



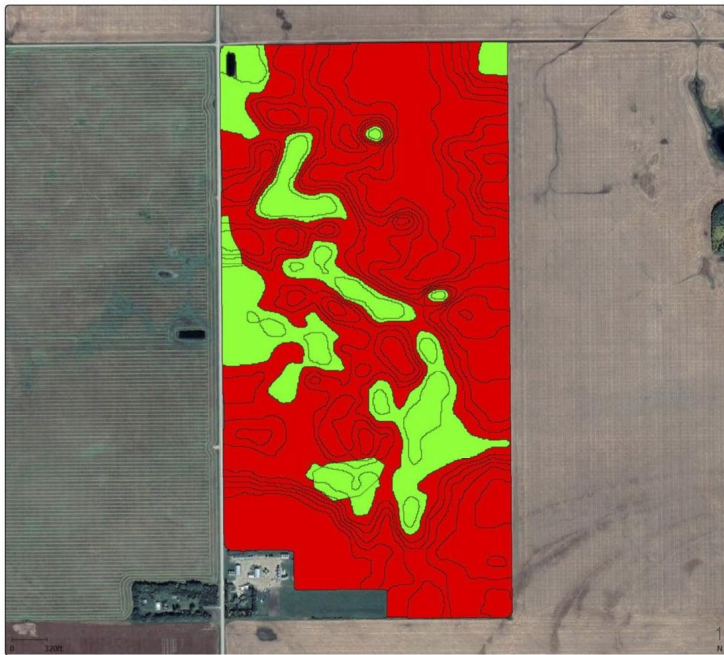
Willmar Farms Ltd.

“We want to embrace new technology on our farm, while becoming experts in mastering the oldest technology available - farming with nature.”

Precision Conservation Management

After our previous experiences with intercropping oats/peas/clover and taking 35 acres of marginal land out of production, we decided to take an approach to focus on precision conservation on all cereal acres.





Farm : Willmar Farms
 Field : Home Half
 Year : 2021
 Crop / Product : Cover Crop
 Area : 306.15 ac
 Total Amount : 627.84 lb
 Average Rate : 2.05 lb/ac
 Minimum Rate : 0.00 lb/ac
 Maximum Rate : 10.00 lb/ac

Target Rate (Mass)
 (lb/ac)

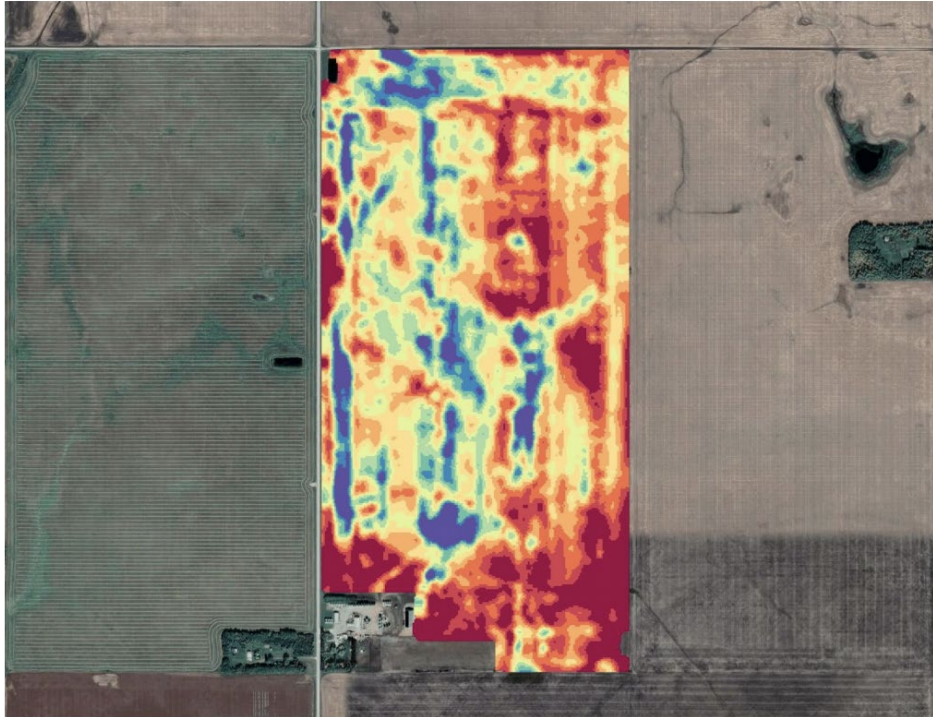
10.00	(63.07 ac)
0.00	(244.48 ac)

Cover crop (green)
 seeded into wheat
 crop.

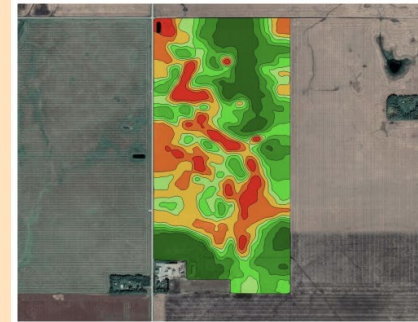


Profit - 2021

Home Half / Wheat - CPS					
Grower	Willmar Farms	Acres	306.2	ADS Field ID:	89720
Farm		Crop	Wheat - CPS	Legal Land	SW 22-45-17-W2
Field	Home Half	Variety	other	Irrigated	No



Average Profit						
\$107.06 /ac						
Sale Price	COP					
\$8.00 /bu	\$296.29 /ac					

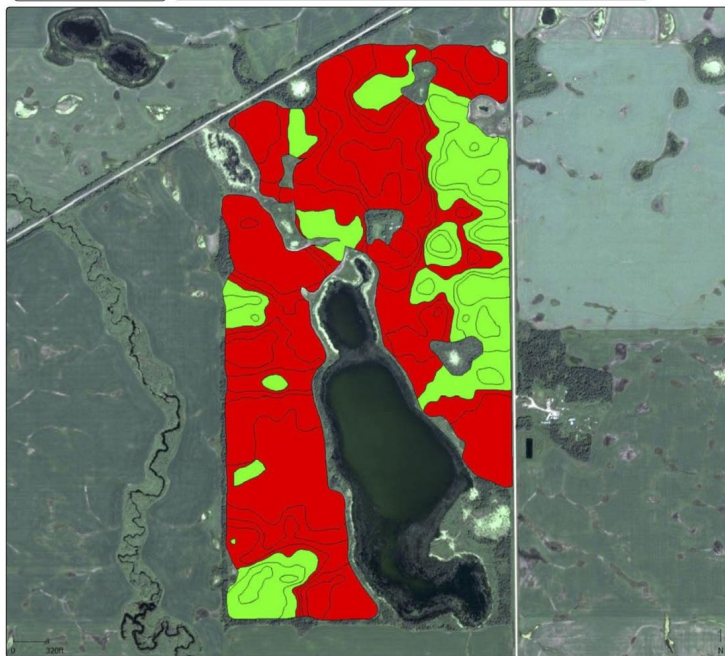


Zone	Acres	CPI	Tar. Yield	Yield	Cost	CPUP	Profit
1	18.51	90.54	54.00	50.12	\$245.76	\$4.90	\$155.18
2	41.01	93.70	65.00	54.04	\$269.15	\$4.98	\$163.20
3	48.94	96.64	76.00	57.31	\$285.48	\$4.98	\$173.02
4	37.83	99.01	84.00	58.50	\$299.12	\$5.11	\$168.84
5	41.12	101.02	87.00	51.91	\$303.02	\$5.84	\$112.30
6	39.58	103.01	91.00	46.76	\$310.87	\$6.65	\$63.22
7	35.99	104.99	94.00	42.39	\$318.26	\$7.51	\$20.86
8	43.90	106.96	96.00	40.77	\$318.26	\$7.81	\$7.90
	306.88 ac	100.04	82.57 bu/ac	50.39 bu/ac	\$296.74/ac	\$6.02	\$106.35/ac



Net Return	Based on the Average Mean Profit, the Net Return with VRT is \$15 per acre.
\$14.71 /ac	2 of 2

Home Quarter Profit Map



Farm : Willmar Farms
 Field : Whyte's Land
 Year : 2021
 Crop / Product : Cover Crop
 Area : 200.22 ac
 Total Amount : 567.57 lb
 Average Rate : 2.83 lb/ac
 Minimum Rate : 0.00 lb/ac
 Maximum Rate : 10.00 lb/ac

Target Rate (Mass)
 (lb/ac)

10.00	(57.02 ac)
0.00	(144.13 ac)

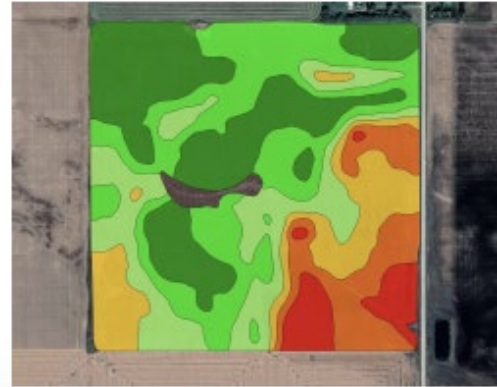
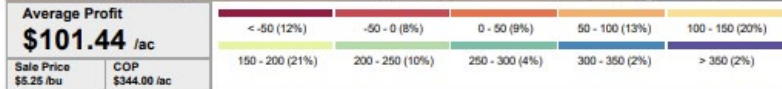
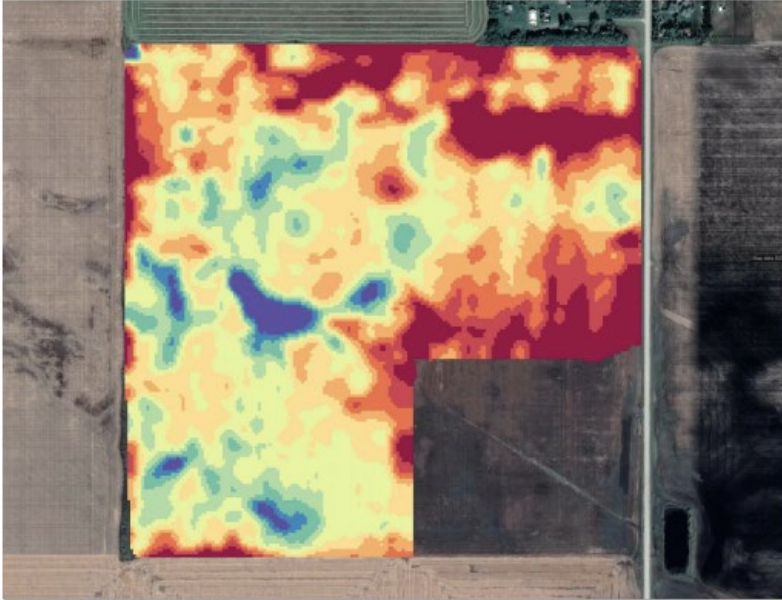
This field there was very poor emergence on the cover crop. There was a little clover and ryegrass. But no other crops such as the sunflower and chicory. The decision to spray the crop out was made.

The chemical chose would allow the clover and rye grass to continue to grow, but terminate other plants that were in the blend but control many of the dandelions, cleavers and other weeds.

This was a lightbulb moment for our farm in taking our precision conservation management to the next level.

Profit - 2021

Hill Quarter / Oats - Milling					
Grower	Willmar Farms	Acres	160.0	ADS Field ID:	89721
Farm		Crop	Oats - Milling	Legal Land	NE 16-45-17-W2
Field	Hill Quarter	Variety	CDC Arborg	Irrigated	No

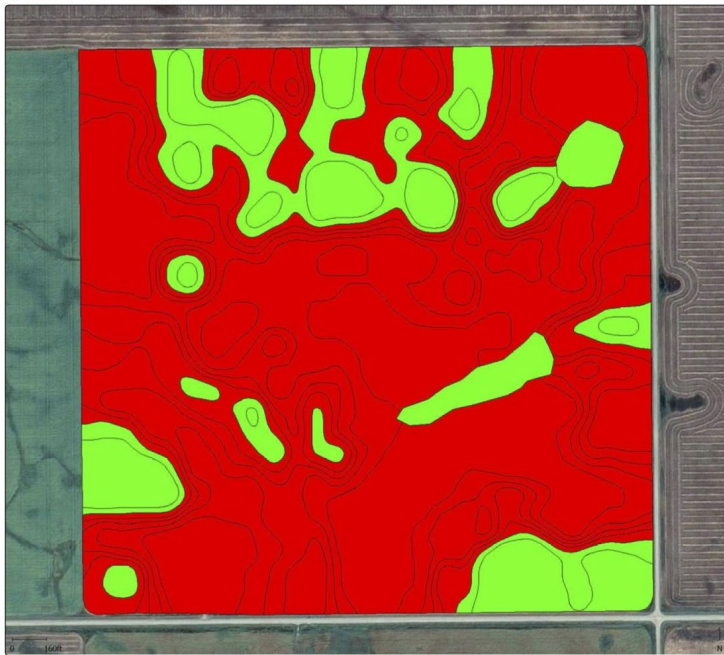


Zone	Acres	Tar. Yield	Yield	Cost	CPUP	Profit
1	8.73	85.00	80.34	\$296.74	\$3.69	\$125.04
2	16.44	121.00	69.36	\$321.06	\$4.63	\$43.08
3	19.82	159.00	76.08	\$340.33	\$4.47	\$59.08
4	27.21	165.00	83.72	\$347.43	\$4.15	\$92.08
5	40.65	171.00	85.36	\$350.35	\$4.10	\$97.78
6	41.96	179.00	90.25	\$355.95	\$3.94	\$117.86
	154.81 ac	160.42 bu/ac	83.23 bu/ac	\$343.94/ac	\$4.15	\$93.00/ac

Net Return \$6.00 /ac	Based on the Average Mean Profit, the Net Return with VRT is \$6 per acre.
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Hill Quarter Profit Map



Farm : Willmar Farms
Field : Neu Quarter
Year : 2021
Crop / Product : Cover Crop
Area : 160.58 ac
Total Amount : 355.63 lb
Average Rate : 2.21 lb/ac
Minimum Rate : 0.00 lb/ac
Maximum Rate : 10.00 lb/ac

Target Rate (Mass)
(lb/ac)

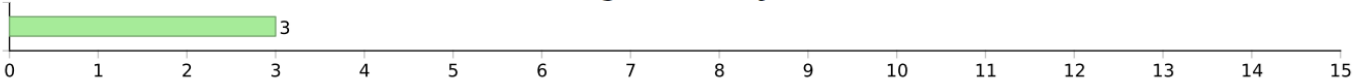
10.00	(35.73 ac)
0.00	(125.59 ac)



SOIL TESTS

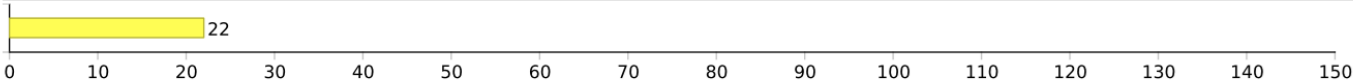
LabNo: 51096 Organic Matter: 6.9 Sample ID: NEUPRO

Biological Quality Result



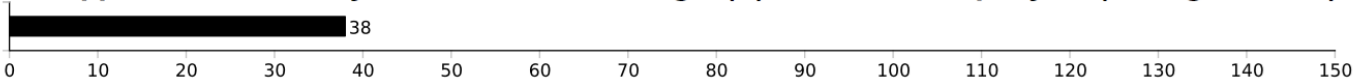
- 0-1: Very Low Soil Microbial Activity**- Associated with dry sandy soils and little to no organic matter.
- 1-2.5: Low Soil Microbial Activity**- Soil is marginal in terms of biological activity and organic matter.
- 2.5-3.5: Medium Soil Microbial Activity**- Soil is in moderately balanced condition.
- 3.5-4: Ideal Soil Microbial Activity**- Soil is well supplied with organic matter and has an active population of microorganisms.
- >4: Unusually High Soil Microbial Activity**- Soil has very high level of microbial activity. May have excessive organic matter.

CO2-C Result



- 0-5: Little biological activity**- Soil is depleted of organic matter Biomass < 100 ppm.
- 6-30: Moderate to Low**- Low in organic matter and microbial activity.
- 31-60: Moderate Level**- Soil is approaching ideal levels, applications of active organic matter still recommended.
- 61-100: Moderate to high**- ideal balance of biological activity and adequate organic matter level.
- >100: High N potential soil**- Soil is well supplied with organic matter.

Approximate Quantity of Mineralizable Nitrogen(N) release lbs/ac per year (average climate)



Methods: **Microbial Activity**- Soil Biomass **Organic Matter**- Combustion **N Release**- Calculation based on CO2-C Result
NO3N (ppm): 23 N4HN (ppm): 0

SH tests results of 1 year precision cover crop (A) - Neu Quarter

SOIL TESTS

Reported Date:
Printed Date:2021-11-03

VitTellus Soil Health Report Biological Activity & Mineralizable Nitrification

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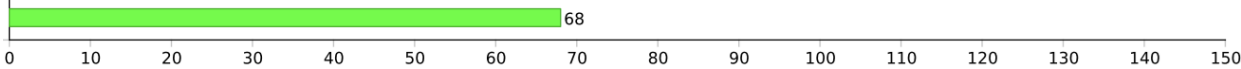
LabNo: 51095 Organic Matter: 8.7 Sample ID: PETPRO

Biological Quality Result



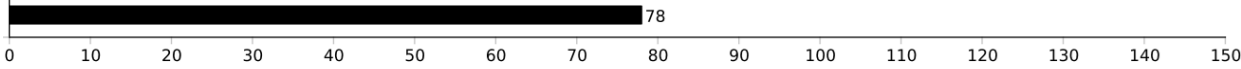
- 0-1: Very Low Soil Microbial Activity-** Associated with dry sandy soils and little to no organic matter.
- 1-2.5: Low Soil Microbial Activity-** Soil is marginal in terms of biological activity and organic matter.
- 2.5-3.5: Medium Soil Microbial Activity-** Soil is in moderately balanced condition.
- 3.5-4: Ideal Soil Microbial Activity-** Soil is well supplied with organic matter and has an active population of microorganisms.
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CO2-C Result



- 0-5: Little biological activity-** Soil is depleted of organic matter Biomass < 100 ppm.
- 6-30: Moderate to Low-** Low in organic matter and microbial activity.
- 31-60: Moderate Level-** Soil is approaching ideal levels, applications of active organic matter still recommended.
- 61-100: Moderate to high-** ideal balance of biological activity and adequate organic matter level.
- >100: High N potential soil-** Soil is well supplied with organic matter.

Approximate Quantity of Mineralizable Nitrogen(N) release lbs/ac per year (average climate)



Methods: Microbial Activity- Soil Biomass Organic Matter- Combustion N Release- Calculation based on CO2-C Result

NO3N (ppm): 3 N4HN (ppm): 0

CO2-C result is significantly higher than other tests - has been cover crop for longer

SH tests results of 2 year multi-species silage crop- Putella.

21 Barley Neu Quarter

Willmar Farms

Switch Station

Moisture

Yield Potential

Environmental

Aug 31 2021 - 05:00 AM
10cm = 25.13 mm / 100mm of soil
20cm = 31.57 mm / 100mm of soil
30cm = 28.90 mm / 100mm of soil
50cm = 17.79 mm / 100mm of soil
70cm = 28.82 mm / 100mm of soil
100cm = 33.68 mm / 100mm of soil

10cm 20cm 30cm 50cm 70cm 100cm

21 Alfalfa Petulla Quarter

Willmar Farms

Switch Station

Moisture

Yield Potential

Environmental

Aug 31 2021 - 07:45 AM
10cm = 16.08 mm / 100mm of soil
20cm = 22.68 mm / 100mm of soil
30cm = 26.76 mm / 100mm of soil
50cm = 32.06 mm / 100mm of soil
70cm = 31.18 mm / 100mm of soil
100cm = 35.83 mm / 100mm of soil

10cm 20cm 30cm 50cm 70cm 100cm

These two images are from soil moisture probes placed at Neu quarter and Petulla. The top image represents a monocrop soil profile and the bottom is our two year multi-species cover crop.

What we want to point out in these images is the rate at which water infiltrates through the profile. At the monocrop level, comparing the moisture (mm) at 10 cm and 20 cm, you can see that the water infiltrated the top 30cm faster at the cover crop. These soils have similar textures.

NPP



Thank You

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