2. Summary of Research Results 2017

2.1 Screening of crop varieties:

2.1.1 Spring Cereals:

√*Wheat Varieties:*

- Thirty four varieties were evaluated; 9 of which were durum wheat and the rest mostly hard red.
- Two varieties that gave >7,000 kg/ha grain yield were *AAC Chiffon* (soft white; 7,214 kg/ha) and *Easton* (HRS; 7,056 kg/ha). Second best group of varieties in grain yield was *SY Rowyn* (CPRS; 6,777 kg/ha), *Prosper* (HRS; 6,550 kg/ha), and *CM 9004* (HRS; 6,482 kg/ha).
- *AAC Penhold* (last year's highest yielding variety) gave poor grain yield (5,808 kg/ha) this year!
- Three top grain yielding durum wheat varieties were *CDC Alloy* (5,911 kg/ha), *CDC Dynamic* (5,882 kg/ha) and *CDC Carbide* (5,617 kg/ha).
- Highest straw yield (8,586 kg/ha) was obtained with *Enterprise* (durum wheat), whereas highest biomass yields were registered by *Easton* (14,594 kg/ha) and *AAC Chiffon* (14,510 kg/ha).
- Averaged over 2016 and 2017, three top yielding varieties with similar grain yields of ~6,000 kg/ha were *AAC Penhold*, *AAC Chiffon* and *AAC Foray VB*.
- Grain protein content determined in selected varieties was; *Prosper* 15.2 %, *SY Rowyn* 15.1 %, *CM 9004* 14.3 %, *Easton* 13.1 % and *AAC Chiffon* 10.3 %.

√*Wheat Varieties Demonstration/and Wheat Barley comparison for forage production:*

- *Innova* registered somewhat higher grain yield (5,657 kg/ha) than *Hallmark* (5,342 kg/ha). This was true for the straw yield (*Innova*: ~6,800 kg/ha; *Hallmark*: ~6,500 kg/ha) as well.
- *AAC Penhold* wheat, which has broad/dense leaves, gave ~1,800 kg/ha more forage dry matter yield (with 1.6 % points higher protein content) than *CDC Coalition* barley.

√*Barley Varieties:*

- Sixteen high yielding barley varieties (new and proven; 5 two row and 11 six row) were compared for their production potential.
- Three top grain yielding varieties were *Boroe* (7,170 kg/ha), *Chambly* (7,012 kg/ha) and *Cyane* (6,749 kg/ha). This was true when grain yield was averaged over 2016 and 2017; though the difference between *Boroe* and *Chambly* yields was higher in this case.
- *Oceanik* (6,610 kg/ha) and *Amberly* (6,583 kg/ha) formed the second best group in grain yield.
- Straw (5,165 kg/ha) and biomass (12,176 kg/ha) yields were highest with *Chambly* in 2017. This was also true for the average yields over 2016 and 2017.

√*Malting Barley Varieties:*

- Ten varieties were evaluated.
- *CDC Bow* (6,977 kg grains/ha), a new variety, gave over 2 MT/ha higher grain yield than the best yielding *AAC Synergy* (4,784 kg grains/ha) in the past two years.
- *AAC Synergy* was followed closely by *CDC Kindersley* (4,424 kg/ha). *OAC 21*, an old variety demanded for craft beer, recorded a grain yield of 3,573 kg/ha.
- Grain yield of other varieties ranged from 1,846 kg/ha (*Newdale;* poor stand probably due to bad seed) to 3,910 kg/ha (*CDC Copeland)*.
- Straw (10,793 kg/ha) and biomass (17,769 kg/ha) yields were the highest with *CDC Bow! AAC Synergy* was the second best in straw (6,972 kg/ha) and biomass (11,756 kg/ha) yields.
- Malting quality this year (grain protein content higher than the accepted 12.0 % in all varieties wasn't as good as in the previous years; *CDC Bow* had the lowest grain protein content (12.7 %).

√*Older Barley Varieties Demonstration (Single Replication):*

- *Cyane* produced the highest grain (6,813 kg/ha) and biomass (10,843 kg/ha) yields. Other older varieties were *AC Klinck*, *Brucefield* and *Chapais*.

√*Hulless Barley and Oat Varieties Demonstration (Single Replication):*

May 16 Seeding:

- Barley grain yield was in the order of *Azimuth* (4,916 kg/ha) ≥ *Roseland* (4,894 kg/ha) > *Millhouse* (4,122 kg/ha) > Black barley (1,327 kg/ha). *Azimuth* had the highest straw yield (8,327 kg/ha).

- In oat, *Navaro* recorded higher grain (6,092 kg/ha) and straw (16,534 kg/ha) yields than *Gehl* (5,306 kg grain and 9,148 kg straw/ha). Biomass yield with *Navaro* was 22,626 kg/ha.

June 9 (Late) Seeding:

- Barley grain yield was in the order of *Azimuth* (4,225 kg/ha) > *Roseland* (4,196 kg/ha) > *Millhouse* (3,038 kg/ha). Black barley didn't even mature in this seeding date! Roseland had the highest straw yield (3,801 kg/ha).
- In oat, *Navaro* recorded higher grain (5,976 kg/ha) and straw (5,840 kg/ha) yields than *Gehl* (4,236 kg grain and 4,441 kg straw/ha). Biomass yield with *Navaro* was 11,816 kg/ha.

√*Black (Hulless) Barley Seed Rates:*

- Highest grain (1,328 kg/ha), straw (3,752 kg/ha) and biomass (5,080 kg/ha) yields were obtained with 75 % of the recommended seed rate.

Black (Hulless) Barley is a specialty crop and can be eaten like (boiled) rice! It may be of interest to gardeners/and organic producers.

√*Oat Varieties:*

- Twenty three oat varieties were evaluated for their yield potential.
- *OA 1395-1* recorded the highest grain yield (7,245 kg/ha) followed by *OA 1357-2* (6,419 kg/ha) and *Vitality* (6,417 kg/ha). Two other high yielding varieties were *AAC Rosken* (last year's topper; 6,365 kg/ha) and *AAC Noranda* (6,361 kg/ha).
- Grain yields of *AC Rigodon* and *AC Jordon,* formerly high yielding varieties with stable yields till 2015, were 4,500-5,000 kg/ha only.
- Among the registered varieties, *AAC Richmond* produced the highest straw (9,217 kg/ha) and biomass (14,027 kg/ha) yields. Other high straw yielding varieties were *AC Dieter* (8,868 kg/ha), *AC Jordan* (8,823 kg/ha) and *Vitality* (7,435 kg/ha).
- Selected high yielding varieties were tested for their grain protein content. *OA1357-2* (13.9 %) and *Vitality* (13.6 %) had higher grain protein content than *AAC Rosken* (12.4 %) and *AAC Noranda* (10.8 %).

2.1.2 Winter Cereals:

√*Manitoba and Ontario Winter Wheat Varieties:*

- Nine winter wheat varieties from Manitoba and Ontario, including *Gallus*, *AAC Elevate* and *AAC Wildfire*, were compared for their production potential.
- None of the varieties had adequate stand in the spring because of severe winter kill! Hence no data could be obtained from this trial.

√*Winter Rye Varieties:*

- Twelve varieties/hybrids were compared for their production potential. There was some winter kill this year and hence the grain yields were lower than that in the previous years.
- Two hybrids that recorded higher grain yield than *Hazlet* (4,986 kg/ha) were *KWS-H-151* (6,193 kg/ha) and *KWS-H-10104* (5,587 kg/ha); though only *KWS-H-151* was significantly better than *Hazlet*.
- Grain yields of *Guttino* (3,938 kg/ha) and *Brasetto* (3,414 kg/ha) were lower than that of *Hazlet*.
- *KWS-H-151* produced the highest straw (9,560 kg/ha) and the biomass (15,753 kg/ha) yields!

√*Winter Rye/Triticale Varieties:*

- Only two varieties (*Hazlet* and *Bono*) were compared/demonstrated with *Luoma triticale*.
- *Hazlet* (~6,620 kg/ha) gave somewhat higher grain yield and a considerable higher straw (9,560 kg/ha) and biomass (over 16,180 kg/ha) yields than *Bono* (6,376, 6,827 and 13,203 kg/ha, respectively).
- *Winter rye could be a good option for grain (feed or malt)/and straw production!*
- Grain, straw and biomass yields of winter triticale (cultivar *Luoma*) were 3,017 kg/ha, 8,172 kg/ha and 11,189 kg/ha, respectively.

√*Perennial Rye (Variety Ace-1; seeded in fall 2016):*

- Maximum grain (3,208 kg/ha; 16.3 % protein) and straw (24.3 MT/ha; that is a lot of straw-highest of all crops tested at TBARS so far!) yields were obtained with a seeding density of 400 seeds/m^2!
- Forage dry matter yield increased with the increasing seed rate from 325 seeds/m^2 (2.831 kg/ha; 12.1 % protein), to 425 seeds/m^2 (3,513 kg/ha) to 475 seeds/m^2 (3,811 kg/ha).

√***2.1.3 Grain Corn:***

- Nine corn varieties (3 from DuPont Pioneer, 2 from Pride Seeds, 3 from Maizex and 1 from Brett & Young) were evaluated for grain production.
- Grain yield ranged from 6.08 MT/ha (*A4025G3*) to 16.4 MT/ha (*MS 6902R*). The two other Maizex varieties *MZ 1340DBR* (14.2 MT/ha) and *LF 728R* (13.5 MT/ha) too registered higher grain yields than Pioneer and Pride Seeds varieties.
- Stover yield was highest (30.9 MT/ha) with *LF 728R* followed closely by *MS 6902R* (28.0 MT/ha); consequently, these two varieties produced the highest biomass yield (>44 MT/ha).

2.1.4 Grain Legumes and Oil Seeds Varieties:

√*Soybean Varieties:*

- Eleven varieties were evaluated for grain production.
- Three top grain yielding varieties were *NSC Tilston RR2Y* (4,580 kg/ha), *NSC Watson RR2Y* (4,051 kg/ha) and *NotusR2* (~3,700 kg/ha).
- Grain yield in other varieties ranged from 1,853 kg/ha (*TH32004R2Y*) to 3,370 kg/ha (*TH32004R2Y*).

√*Edible Beans Varieties:*

- Six white and 2 red edible bean varieties were compared for their grain yield.
- *Earlired* (3,128 kg/ha) that has given consistently high yield in the past, fell a little short of grain yield of another red variety (*Dynasty*; 3,253 kg/ha) this year.
- Among the white varieties, *Yeti* one of the top yielding varieties last year, produced the highest grain yield (3,866 kg/ha); ~600 kg/ha than that of *Bolt* (last year's topper).

Edible beans could be an integral part of the cropping systems in northwestern Ontario!

√*Pea Varieties:*

- Eight field pea varieties (4 green, 2 yellow, 1 saffron and 1 brown/specialty pea) were evaluated.
- Grain yield ranged from 1,457 kg/ha (Sorrento) to 4,232 kg/ha (Gold Harvest). The results may not be reliable, because some deer damage was noticed in pea plots.
- Excessive heat in July end and on 1st August lead to abortion of flowers and young pods; not noticed in any of the years before. Gold Harvest due to early maturity escaped damage from excessive heat.

√*Flax Varieties:*

- Ten varieties were evaluated for their production potential.
- Flax didn't like the weather this year; mostly wet and too much heat for it during end July and on August 1! Consequently, the flax seed yield was low (trial mean of only ~1,700 kg/ha).
- Three varieties that gave >2,100 kg/ha seed yield were *Prairie Sapphire*, *CDC Plava* and *CDC Sorrel*. *CDC Glas* (1,217 kg/ha) last year's topper was one of the poorest yielding variety this year.
- *CDC Neela* recorded the highest straw yield (8,632 kg/ha); *Prairie Sapphire* (7,836 kg/ha) and *CDC Sorrel* (7,223 kg/ha) were the next best varieties in straw yield. It is clear that good crop growth wasn't translated to high seed yield!
- Highest biomass yield (10.6 MT/ha) was obtained with *CDC Neela*.

√*New Flax Varieties (Brown Seeds):*

- Fourty nine biotypes were compared including 7 standard/named varieties.
- In the standard varieties, *Flanders* and *Prairie Thunder* gave the highest seed yield (~2,400 kg/ha).
- In the new lines, *FPL14167* recorded the highest seed yield (2,508 kg/ha).

- Flax seed yield was poor this year with a trial mean of 1,646 kg/ha only as compared to 3,084 kg/ha in 2016 and 3,450 kg/ha in 2015. This year's heat during July end/on August 1 and excessive wetness at ripening didn't seem to be of flax's liking at all.

√*Liberty Canola Varieties:*

- Five varieties were evaluated.
- *L230* recorded the highest seed (7,925 kg/ha; 1,256 kg/ha higher than *L252* – last year's highest yielding variety and 873 kg/ha higher than *L5440*), straw (12,314 kg/ha) and biomass (20,239 kg/ha) yields.
- Seed yields of the other two varieties were less than the three mentioned in the 2nd bullet and were in the order of *L233P* (6,734 kg/ha) > *L140P* (6,014 kg/ha); *P in these two varieties stand for 'Shatter Reduction'*.

√*Round Up Ready/Clearfield Canola Varieties:*

- Five varieties were compared.
- Seed yield ranged from 4,405 kg/ha (*73-45 RR*; an older variety) to 7,042 kg/ha (*6074 RR*; a new variety).
- Next best varieties to *6074 RR* in seed yield were *6086 RR* (6,550 kg/ha), *6080 RR* (6,319 kg/ha) and a Clearfield canola variety *5545 CL* (6,013 kg/ha).
- Straw yield followed a trend similar to the seed yield with *6074 RR* producing the highest straw yield (~12 MT/ha).

√*Mustard Varieties:*

- *AC Vulcan* (Oriental mustard) recorded higher seed (1,689 kg/ha) and straw (4,535 kg/ha) yields than *Adagio* (Yellow mustard) - 651 kg/ha seed and 2,576 kg/ha straw.
- Compared to canola, mustard is a low input crop, is used for culinary purposes, can be sold in retail and fetches higher market price than canola!

2.1.5 Forage Crops/Varieties:

√*Alfalfa Varieties OFCC 2015:*

- Four Pioneer varieties were compared with *OAC Superior*, which has been consistently giving high yield for more than a decade!
- Dry matter yield was similar in all varieties and ranged from 5,492 kg/ha (*55Q27*) to 5,604 kg/ha (*55V48*).
- Two years total dry matter yield ranged from 11,619 kg/ha (*55Q27*) to 12,185 kg/ha (*55Q14*)!

√*Comparative Performance of Alfalfa and Galega: Two cuts were taken!*

- In the older crop (seeded in 2011), Galega @ 35 kg seed/ha gave 600 kg/ha higher dry matter yield than @ 25 kg seed/ha at which rate Galega wasn't better than alfalfa in yield.
- Averaged over 2016 and 2017, Galega @ 35 kg seed/ha (6,600 kg/ha) produced 800 kg/ha higher dry matter yield than alfalfa (4,832 kg/ha).
- Averaged over 6 years (2012-'17), Galega @ 25 kg seed/ha exceeded alfalfa in dry matter yield by 654 kg/ha/year and by 1,155 kg/ha/year when seeded @ 35 kg seed/ha.
- Protein content in Galega, was 4.2-4.9 % point higher than that in alfalfa in the first and 1-~5 % point higher in the second cut.
- *Higher yield and higher protein content in Galega than in alfalfa, makes Galega a better fodder than alfalfa!*
- Mineral content (zinc, manganese, copper and iron) was higher in alfalfa than in Galega in the 1st cut, whereas reverse was true for the 2nd cut.

√*New Annual Forage Crops:*

- *Union Ultimate Blend* (30 % Hairy Vetch, 25 % Italian Ryegrass, 15 % Sorghum, 10 % Crimson Clover, 10 % Winfred, 5% Hunter, and 5% Graza) + *CDC Coalition* gave the highest dry matter yield (6,923 kg/ha – 10.2 % protein). Second and third highest dry matter yields were obtained with *Italian Ryegrass* (Crusader; 5,205 kg/ha – 17.0 % protein) and *forage peas* (4,419 kg/ha – 13.8 % protein).
- Protein content was highest in *Choice Chicory* (26.6 %) and A*ll Brassica Blend* (25.2 %), which had low dry matter yields; *Choice Chicory* 1,095 kg/ha and A*ll Brassica Blend* 1,868 kg/ha. *Tonic Plantain* (dry matter yield of ~1,800 kg/ha) too had good protein content (20.8 %).

- Frosty berseem produced ~1,200 kg/ha extra dry matter yield and had ~3 % point higher protein content than the conventional berseem.
- Dry matter yield and protein content in *Fixation Balansa* were 1,471 kg/ha and 23.8 %, resp.
- Highest RFV was recorded in *Tonic Plantain* (176) and *all brassica blend* (172).

These new forage crops will be good for grazing/or feeding small ruminants!

2.2 Fertilizer Management Practices (Grain/seed crops):

2.2.1 Grain Legumes and Oil Seeds:

√*Effect of P and bio-ag products on soybean grain yield:*

- Neither application of 20 kg P_2O_5/ha nor seed treatment with *Quickroots* a microbial *(Bacillus amyloliquefaciens* and *Trichoderma virens based)* seed inoculant increased the soybean grain yield. Effect of *Quickroots* this year is contrary to the last year's results.
- Seed treatment with *Jumpstart* (*Penicillium bilaii;* a fungus providing better access to soil and applied P) improved the soybean grain yield significantly by 926 kg/ha. This wasn't the case last year.

√*Maximizing canola yield with nitrogen and other nutrients and fungicides/growth retardant:*

- Nutrients (N, S, B, Zn and Mn) effect on canola yield was assessed over uniform recommended rates of P and K. The seed yield this (wet) year was higher than last year.
- Application of N @ 150 kg/ha raised the canola seed yield from 3,709 kg/ha in the check (Zero N) to 6,673 kg/ha. Unlike last year, addition of S, B, Zn one by one or all three together didn't improve the seed yield further. It appears that availability of these nutrients from soil under wet conditions was not limiting. However, manganese spray @ 2 kg Mn/ha increased the seed yield by ~1,500-2,000 kg/ha as compared to N alone or N with S, B and Zn. The seed yield went up to 8,148 kg/ha with NSBZnMn.
- Spraying fungicide (Proline @ 315 ml/ha), but not the growth retardant (Manipulator 620 @ 1.8 l/ha) improved the seed yield significantly (by ~800 kg/ha) only in the absence of Mn spray.
- Nutrient use efficiency expressed as kg seed yield/kg applied nutrients was highest (38.8) with NSBZnMn. This treatment recorded the highest straw yield (13,540 kg/ha) as well!

√*Maximizing canola yield with nitrogen and growth retardant:*

- Application of N @ 60,120, 180 and 240 kg/ha from urea/or urea + ESN (2:1 ratio on N basis) significantly improved the canola seed yield.
- When N was applied as urea, the seed yield increased linearly with each increment of 60 kg N/ha; from 3,759 kg/ha without N to ~9,600 kg/ha with 240 kg N/ha, which is a huge yield response to N application! In the case of urea + ESN (2:1 ratio on N basis) the seed yield didn't increase by increasing N rate beyond 180 kg N/ha; at which rate the seed yield was ~9,000 kg/ha.
- Except @ 120 kg N/ha, urea + ESN (2:1 ratio on N basis) blend was not significantly better than urea alone in improving the seed yield. However, the yield increase by the blend at all N rates was economically rewarding!
- Averaged over N rates, urea + ESN (2:1 ratio on N basis) gave 600 kg/ha more straw yield than urea alone.
- Manipulator 620 spray appeared to lower the seed yield.
- Highest straw yield (~12, MT/ha) was recorded with 180 kg N/ha from urea + ESN (2:1 ratio on N basis) i.e. 120 kg N/ha from urea and 60 kg N/ha from ESN. Straw yield from this treatment was a little better than straw yield (~11.9 MT/ha) from urea alone @ 240 kg N/ha; which produced the highest biomass yield (21.5 MT/ha)!

√*Evaluation of Ammonium Sulphate and Gypsum as Sources of Sulphur (S) for Canola Production:*

- Gypsum gave higher canola seed yield than ammonium sulphate only at two rates of S application (12 and 36 kg/ha). As a result, average seed yield from Gypsum was only ~350 kg/ha higher than that from ammonium sulphate. Optimum rate of S could be considered as 24 kg S/ha (seed yield at this rate was 6,610 kg/ha with ammonium sulphate and 6,715 kg/ha with Gypsum).
- Gypsum @ 48 kg/ha produced the highest straw yield (14.2 MT/ha). However, averaged over rates of S application, straw yields from Gypsum and ammonium sulphate were about the same.

- All macro and micronutrients contents (except B and Mo) at bolting were higher with ammonium sulphate than with Gypsum. These differences narrowed down/or vanished at flowering.
- Post harvest soil tests in most cases were a little better with ammonium sulphate than with Gypsum.

√*Evaluation of Gypsum and Ammonium Sulphate as sources of S for Barley, Canola and Pea Production (Gypsum was applied @ 19.5 kg S/ha in the seed row and ammonium sulphate at the same rate of S was broadcast incorporated at seeding!):*

- Barley didn't respond to S application.
- S application through either of the sources significantly increased the canola seed yield (by over 1,000 kg/ha).
- Gypsum appeared to depress and ammonium sulphate seemed to increase the pea grain yield.
- Averaged over S rates, canola resulted in the highest production; 6,941 kg/ha seed and 9,868 kg/ha straw yield!
- Averaged over crops, Gypsum was no better than ammonium sulphate as a source of S!
- Residual effect of these treatments will be studied on spring wheat next year.

√*Effect of nitrogen and growth regulator on flax seed yield:*

- Application of N (@ 35, 70 and 105 kg/ha) increased the flax seed yield significantly and the response to N exhibited a Law of Diminishing Returns. Seed yields were relatively lower this year!
- Among urea N rates, maximum seed yield (2,092 kg/ha) was recorded at 70 N/ha and maximum straw yield (6,285 kg/ha) was obtained with 35 kg N/ha.
- Substitution of 1/3rd N from ESN in the 105 kg/ha N treatment increased the straw yield (by 2,041 kg/ha) more than the seed yield (only marginally by 62 kg/ha) as compared to N from urea alone at an equivalent rate.
- Growth regulator (Manipulator 620) spray improved the seed yield significantly by 571 kg/ha (more than last year!). The treatment resulted in maximum straw (7,089 kg/ha) and biomass (9,545 kg/ha) yields.

√*Effect of P and K on flax seed yield:*

- Treatments included all combinations of 3 rates of P_2O_5 and 3 rates of K_2O application (both at 0, 20 and 40 kg/ha).
- Application of 20 P_2O_5/ha (without application of K_2O) resulted in the maximum seed (2,458 kg/ha) and straw (5,675 kg/ha) yields.
- Improvement in seed yield (224 kg/ha) by K_2O @ 20 kg/ha in the absence of P_2O_5 application fell slightly short of the level of significance (252 kg/ha).

√*Effect of sulphur on flax seed yield:*

- Application of S @ 10, 20 or 30 kg/ha didn't increase seed yield of flax. However, S @ 10 kg/ha significantly increased the straw and biomass yields. Further increases in the rates of S tended to lower the straw and the biomass yields.
- Maximum seed yield (2,314 kg/ha) was obtained without application of S and maximum straw (7,760 kg/ha) and biomass (10,005 kg/ha) yields were recorded with S @ 10 kg/ha.

2.2.3 Forages:

Alfalfa:

√*Evaluation of NK21 as a source of N and K for alfalfa (one cut in 2015 and two cuts in 2016 and 2017):*

- NK21 was compared at two rates of N (21 and 31.5 kg/ha) and K_2O (87.7 and 98.2 kg/ha) with equal amounts of N and K from ammonium sulphate supplemented with muriate of potash. In NK21 treatments, S to equal amounts of ammonium sulphate in the other treatments was applied as potassium sulphate. K levels were adjusted to equal in both the fertilizers (ammonium sulphate and NK21).
- NK21 and ammonium sulphate significantly improved the dry matter yield as compared to the no N, K or S check (811 to 1,063 kg/ha in 2017).
- Totaled over years (2015-'17) and averaged over the two N rates, dry matter yields from ammonium sulphate and NK 21 were more or less the same (~13.6 MT/ha).

- Averaged over the two N fertilizers, 31.5 kg N/ha produced 637 kg/ha higher total (2015-'17) dry matter yields than 21 kg N/ha.
- In 2017, N application improved the protein content by 0.8 to 1.7 % points in the first cut and up to 0.9 to 2.7 % points in the second cut. Protein content with ammonium sulphate was higher than that with NK 21 in both the cuts.
- ADF and NDF appeared to be higher and TDN and RFV lower with NK21 than that with ammonium sulphate.

2.3 Other Agronomic Practices:

√*Mid June Seeding Options:*

- Six spring crops (wheat, barley, oat, canola, pea and flax) were evaluated for their success of cultivation and production potential when seeded during mid June.
- Mid June seeding didn't work in *canola* and *flax*/and resulted in crop failure. *Pea* had poor growth and consequently a very poor grain yield (1,312 kg/ha).
- Grain yields from mid June seeded wheat (*Sable*), barley (*Encore*) and oat (*AC Rigodon*) were 2,904, 2,863 and 5,520 kg/ha; which were not too bad for late seeding during a wet year. *Oat (straw yield 5,588 kg/ha) has always done well in wet years as compared to wheat and barley!*

√*MasterGraze corn seeding and harvest management:*

- Among the 4 seeding dates (May 15 to June 15), June 5 seeding resulted in the highest dry matter yield (9,064 kg/ha) with 12.5 % protein content and a RFV of 110.
- Dry matter yield improved with delay in harvesting from initiation of tasseling (5,210 kg/ha) to 50 % tasseling (7,167 kg/ha) to 100 % tasseling (8,147 kg/ha).
- Protein content was highest (16.4 %) with June 15 seeding and ranged narrowly from 12.3-13.6 % with other seeding dates.

MasterGraze could be added to the cropping systems, especially by the dairy farmers!

√*Comparative forage production potential of different forage crops*:

- Eleven forage crops (legumes and non legumes) were evaluated, either alone or in mixtures of two crops, for forage production potential and feed quality on the same site!
- Silage corn produced unbelievably high yield (36.8 MT dry matter; 8.2 % protein), which was the highest among all crops.
- Unlike last year, dry matter yield from MasterGraze corn (10,939 kg/ha; 11 % protein) was much higher than that from sorghum Sudangrass (3,078 kg/ha; 15.8 % protein).
- Barley (5,542 kg/ha; 10.1 % protein) gave higher dry matter yield than oat (4,700 kg/ha; 9.0 % protein). Intercropping berseem with barley, but not with oat, improved the dry matter yield by 730 kg/ha and protein by 0.6 % points.
- Intercropping barley or oats with peas didn't improve the dry matter yield, but raised the protein content by nearly 2 % points in barley and 0.7 % in oats.
- Among grain legumes, fababeans recorded the highest dry matter yield (8,064 kg/ha) and protein content (18.5 %)!
- Forage dry matter yields from berseem clover, soybean and peas were 2,200 kg/ha (19.3 % protein), 2,010 kg/ha (16.2 % protein), and 1,660 kg/ha (16.8 % protein), respectively.
- RFV was highest (228) in cowpeas that had hardly any yield (292 kg/ha only) as compared to 106 in barley/and silage corn, 115 in berseem clover and 150 in soybean.

Dairy producers could add berseem crop to their cropping systems as an intercrop with barley!

√*Cross seeding grasses – at TBARS and at a farmer's field:*

- Cross seeding (at half seed rate in one direction and half seed rate at 45 degree angle to the first seeding) gave ~1,200 kg/ha extra dry matter yield as compared to conventional (unidirectional) seeding at TBARS and ~300 kg/ha extra yield at farmer's field.
- Cross seeding resulted in 4.1 % point lower protein content than conventional seeding at TBARS, but increased the protein content by 1.3 % point at farmer's field. It seems that higher yield at TBARS as compared to farmer's field resulted in dilution effect on the protein content.
- Main weeds were Annual Sow Thistle at TBARS and Twitch grass at farmer's field.

Optimum Seeding Rate of Quinoa:

- *Quinoa* made good vegetative growth, but didn't set seeds (late seeding on June 6?).
- Dry matter yield was maximum (3,883 kg/ha) at the highest seed rate (11.2 kg/ha = 10 lb/ac).

2.4 Extension and Outreach:

A proactive approach to extension and outreach activities was adopted by TBARS for Dissemination of Technology to the end users (farmers, extension scientists and researchers not only in northwestern Ontario, but also in the other parts of the province, and the country/other countries). There is hardly any farm magazine/journal in Ontario in which TBARS wasn't mentioned at least once. Impact of our Extension and Outreach activities could be seen in the form of favourable changes as follows:

- Truckloads of seeds of new crops/varieties (AAC Penhold wheat, Boroe barley, L252 canola and Hazlet winter rye) were procured by Thunder Bay Co-op to meet farmers' orders.
- Number of canola growers doubled during the year; with ~500 acres under canola in the vicinity of TBARS, canola (at an estimated produce value of ~$400,000.00) became one of the main crops in the area. Thunder Bay District, with canola fields scattered here and there, looked like mini Alberta!
- The number of winter rye growers increased from one in 2015-'16 to six in fall 2016 to 10 in fall 2017 making winter rye too as one of the main crops in the area.
- Use of multiple sources of N (urea, ESN and ammonium sulphate) for crop production is becoming a popular practice with a single producer applying ESN in the seed row in 200 acres for spring wheat production!
- High grain/seed yields (2.25 MT/acre spring wheat – highest so far, 2.30 MT/acre spring barley and 1.75 MT/acre canola) continued to be recorded on farms.
- One dairy farmer doubled his barn capacity with milking Robots increasing from 2 to 4 and another expanded his Robot milk barn by 1.5 times.
- Land clearing and tile drainage on farms continued!
- *One of the biggest contributions of TBARS this year was the province wide introduction of Galega, a new perennial forage legume crop from the Scandinavian countries!*
- A local Grain Elevator procured 4,600 MT grains at a value of 1.7 million dollars this year from Thunder Bay and Rainy River Districts. I believe at least one more Grain Elevator procured grains from the area as well (volumes not known).

For details, refer to the section on Extension and Outreach.

Dr. Tarlok Singh Sahota CCA **December 13, 2017**
Director of Research and Business