HURON TRACTOR
PRECISION FARMING

August 13 2018

Exeter Demo Plot: Split vs Single App of Nitrogen, Fungicide or No Fungicide

In this report we will evaluate the following treatments:

1. Nitrogen Management Strategy
2. Fungicide Management Strategy
3. Interaction between Nitrogen Management and Fungicide

Winter Wheat was harvested at the HT Demo Plot in Exeter on July 20, 2018. The main tests to be evaluated surrounded split versus single shot nitrogen application, and Prosaro fungicide vs no fungicide at heading. In total, 130lb of Nitrogen was applied as discussed in the previous plot update. The farm averaged 103 bu/ac.

A definitive visual was observed in the yield map between the fungicide and no fungicide treatments. The Fungicide was applied on the west half of the field, and visually shows higher yield (Figure 1).

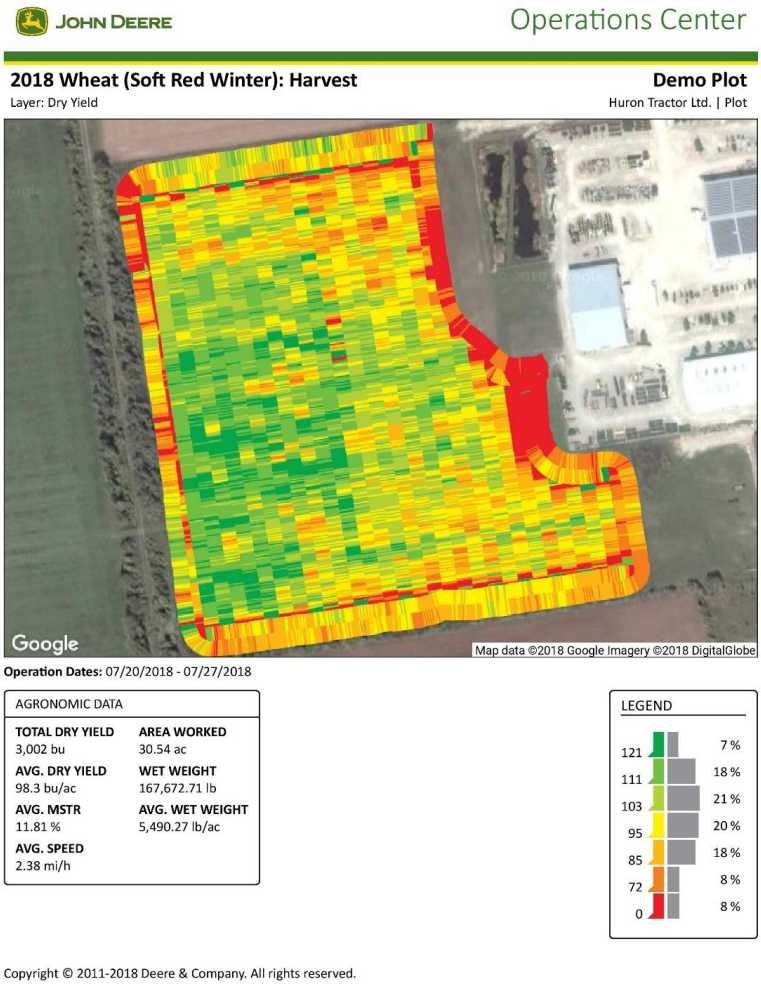


Figure 1: Yield Map gathered from 2018 wheat harvest at the Huron Tractor Demo Plot.

Methods

All data acquired on the plot was documented using John Deere equipment enabled with GS3 2630 and StarFire 6000 with RTK correction. We have cleaned the yield data to eliminate outlier data points. Filters were applied to eliminate areas where speed was above or below a threshold, yield above and below a threshold and moisture readings equal to 0%.

After data cleaning, we filtered the data points used for analysis to only contain information from full length Passes. This was because some passes did not overlay all treatments. Figure 2, provides a visual as to which data was used for analysis.

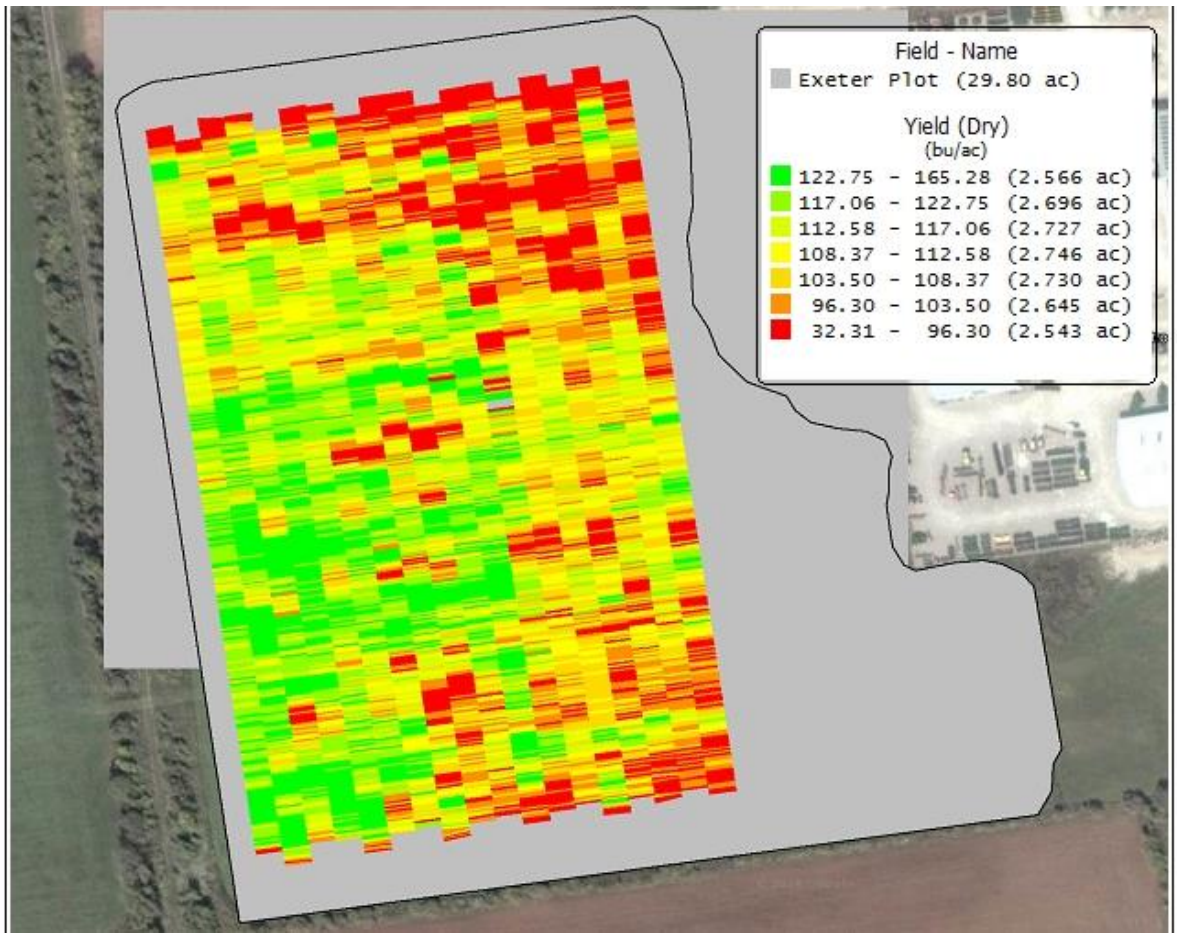


Figure 2: Cropped dataset containing full length passes used for data analysis

All comparisons were evaluated by yield (bu/ac), as well as the net return for the management practice ($/ac). The net return was calculated by taking the difference in bushels between the treated and untreated data, and calculating the difference between gross return and the net cost of the treatment. Various selling prices, and chemical costs were used to generate a sensitivity table indicating net return under various scenarios.

Nitrogen Management Strategy

Two Nitrogen Management strategies were compared. The strategy of applying all nitrogen at once early in the spring versus a split of Nitrogen early and later. The earlier shot of N was applied on May 1st, the soonest we could get on the field (Feekes 3, Zadoks 26). The second shot of N was applied on May 18, at Feekes 7, Zadok 32. Results of the comparison can be visualized in Figure 3.

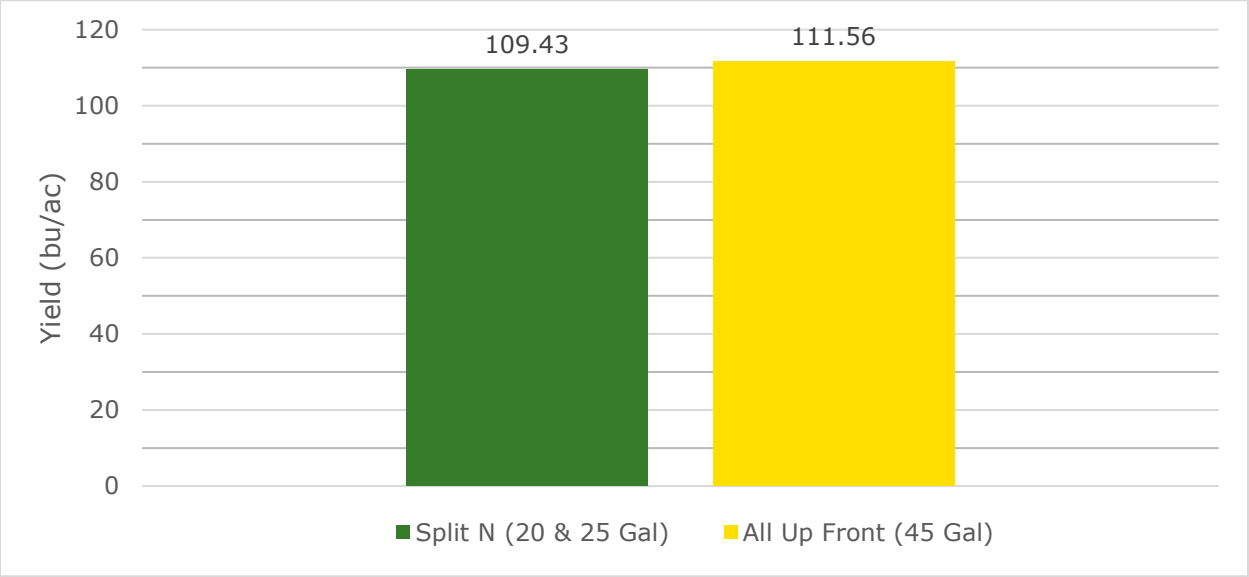


Figure 3: Comparison of Nitrogen Management strategy for Yield (bu/ac). Split Nitrogen application versus a single application all up front.

Table 1: Net return calculation for split application of nitrogen on winter wheat. Both treatments had the same total N rate (130lb/ac), additional cost of split application was only for custom application cost.

Average untreated yield	111.56	bu/ac
Average treated yield	109.43	bu/ac
Calculated yield gain when treated with Split N	-2.13	bu/ac
Estimated commodity price per bushel	7	$/bu
Gross return from application	-14.91	$/ac
Suggested retail price per acre for Extra N	0	$/ac
Estimated application cost	10	$/ac
Net cost + estimated application cost	10	$/ac
Split N Net Return (ROI)	-24.91	$/ac

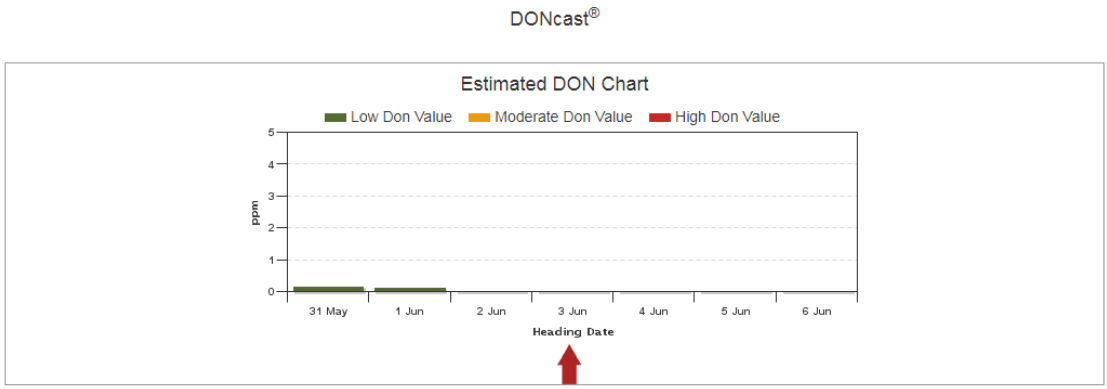
Table 2: Net return for split application of nitrogen on winter wheat for various selling prices and application costs.

		Selling Price ($/bu)										
		6	6.2	6.4	6.6	6.8	7	7.2	7.4	7.6	7.8	8
Application Cost ($/ac)	8	-$20.78	-$21.21	-$21.63	-$22.06	-$22.48	-$22.91	-$23.34	-$23.76	-$24.19	-$24.61	-$25.04
	9	-$21.78	-$22.21	-$22.63	-$23.06	-$23.48	-$23.91	-$24.34	-$24.76	-$25.19	-$25.61	-$26.04
	10	-$22.78	-$23.21	-$23.63	-$24.06	-$24.48	-$24.91	-$25.34	-$25.76	-$26.19	-$26.61	-$27.04
	11	-$23.78	-$24.21	-$24.63	-$25.06	-$25.48	-$25.91	-$26.34	-$26.76	-$27.19	-$27.61	-$28.04
	12	-$24.78	-$25.21	-$25.63	-$26.06	-$26.48	-$26.91	-$27.34	-$27.76	-$28.19	-$28.61	-$29.04
	13	-$25.78	-$26.21	-$26.63	-$27.06	-$27.48	-$27.91	-$28.34	-$28.76	-$29.19	-$29.61	-$30.04

The split nitrogen treatment on the winter wheat at the Exeter demo plot did not produce a yield increase, and also required an additional sprayer application pass. Consequently, the split nitrogen treatments produced a negative net return.

Fungicide Management Strategy

A very simple fungicide management strategy was compared. Based on the DONcast® from weathercentral.ca, the risk for DON was considerably low. Using this model, the decision was made to trial the effect of not applying Fungicide at heading on the winter wheat on half of the plot.



Estimated DON Values

-3	-2	-1	Heading Day	+1	+2	+3
31 May	1 June	2 June	3 June	4 June	5 June	6 June
0.2	0.1	0	0	0	0	0

Figure 4: DONcast(R) value predicted by weathercentral.ca

The benefit to the T3 applied Prosaro Application was well defined in the yield map, and a deeper analysis was completed to compare yield and profitability of the application as seen in Figure 5.

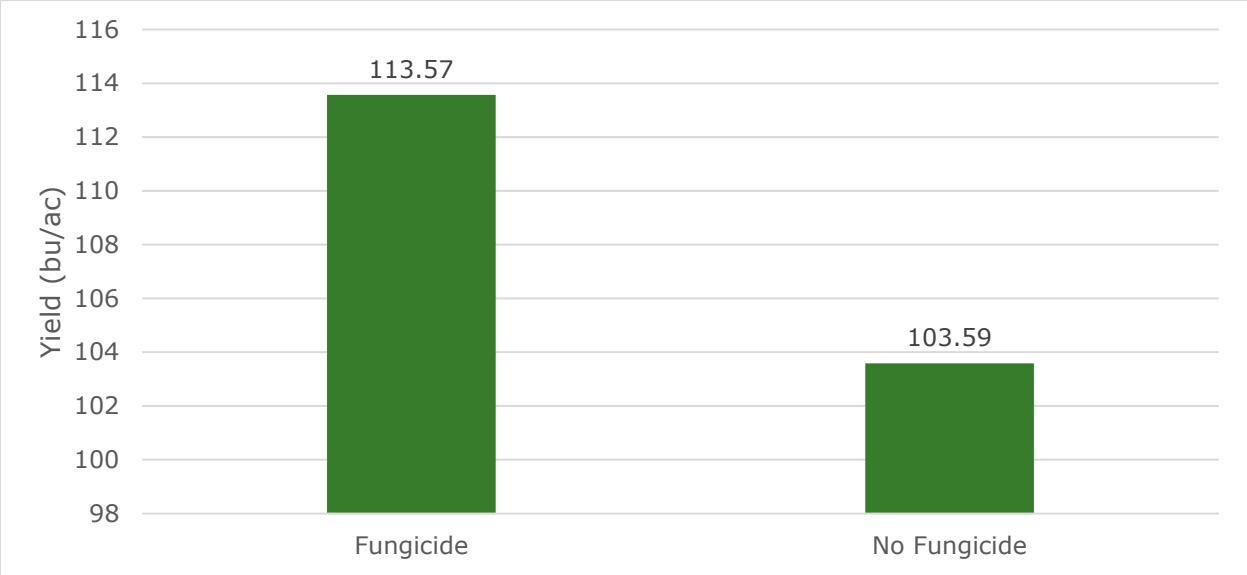


Figure 5: Comparison of Fungicide Management strategy for Yield (bu/ac).

The T3 applied Prosaro application provided a 9.98 bu/ac yield benefit. There was a small test weight boost observed between the truck load from the Fungicide portion of the field over the second truck, 377 g/0.5L (58.5lb/W bu) and 375 g/0.5L (58.2lb/W bu).

Table 3: Net return calculation for Prosaro fungicide application (8oz/ac) at heading on winter wheat. The fungicide treatment had additional costs of fungicide product and custom application cost.

Average untreated yield	103.59	bu/ac
Average treated yield	113.57	bu/ac
Calculated yield gain when treated with Prosaro	9.98	bu/ac
Estimated commodity price per bushel	7	$/bu
Gross return from application	69.86	$/ac
Suggested retail price per acre for Prosaro	18.2	$/ac
Estimated application cost	10	$/ac
Net cost + estimated application cost	28.2	$/ac
Prosaro net return (ROI)	41.66	$/ac

The applied Prosaro Fungicide application at T3 produced a net return on $41.66/ac, based on a 9.98 bu/ac yield gain sold at $7.00, and a product cost of $18.20 with application cost of $10/ac. In Table 4, for the selling price sensitivity analysis, we used a range surrounding the local cash price ($7) for Soft Red Wheat on August 13, 2018.

Table 4: Net return for Prosaro fungicide application (8oz/ac) at heading on winter wheat for various selling prices and Prosaro costs.

		Selling Price ($/bu)										
		6	6.2	6.4	6.6	6.8	7	7.2	7.4	7.6	7.8	8
Prosaro Cost ($/ac)	15	$34.88	$36.88	$38.87	$40.87	$42.86	$44.86	$46.86	$48.85	$50.85	$52.84	$54.84
	16	$33.88	$35.88	$37.87	$39.87	$41.86	$43.86	$45.86	$47.85	$49.85	$51.84	$53.84
	17	$32.88	$34.88	$36.87	$38.87	$40.86	$42.86	$44.86	$46.85	$48.85	$50.84	$52.84
	18	$31.88	$33.88	$35.87	$37.87	$39.86	$41.86	$43.86	$45.85	$47.85	$49.84	$51.84
	19	$30.88	$32.88	$34.87	$36.87	$38.86	$40.86	$42.86	$44.85	$46.85	$48.84	$50.84
	20	$29.88	$31.88	$33.87	$35.87	$37.86	$39.86	$41.86	$43.85	$45.85	$47.84	$49.84

Interaction of Fungicide and Nitrogen Management Strategies

In both the split nitrogen and single application of nitrogen treatments there was a yield benefit to fungicide application at heading. The yield benefit was of similar magnitude, but was slightly greater for the single application of nitrogen (10.6bu/ac versus 8.95 bu/ac).

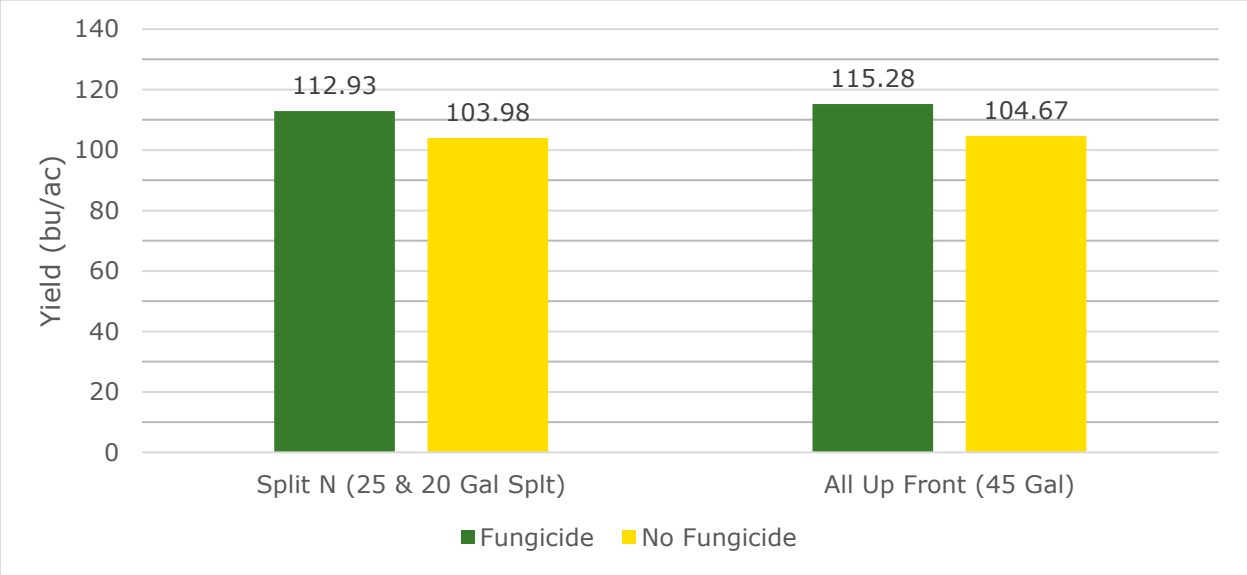


Figure 6: Comparison of the interaction between nitrogen and fungicide management strategies for Yield (bu/ac).

*Table 5: Net return calculation for Prosaro fungicide application (8oz/ac) at heading on winter wheat within **split applied nitrogen treatment**. The fungicide treatment had additional costs of fungicide product and custom application cost.*

Average untreated yield	103.98	bu/ac
Average treated yield	112.93	bu/ac
Calculated yield gain when treated with Prosaro	8.95	bu/ac
Estimated commodity price per bushel	7	$/bu
Gross return from application	62.65	$/ac
Suggested retail price per acre for Prosaro	18.2	$/ac
Estimated application cost	10	$/ac
Net cost + estimated application cost	28.2	$/ac
Prosaro net return (ROI)	34.45	$/ac

*Table 6: Net return for Prosaro fungicide application (8oz/ac) at heading on winter wheat within **split applied nitrogen treatments** for various selling prices and Prosaro costs.*

		Selling Price ($/bu)										
		6	6.2	6.4	6.6	6.8	7	7.2	7.4	7.6	7.8	8
Prosaro Cost ($/ac)	15	$28.70	$30.49	$32.28	$34.07	$35.86	$37.65	$39.44	$41.23	$43.02	$44.81	$46.60
	16	$27.70	$29.49	$31.28	$33.07	$34.86	$36.65	$38.44	$40.23	$42.02	$43.81	$45.60
	17	$26.70	$28.49	$30.28	$32.07	$33.86	$35.65	$37.44	$39.23	$41.02	$42.81	$44.60
	18	$25.70	$27.49	$29.28	$31.07	$32.86	$34.65	$36.44	$38.23	$40.02	$41.81	$43.60
	19	$24.70	$26.49	$28.28	$30.07	$31.86	$33.65	$35.44	$37.23	$39.02	$40.81	$42.60
	20	$23.70	$25.49	$27.28	$29.07	$30.86	$32.65	$34.44	$36.23	$38.02	$39.81	$41.60

*Table 7: Net return calculation for Prosaro fungicide application (8oz/ac) at heading on winter wheat within **single application nitrogen treatment**. The fungicide treatment had additional costs of fungicide product and custom application cost.*

Average untreated yield	104.67	bu/ac
Average treated yield	115.28	bu/ac
Calculated yield gain when treated with Prosaro	10.61	bu/ac
Estimated commodity price per bushel	7	$/bu
Gross return from application	74.27	$/ac
Suggested retail price per acre for Prosaro	18.2	$/ac
Estimated application cost	10	$/ac
Net cost + estimated application cost	28.2	$/ac
Prosaro net return (ROI)	46.07	$/ac

*Table 8: Net return for Prosaro fungicide application (8oz/ac) at heading on winter wheat within **single application nitrogen treatments** for various selling prices and Prosaro costs.*

		Selling Price ($/bu)										
		6	6.2	6.4	6.6	6.8	7	7.2	7.4	7.6	7.8	8
Prosaro Cost ($/ac)	15	$38.66	$40.78	$42.90	$45.03	$47.15	$49.27	$51.39	$53.51	$55.64	$57.76	$59.88
	16	$37.66	$39.78	$41.90	$44.03	$46.15	$48.27	$50.39	$52.51	$54.64	$56.76	$58.88
	17	$36.66	$38.78	$40.90	$43.03	$45.15	$47.27	$49.39	$51.51	$53.64	$55.76	$57.88
	18	$35.66	$37.78	$39.90	$42.03	$44.15	$46.27	$48.39	$50.51	$52.64	$54.76	$56.88
	19	$34.66	$36.78	$38.90	$41.03	$43.15	$45.27	$47.39	$49.51	$51.64	$53.76	$55.88
	20	$33.66	$35.78	$37.90	$40.03	$42.15	$44.27	$46.39	$48.51	$50.64	$52.76	$54.88

Discussion

Based on data provided by weathercentral.ca, the HT Demo Plot received 5.39” of rain from the first N app to harvest, the Climate Normal according to Environment Canada for that same period is 9.8” of rainfall. Based on this data, the growing season would be classified as a dry year. The lack of rain provides a very good explanation as to why there was no observed difference between the split and single application of nitrogen.

Interestingly, the nitrogen management strategy did show differences when the data was segmented by the historical tillage zones. In the disc ripped and vertical tilled treatments the single shot application of Nitrogen performed better. Whereas in the ploughed area, the split application strategy outperformed the single shot application. The historical strip till treatment did not show any difference between the nitrogen management strategies.

The fungicide results were very definitive. It was clear that there is a benefit to the Fungicide applied at heading on the winter wheat crop. It was quite interesting that the fungicide provided such a boost with the weather which was experienced. The benefit to fungicide in this type of dry weather environment, indicates that an application would be a definitive green light for winter wheat all years.

Conclusions

Based on the observed results we have given each management strategy a colour to indicate the recommendation based on trial results for future seasons.

Trial	Assessment
Heading Fungicide	
Split Nitrogen	
Single Nitrogen	

Legend

- Recommended
- Inconclusive
- Not Recommended

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Going Forward

Next year the HT Demo Plot will be planted into corn. The Winter Wheat was harvested using both chop and drop residue management strategies. Fertilizer will be spread on the plot, except for where strip tillage trials will be applied. The strip till fertility will be placed with the strip tillage application later in September. Following fertilizer application, an oat cover crop will be planted on the entire plot.

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