

KW Ag

Soil Health and
Crop Rotations

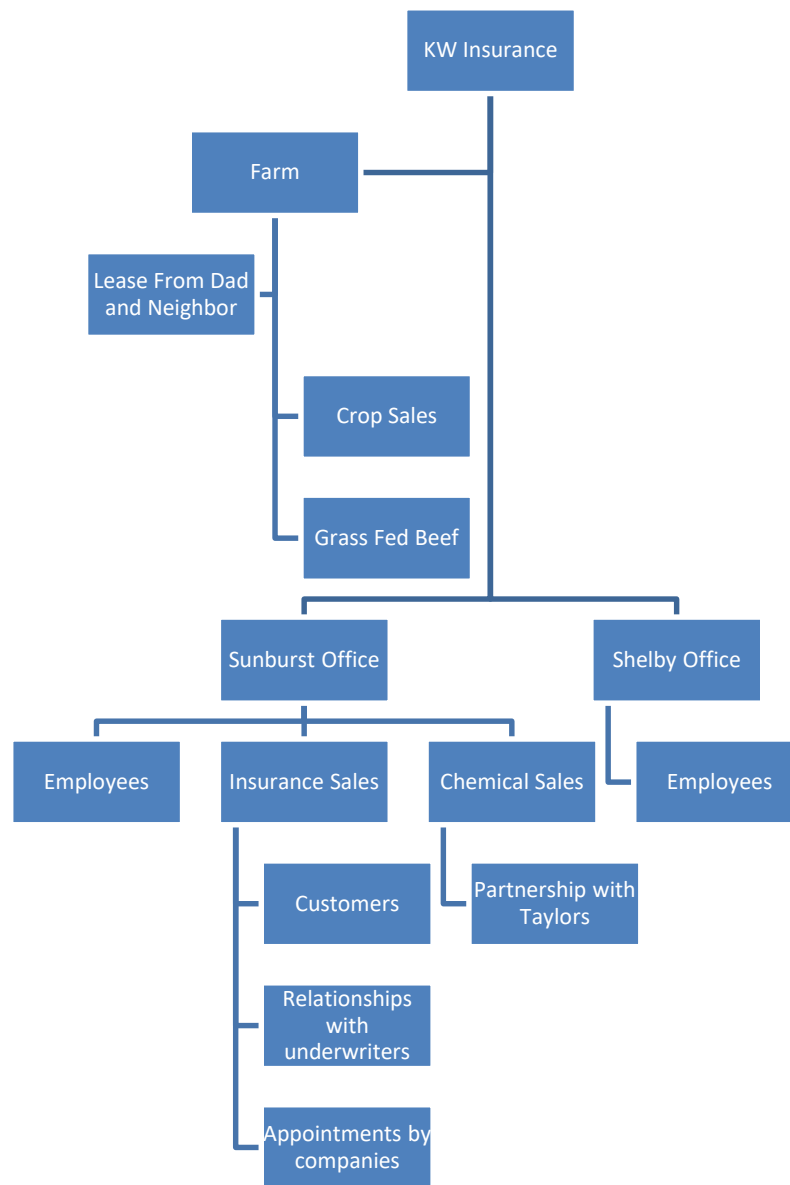
KW Insurance Customer Portal



Full Disclosure

- We have had some failures following full season cover crops
- All of our cost of living expense is covered by our other businesses
 - We may have less risk due to outside income than other operations
- We are starting to see major changes in our soil and CC yields are consistently getting better

Our business structure





**Why don't more producers
adopt soil health and
regenerative agriculture
management practices?**



Rotation Advantages

- Break disease cycles
- Different herbicide modes of action and better weed suppression (Our customers with diverse rotations do not have major weed control issues)
 - How many of the producers having major Kochia issues are wheat or barley and fallow producers?
- Fallow is a backwards year for soil health
 - We are slowly moving in the direction of no fallow and keeping something growing all the time
- Integrating cattle ramps up soil biology and returns on cover crops

Things to consider in rotations

- 3 out of 4 years should be high carbon crops if you want to build organic matter

Material	C:N Ratio
rye straw	82:1
wheat straw	80:1
oat straw	70:1
corn stover	57:1
rye cover crop (anthesis)	37:1
pea straw	29:1
rye cover crop (vegetative)	26:1
mature alfalfa hay	25:1
Ideal Microbial Diet	24:1
rotted barnyard manure	20:1
legume hay	17:1
beef manure	17:1
young alfalfa hay	13:1
hairy vetch cover crop	11:1
soil microbes (average)	8:1

Mimic Nature



High vs Low Carbon Rotation

Rotation Impact on W.Wheat Dakota Lakes Research Farm

Rotation	Yield	Precip*
Corn-Pea-WW 2006	60	7.9
SB-Corn-Pea-WW 2006	29	
Corn-Pea-WW 2005	92	23.7
Sb-Corn-Pea-WW 2005	57	
Corn-Pea-WW 2002	56	6.4
SB-Corn-Pea-WW 2002	28	

Slide taken from Dwayne Beck's presentation SDSU

What is wrong with our current rotation?



Fallow



Barley



Peas



Wheat

How could we improve it?



what's underneath



healthy soil has amazing water-retention capacity.



Every **1%** increase in organic matter results in as much as **25,000** gal of available soil water per acre.

Source: Kansas State Extension Agronomy e-Update, Number 257, July 6, 2012



Want more soil secrets?
Check out www.nrcs.usda.gov

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What does that mean?

- Volume and weight. One inch of rain falling on 1 acre of ground is equal to about **27,154** gallons and weighs about 113 tons. An inch of snow falling evenly on 1 acre of ground is equivalent to about 2,715 gallons of water.



No more Fallow

- We have been $\frac{3}{4}$ crop for several years now
- Going to all crop or cover crop this year
- Lots of Alberta data to back this up
- If we want more than 2% organic matter in our soils we need to quit fallowing
- Many producers are at a turning point of working the ground or providing some cover to the fallow they can't kill
 - You could destroy 10+ years of no till gains in one year

What does it really cost to fallow?

Input	Cost Per Acre	Comments
Chemical at 3 passes	\$15/Acre	
Equipment 3 passes	\$9/Acre	
Cash Lease/Land Payment	\$30/Acre	
Loss of Organic Matter	4 bu wheat x \$6.00 = \$24/Acre	Assuming 1% over time 1 less inch holding capacity = 4 bu wheat
Opportunity lost in wet years?	?	
Yield and ground lost to saline seep?	?	
Total	<u>\$78/Acre</u> plus lost opportunity and increased saline seep	

What does that mean in bushels?

Table 1. "Average" moisture use efficiency (bu./ac./in) for major crops in Saskatchewan

Soil Climatic Zone	CWRS Wheat	Barley	Canola	Oats
Dry Brown	3.50	5.30	2.40	6.50
Brown	3.75	5.70	2.60	7.10
Dark Brown	4.00	6.20	2.80	7.75
Moist Dark Brown	4.12	6.20	3.00	7.90
Black	4.25	6.40	3.20	8.20
Moist Black	4.50	6.70	3.40	8.70
Gray	4.75	7.20	3.60	9.10



Challenges with not Fallowing

- You will be working off all recrop insurance guarantees which are not very good for many producers
 - Our starting CC Winter Wheat yield was 15 bu/Acre
 - We have been quickly building it up but the first few years there is a lot of risk
- More acres to seed and harvest may require more equipment
- Increased operating costs

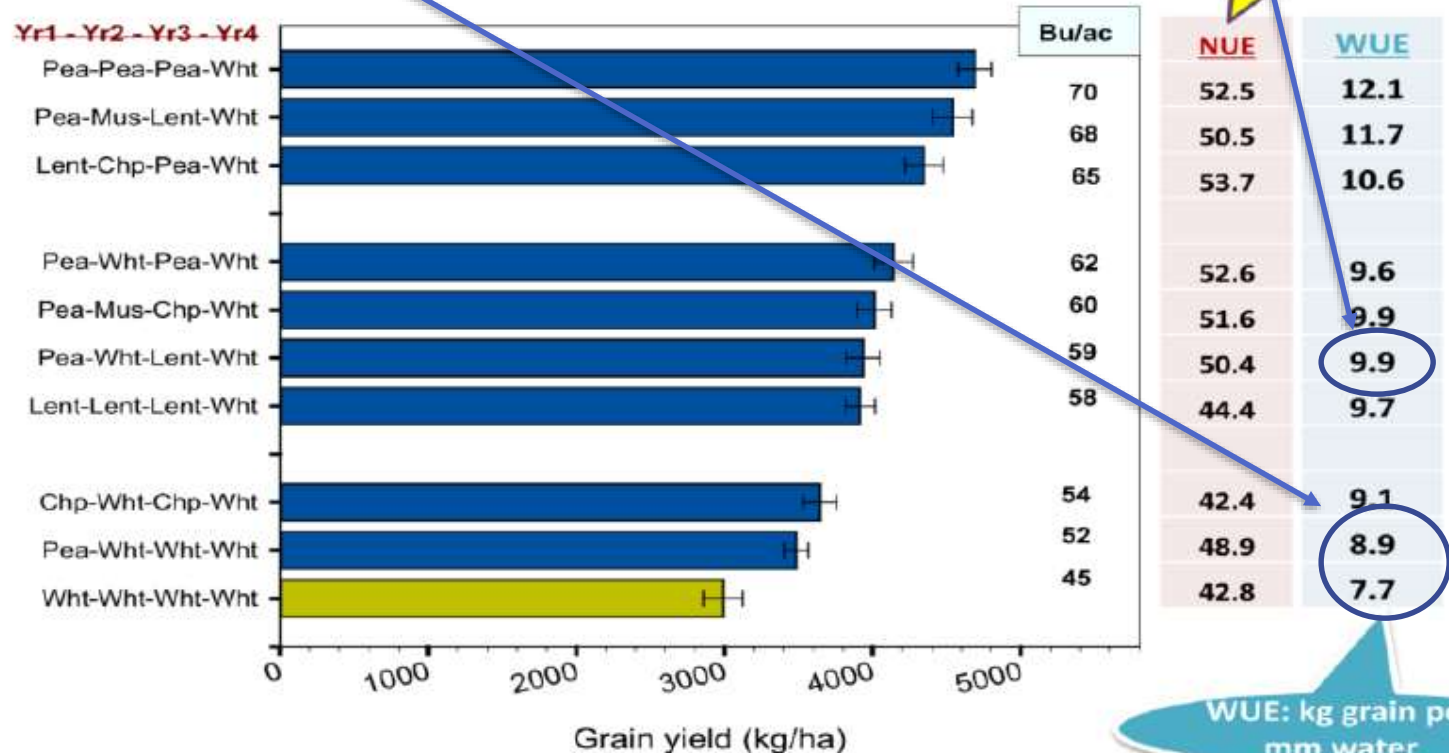
15% more yield with same moisture

Why Rotate Crops?

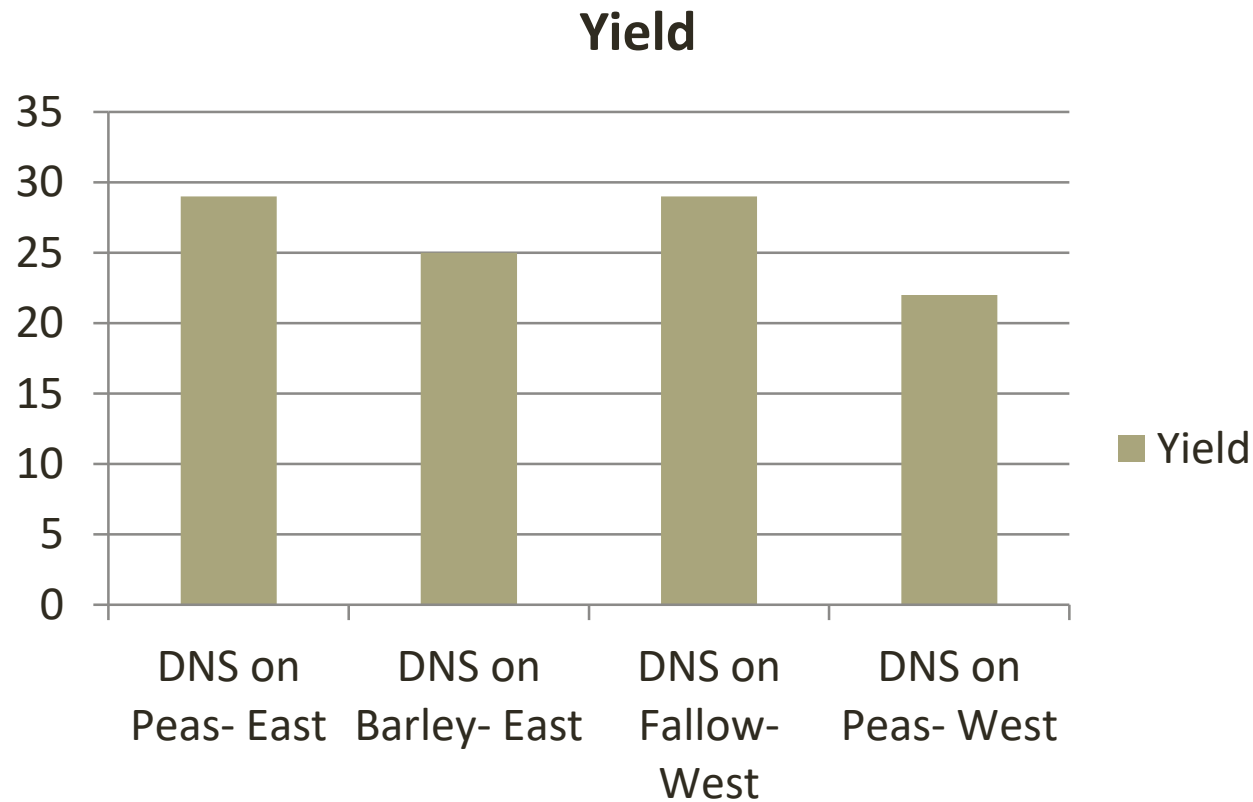
WUE = Water use Efficiency
NUE = Nitrogen Use Efficiency

28% more yield with same moisture

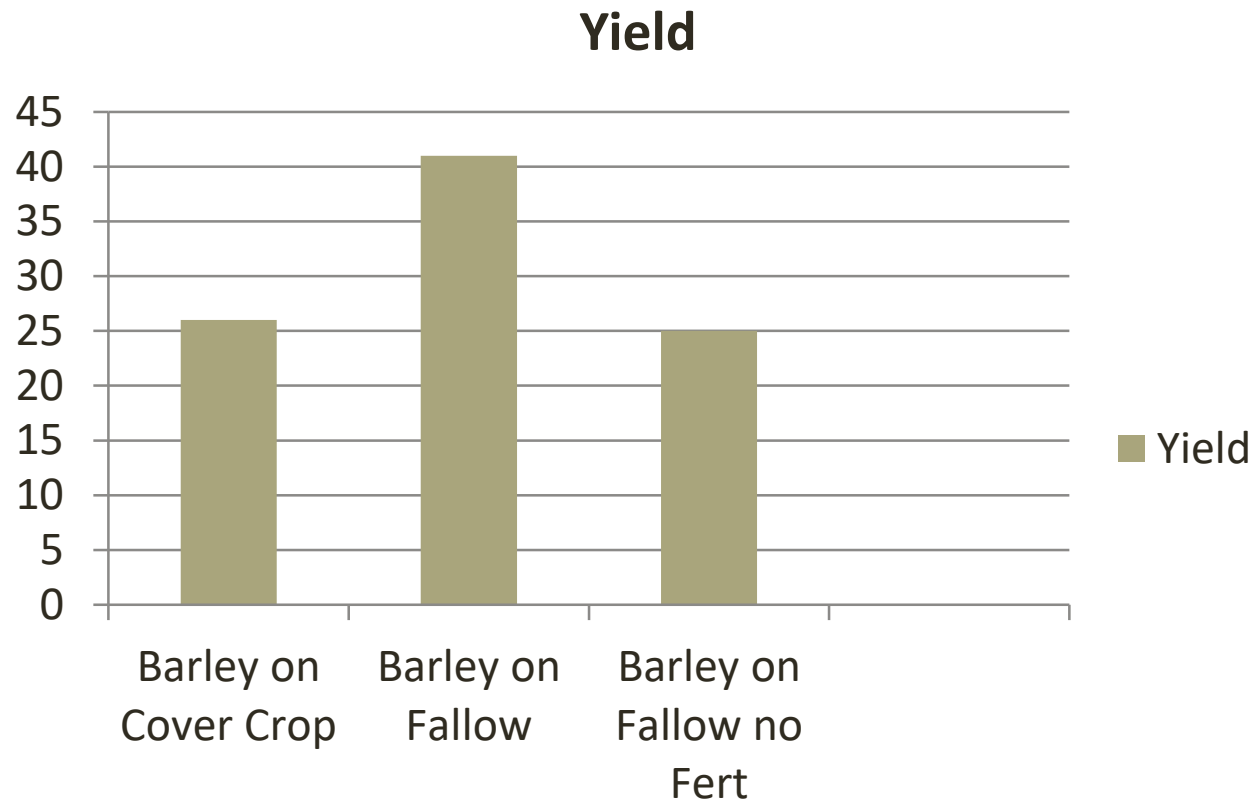
Wheat in 4-year rotations



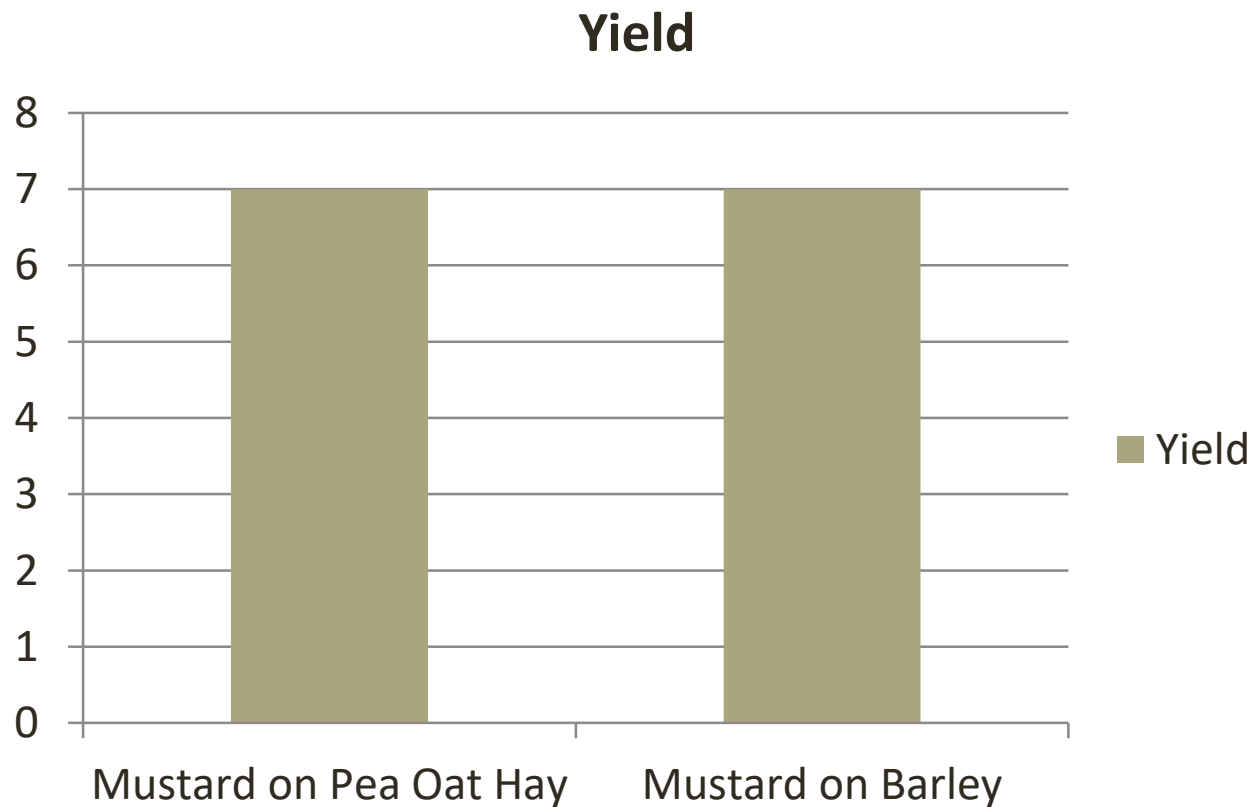
2017 Spring Wheat Rotations



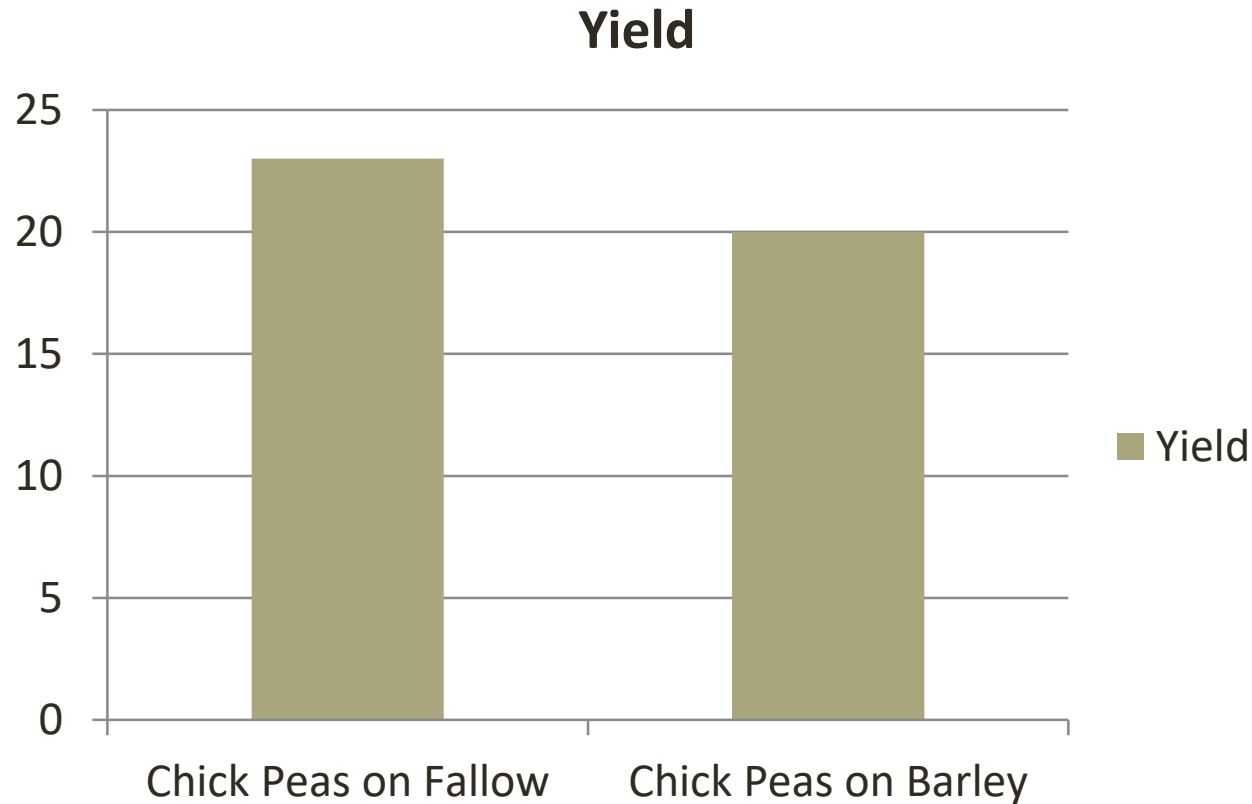
2017 Malt Barley Rotations



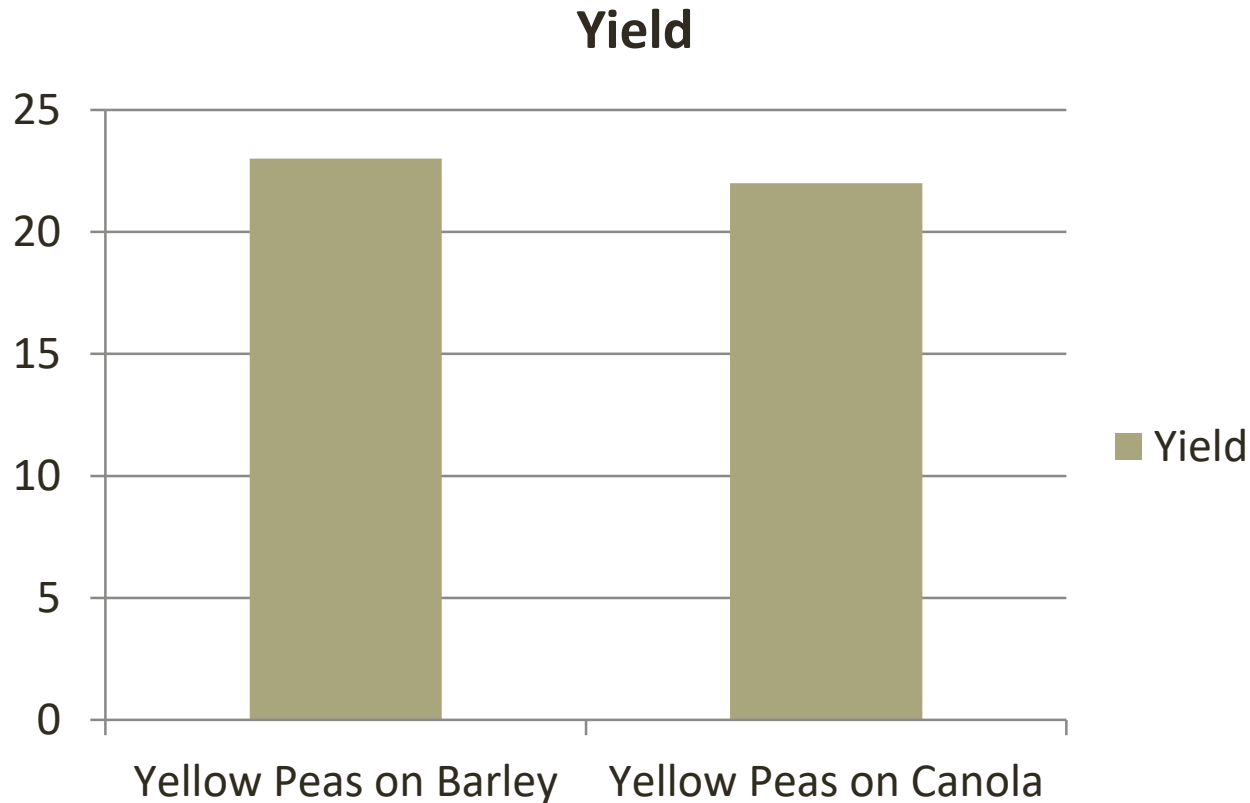
2017 Mustard Rotations



2017 Chick Pea Rotations



2017 Yellow Pea Rotations



*Yellows on Canola seeded 10 days later and had some weed issues

Long Term Rotation Study

Southern Alberta

Table 1. Average annual production costs and returns (\$ per acre per year)

	Continuous wheat	Fallow- wheat	Fallow-wheat- wheat	Legume- wheat	Flax-wheat- fallow	Hay ^a
	(CW)	(FW)	(FWW)	(LW)	(F _x WF)	Hay ^a
Seed costs	7.47	3.73	5.00	9.63	3.64	2.80
Fertilizer costs (N, P ₂ O ₅):						
36,0	10.23	5.12	-b-			10.23
0,18	6.39	3.19		6.39		
36,18	16.62	8.31	11.14		11.14	
36,18	11.51	5.75				
Herbicide costs	20.57	15.06	16.98	20.97	16.85	1.59
Machinery repairs	13.71	8.12	10.02	14.30	7.15	9.23
Fuel costs	9.75	6.26	7.45	8.77	7.16	10.00
Average returns:						
0,0	115.68	116.36	123.59	170.67	107.30	72.18
36,0	155.35	129.72				105.25
0,18	123.57	128.61		170.70		
36,18	163.01	137.86	150.70		127.17	
18,18	145.50	135.44				
manure	129.43	127.67				

Effect of previous crop on yield

Table 6. Relative Yield of Major Crops Sown on Selected Stubble Types in Rotation in Manitoba during 1994-1998 (from Manitoba Crop Insurance Corporation)

	Stubble Type					
	Wheat	Barley	Oats	<i>Brassica napus</i> Canola	Flax	Peas
	Relative % yield (crop on own stubble=100%)					
Wheat	100	109	110	118	114	120
Barley	115	100	110	119	122	122
Oats	114	103	100	124	123	115
<i>Brassica napus</i> canola	114	115	117	100	118	128
Flax	148	148	146	133	100	**

Ally (sulfonylurea injury) peas



Spartan (Sulfentrazone) Injury from overapplicaion



Grass Spray for Peas and Lentils are really good tank cleaners

Herbicide pulled from sprayer hoses after the sprayer sat with Clethodim in the hoses for a couple days



Summary

- Weed control for pulse crops often needs to be planned out long before seeding
- Make sure you understand the herbicide history of the field you are seeding
- Avoid over applying Spartan
- Good tank cleaner is really important
- Never seed a pulse without inoculant



Cover Cropping

What we have learned

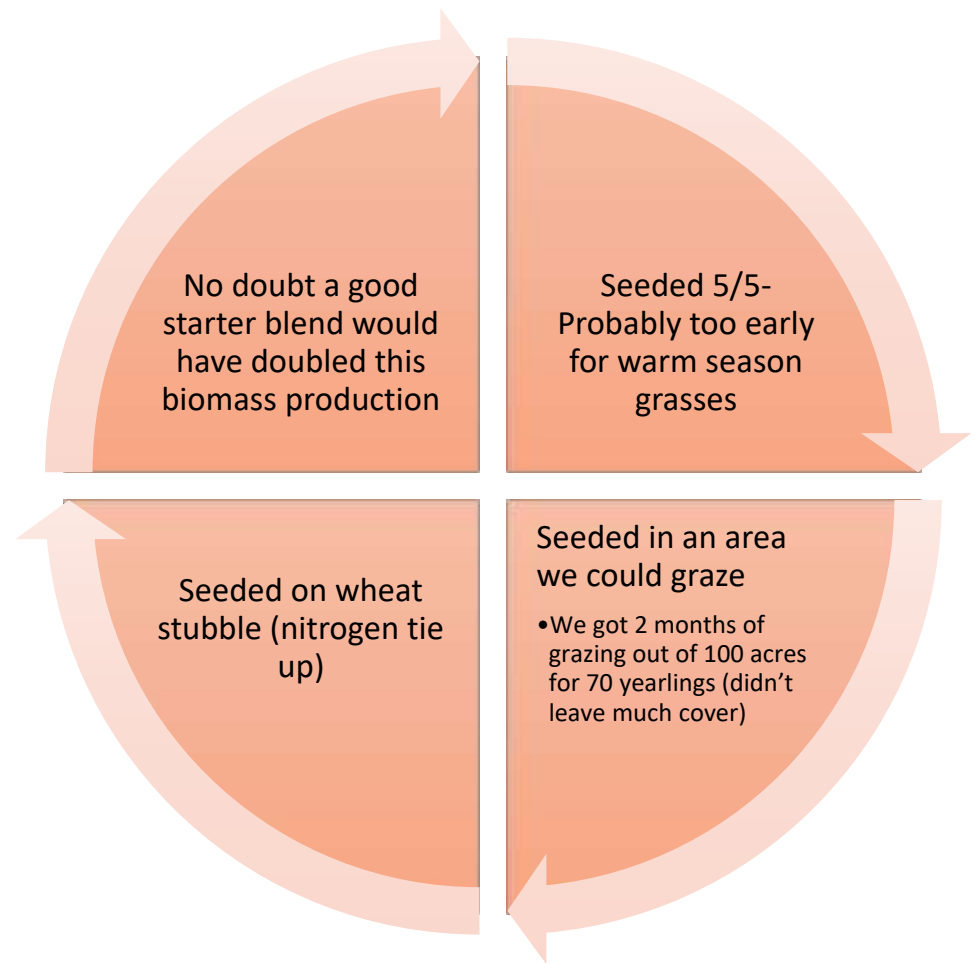
2014

- Triticale, Millet, Sorghum Sudan, Forage Peas, Lentils, Turnips and radishes
 - The good
 - Good ground cover
 - Sprayed out before seed set so we didn't have volunteer issue
 - Turnips established really well
 - The bad
 - We didn't graze and the combination of forage peas and Triticale made seeding difficult
 - Peas and lentils in this mix put us 2 years out to either peas or lentils in our rotation
 - Why put pulse crops in the cover when we are already pushing our luck crowding them into the rest of our rotation?
 - We seeded too early (ground too cold) for the warm season grasses to get going





2016



Stop 2

Cover Crop Cocktail

Plant Date- 5/5/16

Rotation- Barley/Peas/Winter Wheat/Cover Crop

Input	Quantity	Cost/Acre	Comments
Prespray	24 oz./acre RT3	\$3.20	
No Fert	0	\$0	Fertilizer may have helped push this along
Seed Cost	120#	\$27/Acre	Common Vetch, Spring Oat, Sorghum Sudan Grass, Purple Top Turnips, Diakon Radish, Sunflower and Canola
No Herbicide		\$0	
Cash Lease	Acre	\$35/Acre	Should carry at least 1.5 AUM per acre
EQIP Payment	Acre	-\$40	
Seeding/Harvest/Spray Costs	Per Acre	15/0/3 \$18	
Insurance	Per Acre	\$0	
	Total Cost/Acre	\$43/Acre	At 1.5 AUM per month grazing value of \$37.50/Acre

- 1) Should provide rotation benefits of 5 years of individual rotations
- 2) Excellent grazing
- 3) Good soil organic building
- 4) Still not sure on the moisture vs fallow
- 5) Probably would have benefited from some starter fertilizer. Notice the nitrogen rich areas of the field.





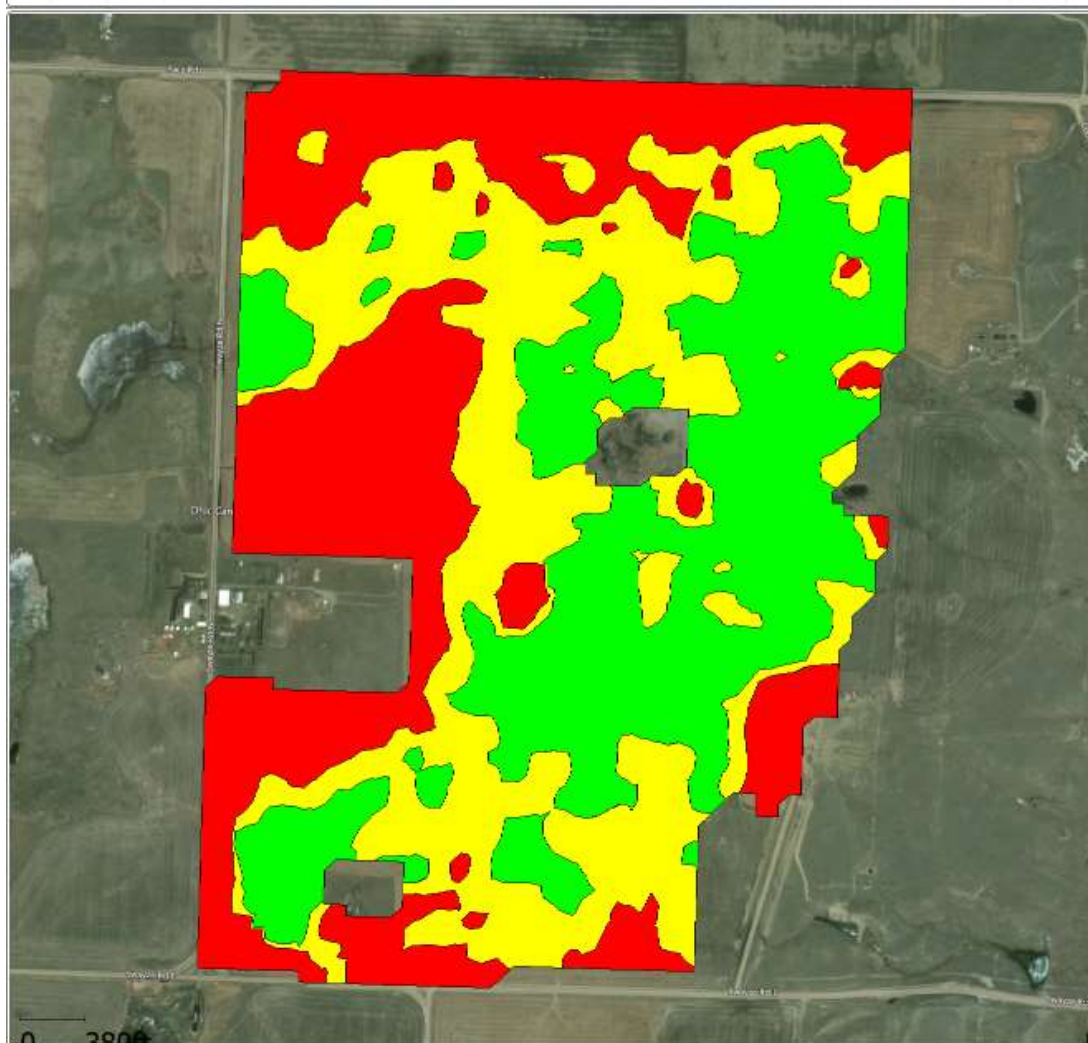


Yellowing from N and S stress





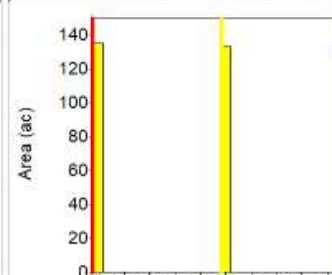
Fertilizing Prescription (Dry) 2017 - Around Randy's(16-20-0)



Grower : KW Ag
 Farm : Randy's Land
 Field : Around Randy's
 Year : 2017
 Operation : Fertilizing Prescription (Dry)
 Crop / Product : 16-20-0
 Previous Years Crop(s) : Wheat - Winter
 Op Instance : Instance - 1
 Area : 400.63 ac
 Total Amount : 47,649 lb
 Average Rate : 118.93 lb/ac
 Minimum Rate : 75.00 lb/ac

Target Rate (Mass) (lb/ac)

163.0 (132.2 ac)
120.0 (134.1 ac)
75.0 (135.9 ac)

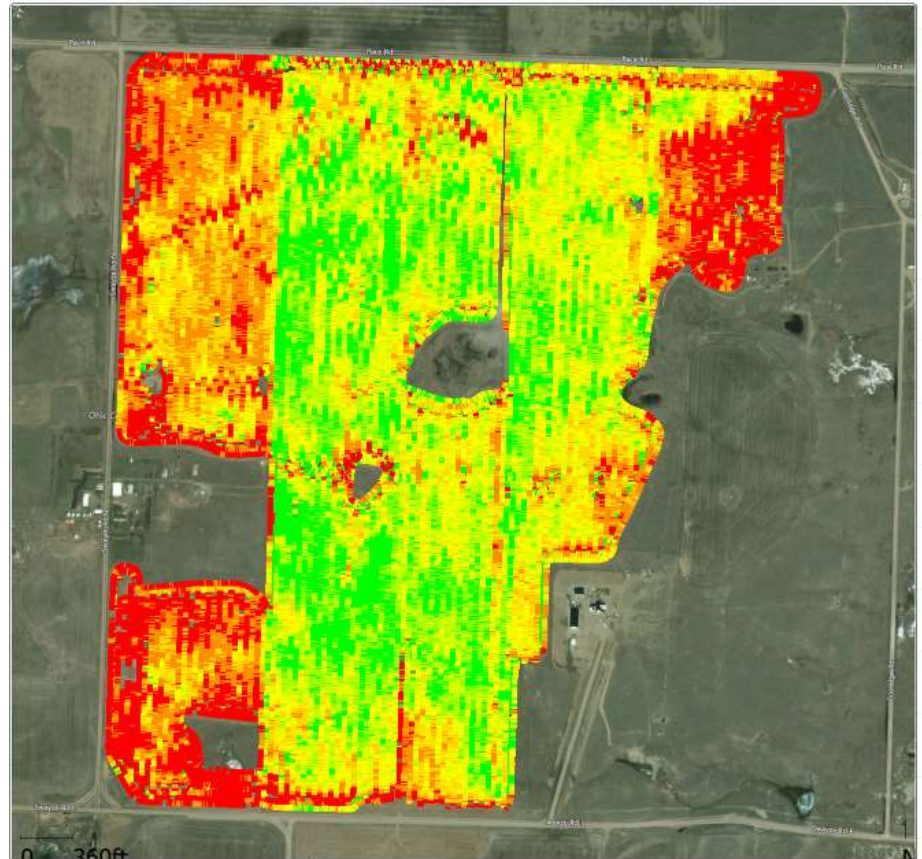


Cover Crop vs Fallow



Crop seeded on 2016 Cover crop

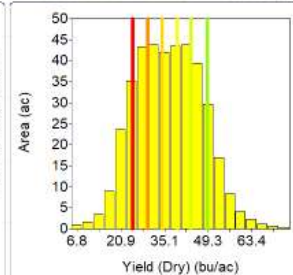
Grain Harvest 2017 - Around Randy's(Barley - Spring)



Grower : KW Ag
Farm : Randy's Land
Field : Around Randy's
Year : 2017
Operation : Grain Harvest
Crop / Product : Barley - Spring
Op. Instance : Harvest - 1
Area : 393.43 ac
Avg. Yield : 36.70 bu/ac
Avg. Moisture : 11.11 %

Yield (Dry) (bu/ac)

49.07	-	198.29	(49.92 ac)
43.83	-	49.07	(55.90 ac)
39.30	-	43.83	(56.86 ac)
34.51	-	39.30	(57.27 ac)
29.80	-	34.51	(58.10 ac)
24.78	-	29.80	(59.32 ac)
5.02	-	24.78	(58.06 ac)



2017



**Seeded on
Peas stubble
5/25 (later
seeding for
warm season
grasses)**

More available N
and moisture



**Used a starter
blend**

100 lbs of 16-20-0-
13



**Didn't rain at
all after June
12th and a
long stretch of
way above
average temps**



**Best biomass
production we
have ever had
with a cover
crop**

Starter Fert and
placement on Pea
stubble

Stop 7

Cover Crop Cocktail

Plant Date- 5/25

Rotation- Barley/Fallow/Barley/Winter Wheat/Peas/Cover Crop

Input	Quantity	Cost/Acre	Comments
Seed Mix	23 <u>lbs</u>	\$12.19	Siberian Millet, Hayes Forage Spring Barley, Daikon Radish, Purple Top Turnip, Buffalo Honey Sorghum X Sudan Grass
20-20-0	45 lbs./Acre	\$15	
<u>Preemerge RT3</u>	24 oz./Acre	\$3.20/Acre	Would cost at least \$15/Acre to fallow this ground
Cash Lease	Acre	\$35/Acre	
Fallow Cost	Acre	\$0 Acre	
Seeding/Harvest/Spray Costs	Per Acre	10/0/3 \$13	
Insurance	Per Acre	\$0	
	Cost per acre	\$43/Acre	Should carry 1 AUM per acre minimum for a \$30/Acre value

Comments:

We moved our seeding date to late in May to try and give the warm season grasses and the radishes a better chance to compete.









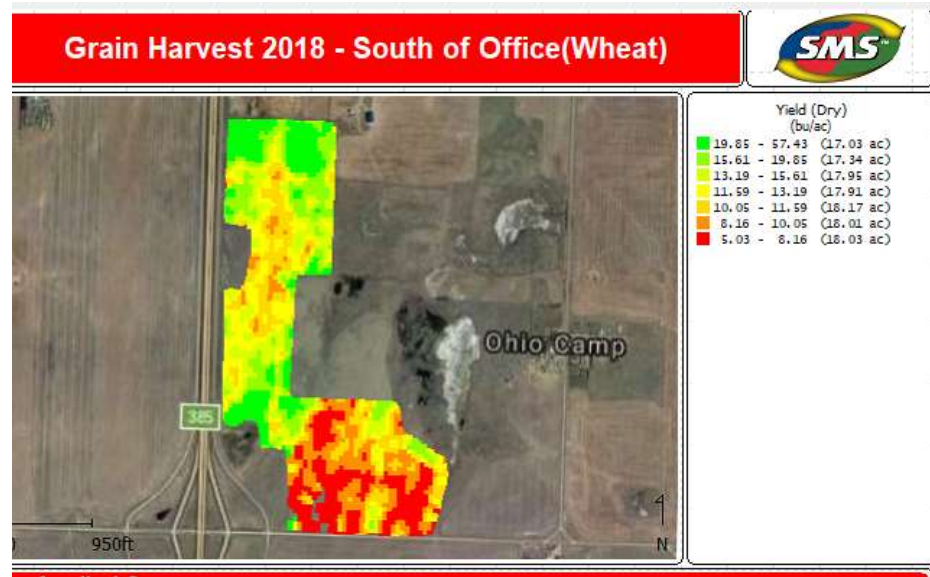


- Planned to seed a fall cover crop
 - We received no measurable rain from July through September
 - Grazed a neighbors cover crop to finish our grass fed steers out on

2018

2018 crop on last years full season cover

- Was about a 10 bushel yield drag vs other cropping rotations
- Was also the last field we seeded which as around the end of may which may have contributed to it.
 - We used up some leftover 28-0-0 on this field and burnt up the south end



What we have learned



- Treat the cover crop like any other crop
 - Fertilizer helps a lot
 - Most of it is getting cycled back through the cattle so it will be available for the next cash crop
- Pulse crops in cover may not be a good idea if you plan on using them a lot in your rotations
- Wait to seed warm season grasses and broadleaves till the ground is warm (usually late May for us)
- Cattle make this system really work well
- Full season covers have always caused a pretty big yield drag the next year (Sacrifice yield for enhanced soil health)

Cover Crop Guidelines

- Cover crop must be terminated 90 days prior to planting to be insurable.
 - If terminated closer than 90 days to planting you need a statement from 2 ag experts stating that your management practice will not adversely affect the yields or quality of the insured crop.
- To be considered SF it must be terminated for one year prior to planting.



Intercropping



Mixed Grain Intercrops: The Value Proposition

South East Research Farm, Redvers SK

Lana Shaw, PAg, MSc
Research Manager

Elijah Leatherdale
Technician

FAQ – Why Intercropping

- ◆ Hybrid of organic and “conventional” techniques
- ◆ “New Conventional”?
- ◆ Sustainable Intensification
- ◆ More profit

Derek and Tannis Axten Win Saskatchewan Outstanding Young Farmers Award

Published: 22 June 2017

Written by Neil Billinger



FAQ – Mixed Grain Intercrops

Is anyone actually doing this?

- ◆ Yes. In SK, MB, AB, ND, SD. (see Twitter)
- ◆ SCIC - 34,000 acres insured in 2017
- ◆ Estimated 45-50 thousand acres in 2017 in Saskatchewan
- ◆ Interest is huge

Intercropping Challenges

- Both must be compatible with herbicide
- Changes to seeding and harvest techniques
- Over-yielding can be inconsistent
- Practical separation of harvested product
- Deficit of knowledge, research...

Chickpea Flax (2017 Redvers)



Sept 2, 2018

Monocrop chickpeas still flowering in low area.

Intercrop ripening well beside - 7-10 days difference average for whole trial

Chickpea Flax Intercrop

Best Advice So Far

- ◆ Start with small acreage
- ◆ Target monocrop chickpea density
- ◆ Flax rate 10-25 lb/ac (preliminary), do strip trials for local verification
- ◆ Chickpeas thresh the flax bolls
- ◆ Intercrop compensates, lowers risk (esp. in wet areas)

Chickpea Flax Intercrop

Best Advice So Far

- ◆ Use Sulfentrazone (Spartan)
- ◆ Field selection: low N, fairly clean, cereal stubble if conventional
- ◆ Seed at different depths (esp if dry)
- ◆ Be prepared to use dessicant or stripper header as needed

Mustard-Lentil Intercrop

- ◆ Replicated 2016, 2017 at Redvers (ADOPT, SPG funded)
- ◆ Why?
 - ◆ Reduce lodging, improve harvest standability
 - ◆ Could reduce disease pressure
 - ◆ Possible overyielding, higher value
 - ◆ Better weed competition

Large Green Lentil – Yellow Mustard



Not Lodged

Lrg Green Lentil
with Yellow Mustard

Green Lentil – Mustard

◆ 2017 Redvers Trial

- ◆ 2200 lb/ac Green Lentils
(95% of monocrop Green Lentil yield)
- ◆ 300 lb/ac bonus mustard
- ◆ More crop value
- ◆ Easier to harvest, taller



SPG Mustard Pulse – Lentil Table

Treatment	Lentil Yield	Mustard Yield	Lentil Yield	Mustard Yield	Total Yield	Crop Value
Pulse x Oilseed	(lb/ac)	(lb/ac)	Partial LER	Partial LER	Full LER	\$/ac
GLentil Monocrop	2311	0	1	1	1	693.40
GLentil YMust	2207	337	0.96	0.46	1.42	763.28
GLentil BMust	2106	360	0.91	0.37	1.29	721.71
YMust Monocrop	n/a	726	n/a	1	1	217.66
BMust Monocrop	n/a	962	n/a	1	1	240.41

Root rot – intercrop may help with symptoms

Full report submitted to Sask Pulse Growers

Other Redvers Intercrop Trials (Preliminary)

- ◆ Peas (inc. maple) with mustard & canola
 - ◆ Mustard and canola support peas
 - ◆ Possibly helping with root rot (ongoing research)



FAQ-Intercropping

- ◆ What do you do with the mixed grain
 - ◆ Separate if worthwhile (amount / quality)
 - ◆ Sell grain with high dockage if not worth separating



David Ediger, MB: KwikClean set-up

How do you separate it?



- ◆ Large seed size difference is important
- ◆ Dockage cleaners have capacity

Get on Twitter to learn more



Colin Rosengren
@RosengrenFarms

Anyone else have trouble with green growth of turnips plugging their return when combining corn soybean?

2:33 PM · 21 Oct 16



Leeann Minogue @Grain... · 21 Oct 16

Replying to @RosengrenFarms

That might be just you. #EarlyAdopter



2



RealAgriculture
@realagriculture

Intercropping can sound overwhelming and complicated, so where to begin?

@SE_ResearchFarm shares her advice for intercropping rookies:
bit.ly/2CJsbfv

11:52 AM · 03 Jan 18

3 Retweets 8 Likes



Intercropping

- 15 lbs Flax seeded at $\frac{1}{2}$ " deep and 90 lbs chickpeas seeded at 90 lbs/Acre (Taken from Canadian research)
 - This drill has separate drop tubes for the small seeds
- No herbicide applied (rained right after seeding and emerged before we could get to it.)
 - Both Flax and Chickpeas are tolerant of Spartan (Will definitely apply that next time)



Advantages

- No Fungicide Applied
 - 2 Passes on our other chickpeas = \$40/Acre
- Lower seeding rate of Chickpeas
- Flax
 - mycorrhizal fungi building crop
 - Provide disease protection for Chickpeas
- Chickpeas
 - Provide N for Flax crop



Harvesting



Combine Settings

- Set combine for Chickpeas but backed off the fan some to avoid blowing out flax
 - Large Wire/Large Wire concaves
- Didn't take time to check for losses
 - Would have taken more time setting the machine if this was large acreage





Comparison

Crop	Seed Cost	Fungicide Cost	Herbicide Cost	Fertilizer	Total Cost	Yield	Net above inputs
Intercropped Chickpeas	Flax \$12.75 Chickpeas \$60 \$72.75	\$0	\$0	\$0	\$72.75	11 Bu Chickpeas @ \$16/bu 7 bu flax @\$8/Bu = \$232	\$159/Acre Minus \$18 for cleaning \$141
Chickpeas	\$80	\$40	\$10	\$15	\$145	15 bu Chickpeas @ \$16/bu = 240	\$95/Acre



Insuring intercropping

- Must have 3 years history of that mix to qualify for a written agreement as of now
 - As more if this get done it will probably become insurable up front
 - That could be several years down the road
- We are planning on doing more acres next year since we own the seed and will be lower risk without insurance

What about Whole Farm insurance?

- Might be a good fit for large acreage of uninsurable crops (intercropping maybe)?
- If most of your commodities are insurable through RP whole farm is not a good fit for those farms....
 - With low commodity prices your projection will be so low it may be impossible to get paid



Whole Farm Projections

Whole Farm Level	0.8
5 year average revenue	725,000

Projections for Whole Farm

Crop	Acres	Yield	Price	Projected Revenue	Guarantee
Wheat CC	940	30	5.9	166380	133104
Barley SF	1200	50	5.91	354600	283680
Peas	940	1800	0.12	203040	162432
Whole Farm Total				724020	579216

MPCI Coverage

Level	70%
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Crop	Acres	Ave Yield	Projected Price	Level	Gaurantee	Harvest Price	Harvest Guarantee
Wheat	940	30	6.41	70%	\$ 126,533.40	4.79	\$ 126,533.40
Barley	1200	50	5.5	70%	\$ 231,000.00	5.28	\$ 231,000.00
Peas	800	1800	0.13	70%	\$ 131,040.00	0.1	\$ 131,040.00
Gaurantee					\$ 488,573.40	Harvest Guar	\$ 488,573.40

Harvest Yields and Prices

Crop	Acres	Harvested Yield	Harvest Price	Value For Claim	Cash Price Received or Estimated	Sold Grain Value	Guarantee	MPCI Loss	SCO Guarantee	SCO Loss
Wheat	940	30	\$ 4.79	\$ 135,078.00	4.5	\$ 126,900.00	\$ 126,533.40	0	\$ 28,921.92	\$ 28,921.92
Barley	1200	45	\$ 5.28	\$ 285,120.00	6	\$ 324,000.00	\$ 231,000.00	0	\$ 52,800.00	\$ 52,800.00
Peas	800	600	\$ 0.10	\$ 48,000.00	0.13	\$ 62,400.00	\$ 131,040.00	\$ 83,040.00	\$ 29,952.00	\$ -
Value of sold Grain						\$ 513,300.00	Total MPCI Loss	\$ 83,040.00	Total SCO Loss	\$ 81,721.92

County Wide Averages for SCO	
Wheat	70%
Barley	50%
Peas	86%

Total Revenue	\$ 596,340.00
Whole Farm Guar	\$ 579,216.00
Whole Farm Loss	0

Total Losses	83040
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What Does It Cost

- The more diverse your operation the cheaper the premium
- Here is a quote for 4 commodities at 700,000 Revenue with 500,000 of crop insurance coverage
- This a 3000 acre quote so it would be around \$3.48/Acre for 80% coverage.

Year	Unit	State / County	Crop	Plan	Commodities	Index	Exp Operation	MPCI Liability	Expected Income
2016	0001-0001-000	Montana / 101 - Teton	WFRP / NPS / CLNDP	WFRP	Reported: 3 / Qualified: 3	Indexed		\$450,000	\$625,000



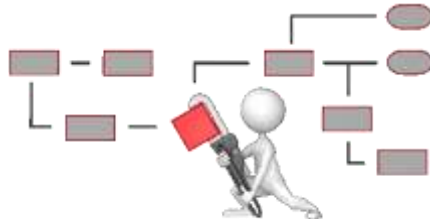
	70%	75%	80%	85%
Coverage - Total	437,500	468,750	500,000	531,250
Gross Premium - Total	31,281	37,500	44,000	51,797
Subsidy - Total	25,025	30,000	31,240	29,006
Net Premium - Total	6,256	7,500	12,760	22,791
Coverage - \$/Prem	69.93	62.50	39.18	23.31
Gross Premium - \$/Cov	0.071	0.080	0.088	0.098
Subsidy - \$/Cov	0.057	0.064	0.062	0.055
Net Premium - \$/Cov	0.014	0.016	0.026	0.043

Misconceptions

- Initially it looks like you are getting \$500,000 of coverage in this example for \$12760 or 2.6% premium which would be super cheap.
 - The only way you would collect the \$500,000 is to have 0 cash sales of grain for that tax year and no crop insurance payments on the MPCl or hail insurance side.
- In reality it is pretty much just covering the gap between the Whole Farm policy of \$500,000 and the Revenue Protection coverage of \$450,000
- So for about \$50,000 in coverage you are paying \$12760
 $\text{Premium} / \$50000 \text{ probable max payout} = 26\% \text{ of the probable max payout}$
- If the grain markets go up which would push your MPCl guarantee up that would make it even harder to get paid on this

Pea and Lentil quality adjustments

- Peas and Lentils that are US #2 or less are docked by taking the price you receive for the lower grade compared to US #1's
 - Example...
 - US #1 Lentils are worth \$.25/lbs at the elevator
 - Your Lentils grade at US #3 which they will pay \$.15/lbs for
 - You harvest 10,000 bushels of lentils
 - Crop insurance will adjust down your production by dividing the #3 price into the #1 price
 - $\$.15/\$.25 = 60\%$
 - 60% of 10000 bushels = 6000 bushels to count for your claim



2018 Crop Rotation Guidelines MPCl



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	Current Year's Planned Crop				
	Smooth Peas*	Lentils	Canola	Chickpeas	Mustard
Previous Crop Year(s)	Break Required from Previous Crop				
Smooth Peas*	2 Years	1 Year	None	None	None
Lentils	1 Year	2 Years	None	None	None
Canola	None	None	1 Year	None	1 Year
Chickpeas	1 Year	1 Year	1 Year	3 Year	1 Year
Mustard	None	None	1 Year	None	1 Year
Sunflower/Rapeseed	None	None	1 Year	None	1 Year

*Smooth Peas include Smooth Green and Yellow Peas, Austrian Peas and Forage Peas Grown for Seed

***One year break would be one full crop year seeded to another crop. For example if you plan on seeding Smooth Peas in 2018 you could not have seeded Smooth Peas in 2017 or 2016 or have seeded Lentils or Chickpeas in 2017

***If you have other broadleaf crops in your rotation not listed on this chart please check with us on rotation issues!!!!

Thanks so much for coming!!!!

