Fe-Iron New	6.42	-8.19	-127.57%
Fe-Iron Old	14.61	8.19	56.06%
Mn-Manganese New	13.41	1.09	8.13%
Mn-Manganese Old	12.32	-1.09	-8.85%
Zn-Zinc New	3.96	-2.11	-53.28%
Zn-Zinc Old	6.07	2.11	34.76%
Cu-Copper New	1.82	-3.19	-175.27%
Cu-Copper Old	5.01	3.19	63.67%
Co-Cobalt New	0.43	-0.08	-18.60%
Co-Cobalt Old	0.51	0.08	15.69%

ANALYTE			
PRIMARY INDICATORS	VALUE	GRADIENT	% DIFF
EC New (mS/cm)	3.50	-4.23	-120.86%
EC Old (mS/cm)	7.73	4.23	54.72%
Total Sugars New (%)	2.07	1.42	68.60%
Total Sugars Old (%)	0.65	-1.42	-218.46%
MAJOR ANIONS			
	PPM	GRADIENT	% DIFF
NO3-Nitrate New	4.51	4.51	100.00%
NO3-Nitrate Old	0.00	-4.51	0.00%
P-Phosphorous New	228.75	114.62	50.11%
P-Phosphorous Old	114.13	-114.62	-100.43%
SECONDARY ANIONS			
	PPM	GRADIENT	% DIFF
S-Sulfur New	1048.58	524.04	49.98%
S-Sulfur Old	524.54	-524.04	-99.90%
Cl-Chloride New	1384.73	625.03	45.14%
Cl-Chloride Old	759.70	-625.03	-82.27%
Si-Silicon New	22.74	-17.51	-77.00%
Si-Silicon Old	40.25	17.51	43.50%
MINOR ANIONS			
	PPM	GRADIENT	% DIFF
I-Iodine New	0.00	0.00	0.00%
I-Iodine Old	0.00	0.00	0.00%
B-Boron New	9.65	2.45	25.39%
B-Boron Old	7.20	-2.45	-34.03%
Mo-Molybdenum New	0.52	0.07	13.46%
Mo-Molybdenum Old	0.45	-0.07	-15.56%
Al-Aluminum New	4.73	-6.16	-130.23%
Al-Aluminum Old	10.89	6.16	56.57%
Se-Selenium New	0.00	0.00	0.00%
Se-Selenium Old	0.00	0.00	0.00%

NEW LEAF / OLD LEAF RATIOS (% DIFFERENCE)



NEW LEAF / OLD LEAF RATIOS (% DIFFERENCE)



Eliminate More

- Chemical Seed Treats
- More Soil Applied Fertilizers
- More Herbicides
- Insecticides???
 - Canola
 - Brix
 - Boron
 - Bees





Make Calcium the Driver

Calcium is the Coach

Nitrogen is the Backup Quarterback

Silica is the Run Game

Phosphorus is the Medical Assistant

Others are the O-Line and Defense

Starting Quarterback- Boron

Sulfur is the Assistant Coach

Microbes are the Referee

**Make Calcium
the Driver**

Where does our future lead?

- Organic???
- Regenerative Organic?
- Elimination of Weeds and Pathogens through Biology and Nutrition
- Mimic Mother Nature



Things for us to figure out

- Cover Crops
 - Do we need them?
 - What do we plant?
 - When do we plant?
 - How do they integrate into the PNW's cropping system?
 - How do we terminate?
- Livestock
 - Cows?
 - Sheep?
 - Goats?
 - Pigs?
 - Chickens?



Things for us to figure out cont.

- Sap tests and foliar feeding
 - Key Timings
 - Weather delays
 - Can we further reduce our inputs
- Time/Hours
- Specialized Markets
 - Nutritionally Dense Foods
 - Identity Preservation



How to get started

Eliminate

Eliminate your biggest microbe killers

Reduce

Reduce Salt load

Incorporate

Incorporate Reduced Tillage Practices

- Full No-till

How to get started continued

- Nitrogen Stabilizers
- Do you really need that fungicide?
 - Other products out there
- Do you really need that Insecticide?
 - Other products out there
 - Spend your dollars differently, not more dollars
- Find an agronomist/soil health consultant who understands this stuff
- Add Carbon!!!



How to get started continued

- Pick 1 or 2 practices to start with.
 - You don't need to do them all.
 - Which one do you start with?
 - Whichever is going to be simplest to bring into your existing system
 - Which one is going to pay for itself the fastest?
- Start with 1 or 2 fields
 - Pick a good field and an average to poorer field
- Reduce Nitrate Fertilizers
- Ask for help



WORDS OF ADVICE

- Patience
 - Biological Change is a slow process
 - You will not see change in 1 year
 - Plan on 3-5 years
- Time consuming
- Paradigm Challenging
- A weed is nature's band-aid



SNOWBALL EFFECT



THANKS