MCGA On-Farm Trials: Assessing the Effects of Split Nitrogen Application in Corn

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Background

There is a growing demand in Manitoba for research into the best management practices to ensure sustainability for the corn industry and profitability for farmers.

After years of wet conditions during the growing season, there has been an increased interest in side dressing nitrogen for corn production to help mitigate early season nitrogen losses.

There is a need for organized on-farm collection of quality data to determine if this is a beneficial and profitable practice. These trials were set up to determine yield response when nitrogen applications were split between fall, spring and in-crop (between V4-V6) versus all nitrogen being applied in the fall and/or spring.

Method

➢Since 2017, 21 on-farm trials have been setup across Southern Manitoba. Treatments were set up in 12 replicated and randomized strips across the field (usually ½ mile in length).

➢There were 16 trials comparing the farmer's Base Rate of N in spring versus Base - 40N in spring plus a sidedress (SD) application of 40N between V4 and V6. In 2018, a third treatment was added (Base - 40N) to look at the agronomic and economic effects on corn production [Figure 2].

➢Manure - 5 trials looked at corn yield response to adding additional nitrogen in spring (at seeding or in-crop between V4-V6) on land manured in the previous fall at two different rates [Figure 3].

➢All trials were scouted during each growing stage to monitor emergence, plant population, insects, disease, row closure, vegetative reflection, and rainfall. In-season scouting tools used included spring soil tests, Greenseeker, pre-sidedress nitrate test (PSNT) and corn stalk nitrate samples.

➢IN 2018, RGB and NIR images were taken between August 10th and 13th. NDVI colour maps were created to detect any vegetative differences between the two treatments [Figure 1]. Areas that were drowned out (ditches, planter skips etc.) were removed from the trial using the imagery.

➢Yields were obtained using a calibrated scale.

➢Simultaneously, this year the University of Manitoba examined a wide range of N rates and splits in corn at various locations across Manitoba, continuing the work done by Manitoba Agriculture over the past two years.

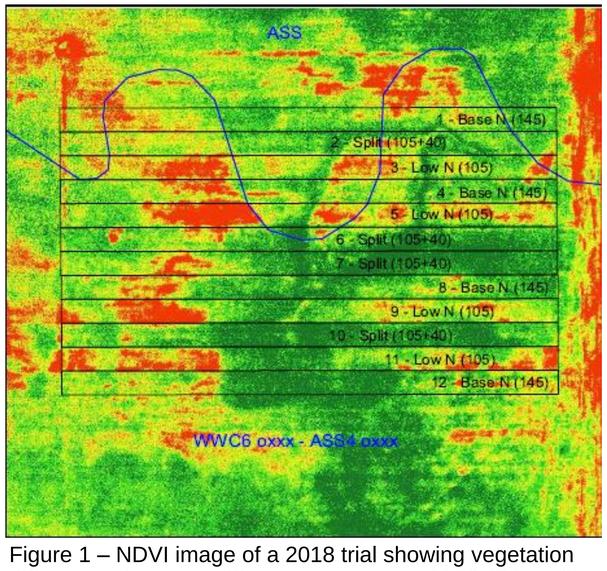

Figure 1 – NDVI image of a 2018 trial showing vegetation differences between different treatments. This field has tile drainage which may have contributed to the large yield differences between these three treatments.

Observations

➢Seeding dates ranged from May 1 – May 10 over the 2017 & 2018 seasons, with seedbed conditions drier in 2018.

➢Nitrogen rates ranged from 80 to 250 lbs N/ac applied, with yield goals ranging from 120-200 bu/ac. Rates were based on soil test recommendations and farmers normal practices. Sidedress N applications of UAN were either streamed, injected, broadcasted or dribbled [Figure 4].

➢Similar to 2017, average rainfall was below normal (62% of normal), with the majority occurring in late June and early July. Early snow caused some harvest delays due to snow accumulation on the cobs. Harvest losses were minimal once temperature dropped below -5°C [Figure 5].

➢In 2018, corn yields ranged from 43-169 bu/ac. Over the past two years, there has been a yield response in favour of split applied N 2 out of 16 times (13% of the time). Both positive responses occurred when N was applied at V4 (mid-June). This compares to the negative response in 2017 when split application was done at V8 (mid-July). The average yield increase over 16 sites is only 0.5 bu/ac. For the Low Rate N treatment included in 2018, there was an average yield loss of only 6.3 bu/ac across 7 sites [Figure 2]. Some growers expected a 40 bu/ac loss since they follow a "1 lb N/bu yield approach" but as N rates approach optimum levels, the effect on yield is often slight.

➢There was no response to additional spring applied N (application rates ranged from 25-120 lbs N/ac) on fields manured in the previous fall (manure sources were either hog or chicken) [Figure 3].

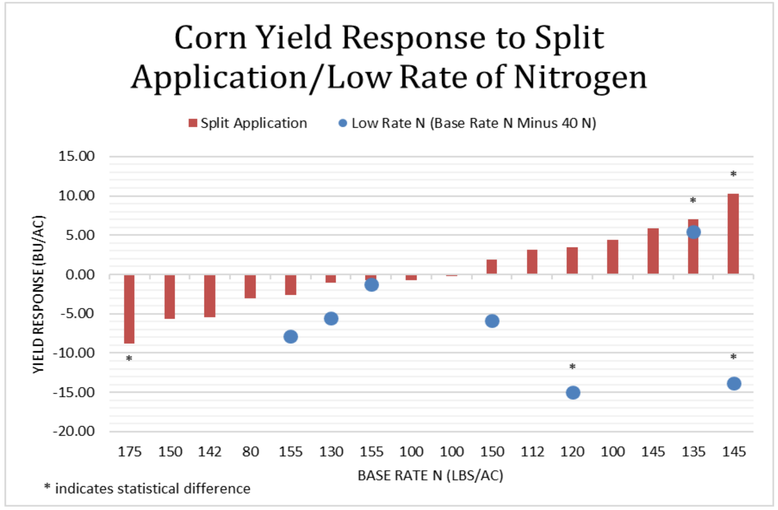

Figure 2

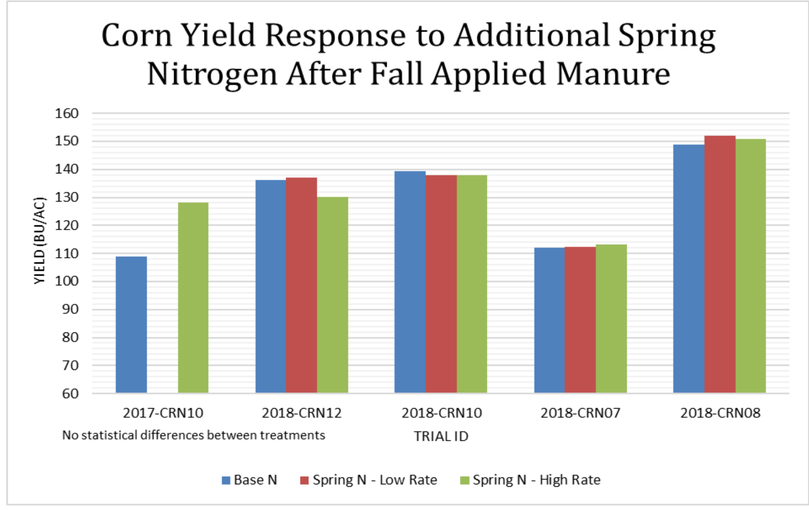

Figure 3

Figure 4 – Sidedress application of UAN with custom y-drop hoses on strip-tilled land at one site – June 14, 2018

Figure 5 – Harvest in snowy conditions – Nov 19, 2018

Conclusions

1. In 2017 & 2018, there has been a yield response in favour of split applied nitrogen 2 out of 16 times (13% of the time), with an average of 0.5 bu/ac advantage across all trials.

2. Similar to 2017, 2018 data suggested that earlier applications of the SD N (V4-V5) was less risky than delaying application and danger of N being stranded at the soil surface when dry.

3. Out of the in-season scouting tools used in the trials, NDVI imagery has been the best indicator of corn yield response to nitrogen.

4. Although it is becoming a more common practice to add additional nitrogen to manured fields, with the below normal rainfall in 2018 and minimal nitrogen losses, it did not translate into higher corn yields.

5. Normal fertilizer practices call for 1lb of N/bushel for corn production. It should be noted that one site averaged 167 bu/ac [Figure 4] and had a nitrogen use efficiency of 0.6 lbs of N/bushel. This land was strip-tilled in Spring 2018 which may have had an affect on the amount of nitrogen required to produce high yields.

6. Further on-farm research under wetter conditions with higher risk of N loss may determine if split applying nitrogen provides an economic return to the farmer.

Acknowledgements

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