

## 2. Summary of Research Results 2021

Our summer was extremely hot and dry with day temperatures touching 30.2 ° C in June, 35° C in July and 33.8° C in August with a rainfall of only 40.2 mm in June and 39.1 mm in August. We had 72.5 mm rain in July; over 50 mm of which poured on a single day within minutes. As a result, yields of canola, flax and lentils were poor. Cereals, soybean and edible beans yields were reasonably good. CHU (May to September) were the highest (2,485) this year till date in the history of Thunder Bay!

### 2.1 Screening of crop varieties:

#### 2.1.1 Spring Cereals:

√*New Canadian Western Red Spring (CWRS) Wheat Varieties:*

- One dozen new CWRS wheat varieties were compared with *AAC Starbuck* and *AAC Wheatland VB*.
- Highest grain yields were obtained with *Rednet* (5.69 MT/ha), *BW 5045* (5.52 MT/ha) and *BW 5055 VB* (5.50 MT/ha). Grain yields from *AAC Starbuck* and *AAC Wheatland VB* were 5.21 MT/ha and 4.93 MT/ha.
- *Rednet* recorded the highest straw (7.01 MT/ha) and biomass yields (12.70 MT/ha). *CDC SKRush* (grain yield 5.26 MT/ha) had the second highest straw (6.90 MT/ha) and biomass (12.16 MT/ha) yields.
- Considering the highest grain and straw yields from *Rednet*, that also has an elevated resistance to Fusarium Head Blight, *Rednet* could be recommended for cultivation on farms!

√*Canadian Western Red Spring (CWRS) Wheat Varieties:*

- Fifteen CWRS wheat varieties were evaluated for their production potential.
- Grain yields in the highest yielding varieties were in the order of *AAC Brandon* (6.69 MT/ha) ≥ *CDC Adamant* (6.18 MT/ha) ≥ *AAC Wheatland* (5.82 MT/ha). Grain yield in other varieties ranged from 4.30 MT/ha in *AAC Viewfield* to 5.77 MT/ha in *Panata*.
- *Jake* produced the highest straw yield (6.03 MT/ha) followed by *CS Tracker* (5.49 MT/ha) and *AAC Russel* (5.22 MT/ha). Straw yield in *AAC Brandon*, *CDC Adamant* and *AAC Wheatland* were 4.53, 4.64 and 3.92 MT/ha, respectively.
- Ten varieties were common during 2019-2021. Averaged over three years, *AAC Wheatland* gave the highest grain yield (5.12 MT/ha) followed closely by *AAC Brandon* (4.93 MT/ha) and *AAC Starbuck* (4.81 MT/ha). Straw yield was a little higher with *AAC Brandon* (5.62 MT/ha) than that with *AAC Starbuck* (5.40 MT/ha) and *AAC Wheatland* (5.23 MT/ha).
- Area producers could grow both *AAC Wheatland* and *AAC Brandon*. *AAC Wheatland* has an advantage of midge tolerance. Midge isn't in the area as yet, but what if it comes?

√*Other Spring Wheat Varieties:*

- Fourteen varieties were evaluated for their production potential.
- Grain yield was highest with *Prosper* (6.52 MT/ha), *AAC Crossfield* (6.22 MT/ha) and *AAC Wheatland* (6.11 MT/ha). Straw yield in these three varieties ranged from 5.25 to 5.84 MT/ha.
- Grain shattering before harvesting was noticed in *AAC Whitehead*, *Dakosta*, *Easton* and *Raven*.
- *Easton* had the highest straw yield (7.16 MT/ha) and *Prosper*/*Easton* the highest biomass yields (12.4/12.2 MT/ha).
- Only seven varieties were common during 2019-2021. Averaged over these three years, three varieties that topped in the grain yield were *AAC Wheatland* (5.22 MT/ha), *Easton* (5.13 MT/ha) and *AAC Crossfield* (5.13 MT/ha). Grain yield from *Prosper* (5.11 MT/ha) was equally good.
- Grain protein content in *AAC Wheatland* in 2019 was 17.8 % as compared to 16.6 %, in *Prosper*.
- Since *AAC Wheatland* is the only CWRS high yielding variety it could be recommended for cultivation on farms in 2022!

#### √*Barley Varieties:*

- Fourteen barley varieties were compared for their production potential.
- *AB Tofield* (6.32 MT/ha), *Oceanik* (6.04 MT/ha) and *CDC Bow* (5.75 MT/ha) were the three top grain yielding varieties.
- *AB Tofield* had the highest straw yield (5.89 MT/ha). *AB Advantage* (5.79 MT/ha) and *AB Cattelac* (5.69 MT/ha) were the two next best varieties for straw production.
- Biomass yield (12.2 MT/ha) was highest with *AB Tofield*; followed by *CDC Bow*, *Amberly*, *Synasolis*, *AB Advantage*, *AB Cattelac*, *Oceanik* and *Boroe* (10.8-11.3 MT/ha).
- Only five varieties (*Amberly*, *Boroe*, *Chambly*, *Oceanik* and *Synasoils*) were common during 2019-2021. Averaged over the three years, all varieties had statistically equal grain yield that ranged from 5.69 MT/ha in *Chambly* to 6.32 MT/ha in *Synasoils*. *Amberly* gave higher straw yield (6.28 MT/ha) than other varieties (5.04-5.55 MT/ha). Biomass yield ranged from 10.9 MT/ha in *Oceanik* to 12.1 MT/ha in *Amberly* and didn't vary significantly with the varieties.

#### √*Malting Barley Varieties:*

- Thirteen varieties were evaluated for grain production. *CDC Copper*, *Torbellino*, and *TR14617* were the new varieties this year.
- Three top grain yielding varieties were *CDC Bow* (7.58 MT/ha), *CDC Churchill* (7.15 MT/ha) and *AAC Synergy* (7.11). *AB Brewnet* (6.73 MT/ha) and *CDC Kindersly* (6.66 MT/ha) were the next best varieties.
- *AB Brewnet* recorded the highest straw yield (8.35 MT/ha); 1.66 MT/ha higher straw yield than *CDC Bow*. *Bentley* (7.29 MT/ha) and *CDC Copeland* (7.24 MT/ha) were also good for straw production.
- Grain yield of other varieties ranged from 4.98 MT/ha (*CDC Fraser*) to 6.49 MT/ha in *CDC Copeland*.
- Seven out of 13 varieties were common during 2017-2021; Averaged over these 5 years, *CDC Bow* produced the highest grain (6.55 MT/ha), straw (7.99 MT/ha) and biomass (14.7 MT/ha) yields. *AAC Synergy* (with 6.14 MT grains, 6.56 MT straw and 12.9 MT biomass/ha) was the next best variety!
- Grain protein was 13.0 % or above in *CDC Kindersley*, *AB Brewnet*, *CDC Fraser* and *Butta 12*. Other malt quality parameters seem to be reasonably good in most of the varieties.

#### √*California Malting Barley Varieties:*

- Three California malting barley varieties (*Butta 12*, *UC Tahoe* and *UC Capay*) were compared with two Canadian malting barley varieties (*CDC Bow* and *TR14617*) for their production potential.
- The experiment was seeded late on June 7 and hence the grain yields were relatively low.
- *UC Tahoe* produced the highest (5.27 MT/ha) and *CDC Bow* the lowest grain yield (3.47 MT/ha). Grain yields from other varieties (4.17-4.70 MT/ha) statistically equaled with that from *UC Tahoe*.
- *TR14617* recorded the highest straw (3.94 MT/ha) and biomass (8.64 MT/ha) yields.

#### √*Oat Varieties:*

- Six selected oat varieties were evaluated for their yield potential. *CDC Endure*, which has good milling qualities and high beta glucan levels that end users require to make heart healthy products like breakfast cereals, was the new variety this year.
- *CDC Endure* (5.59 MT/ha) and *AC Rigodon* (5.48 MT/ha) produced the highest grain yields. *AC Rigodon* recorded the highest straw yield (8.20 MT/ha) and *CDC Arborg* the highest biomass yield (13.9 MT/ha).
- Averaged over 2020 and 2021, *AC Rigodon* gave then highest grain yield (5.66 MT/ha) and *CDC Arborg* the highest straw (6.76 MT/ha)/and the biomass (12.8 MT/ha) yield.
- *Oat growers could try CDC Endure in 2022.*

### **2.1.2 Winter Cereals:**

#### √*Winter Wheat Varieties (seeded on September 10, 2020):*

- Twelve winter wheat varieties from the west and east of Canada, including *Gallus*, *AAC Icefield*, *JDC78* and *AAC Wildfire*, *Lexington*, *PRO 81* and *Adrianus* were compared for their production potential.
- *PRO 81* (7.55 MT/ha), *AAC Icefield* (7.32 MT/ha) and *Moats* (7.32 MT/ha) were the three highest grain yielding varieties. *Adrianus* (7.29 MT/ha), *JDC 78* (7.15 MT/ha) and *Gallus* (7.14 MT/ha) were equally good in grain yield. The grain yields this year, with a trial mean of 6.89 MT/ha, were reasonably high!
- *Goldrush* (10.39 MT/ha) and *AAC Gateway* (9.79 MT/ha) produced significantly higher straw yield than the other varieties. Except *Moats*, *JDC 78* and *Lexington* all other varieties had straw yield higher than 8.0 MT/ha.
- *AAC Gateway*, *JDC 78* and *PRO 81* recorded the highest Biomass yields (16.3 – 16.7 MT/ha).
- Averaged over 2019 to 2021 (9 varieties were common during all these years), *Keldin* (6.69 MT/ha), *Gallus* (6.56 MT/ha) and *AAC Gateway* (6.05 MT/ha) produced the highest grain yields. Straw yield (8.97 MT/ha) was the highest with *CDC Buteo*.
- *JDC 78* was the most dwarf (79 cm tall) and *Moats* (101 cm) and *AAC Wildfire* (100 cm) were the tallest varieties. *AAC Gateway* with a height of 90 cm was a medium variety.

√*Late seeded Winter Wheat Varieties (seeded on September 16, 2020):*

- Two new varieties (*AAC Network* and *W583*) were compared with *AAC Gateway*.
- Grain yield from the new varieties (*AAC Network* 4.08 MT/ha; *W583* 4.84 MT/ha) were significantly lower than the grain yield of *AAC Gateway* (5.85 MT/ha).
- Straw (9.58 MT/ha) and biomass (15.4 MT/ha) yields were also highest with *AAC Gateway*.
- *AAC Network* was the most dwarf (73.7 cm tall) and *AAC Gateway* the tallest variety (92 cm).

√*Winter Barley Varieties (seeded on August 27, 2020):*

- Three winter barley varieties (*McKeller*, *McGregor* and *Scala*) were compared with each other.
- *McKeller* produced the highest grain yield (4.52 MT/ha) and *McGregor* had the highest straw (5.89 MT/ha) yield. Grain yields of *Scala* and *McGregor* were 2.90 and 2.21 MT/ha only.
- Biomass yields were in the order of *McKeller* (9.51 MT/ha)  $\geq$  *McGregor* (8.81 kg/ha)  $>$  *Scala* (5.18 MT/ha).

√*Winter Rye Varieties:*

- Four winter rye varieties were compared for their production potential.
- This is the first year when *Bono* recorded higher grain yield (4.59 MT/ha) than the other varieties (*Guttino* 3.75 MT/ha, *Brasetto* 3.58 MT/ha and *Hazlet* 3.00 MT/ha).
- Biomass yield was highest with *Bono* (10.75 MT/ha) and the straw yield was highest with *Hazlet* (6.91 MT/ha).
- Averaged over three years (2018-2021), grain yield differences between the varieties were not significant and ranged from 3.99 MT/ha in *Brasetto* to 4.45 MT/ha in *Guttino*. The crop was grown at sub optimal fertilizers rates (average over, 0, 50 % and 100 % of NPK application). *Brasetto* gave the highest straw yield (6.66 MT/ha) and *Hazlet* the highest Biomass yield (10.43 MT/ha).

√*Comparative Performance of two Winter Triticale Varieties:*

- *Fridge* (3.80 MT/ha) gave higher grain yield than *Luoma* (2.80 MT/ha).
- Straw and Biomass yields were also higher with *Fridge* (9.29 and 13.1 MT/ha) than that with *Luoma* (7.97 and 10.8 MT/ha).
- Low grain yield could be ascribed to relatively low rainfall at grain development.

### 2.1.3 Grain Legumes and Oil Seeds Varieties:

√*Soybean Varieties:*

- Twenty six varieties were compared for their grain production potential.
- *S001-D8X* (4.46 MT/ha), *S007-A2XS* (4.43 MT/ha), and *Hart R2X* (4.32 MT/ha) recorded the highest grain yields!
- *S007-A2XS* had the highest straw (3.36 MT/ha) and biomass (7.79 MT/ha) yields.

- *DKB003-29* (21 g), *Hart R2X* (20 g), *Mahony R2* (20 g) and *Merrit R2X* (20 g) topped in 100 kernel weights.
- Six varieties (*NSC Tilston RR2Y*, *Lono R2*, *NSC Newton RR2X*, *Bourke R2X*, *Mahony R2* and *PV16 S004 RR2X*) were common during 2019-2021. Averaged over three years, all had similar grain yields (3.10 MT/ha in *NSC Newton RR2X* to 3.51 MT/ha in *Lono R2*).
- *NSC Newton RR2X* and *S007-A2XS* were the tallest varieties (both with a height of 79 cm)!

√*Edible Bean Varieties:*

- Ten edible bean varieties from different classes and of different colours were evaluated for grain yield. Edible beans grain yield was good this year (trial mean of 4.30 MT/ha).
- Grain yield differences between the varieties (3.96 MT/ha – 4.60 MT/ha) were not statistically significant. However, *AAC Argosy – Navy beans* (4.60 MT/ha), *AAC Shock - Navy beans* (4.60 MT/ha) and *AAC Y015 - Yellow beans* (4.36 MT/ha) seemed to have better grain yields than all other varieties. Grain yield of *AAC Earlired* (small red beans) that has been the highest yielding variety during the past several years was 4.04 MT/ha.
- Averaged over 2019 to 2021, there was no significant difference in the grain yields of the 10 edible bean varieties.

*Edible beans (easy weed control with Basagran Forte) if they fetch a good price in the market could be an integral part of the cropping systems in northwestern Ontario!*

√*Linseed Flax Varieties (seeded on May 27, 2021):*

- Twelve varieties of linseed flax were compared.
- Flax seed yield was very poor this year (trial mean of 1.34 MT/ha) due to hot and dry weather. *CDC Rowland* produced the highest seed (1.90 MT/ha) yield and *CDC Melyn* gave the lowest seed yield (0.70 MT/ha).
- Straw (8.14 MT/ha) and biomass (9.43 MT/ha) yields were the highest with *CDC Sorrel*.
- Good crop growth as indicated by the high straw yield couldn't be converted into good seed yield due to hot and dry weather. It seems that flax is more sensitive to heat and drought than cereals.

√*Liberty Canola Varieties (seeded on May 27, 2021):*

- Twelve varieties were evaluated; most of them new and at least half of which had Clubroot resistance and 5 of them had shatter reduction trait.
- Hot and dry weather kept the seed yields low (trial mean 2.67 MT/ha). Growth as seen from straw yield (7.58 MT/ha) didn't get converted into seed yield.
- Seed yield was in the order of *L252* (3.16 MT/ha) ≥ *L340PC* (3.03 MT/ha) ≥ *L230/P501L* (2.92 MT/ha). Seed yield in other varieties ranged from 2.09 MT/ha in *DKLL-82SC* to 2.90 MT/ha in *L234PC*.
- Straw yield exceeded 9 MT/ha in *L340PC* (9.31 MT/ha) and *L345PC* (9.04 MT/ha). Straw yield in other varieties ranged from 6.12 MT/ha in *DKLL-82SC* to 7.94 MT/ha in *LA344PC*.
- *P* stands for 'Shatter Reduction' and *C* for Clubroot resistance.

√*Roundup Ready Canola Varieties (seeded on May 14, 2021):*

- Eight varieties were compared for their production potential.
- *CS2600CR-T* gave the highest seed yield (4.32 MT/ha) followed closely by *LR344PC* (4.03 MT/ha) that has both Liberty and Roundup resistance traits. Seed yield in other varieties was between 3.02 to 3.39 MT/ha.
- Straw yield was highest with *CS2300* (8.04 MT/ha), *CS2600CR-T* (7.88 MT/ha) and *LR344PC* (7.86 MT/ha).

√*Clearfield Canola Varieties (seeded on May 31, 2021):*

- Seed yields were poor. Three out of five varieties that exceeded 2 MT/ha in seed yield were *CS2500CL* (2.34 MT/ha), *5545CL* (2.22 MT/ha) and *BY5125CL* (2.19 MT/ha).
- *CS2700CL* that had the tallest plants (150 cm) produced the highest amount of straw (5.14 MT/ha). Straw yield from *5545CL* was equally good (5.04 MT/ha).

√*Winter Canola Varieties:*

- Two winter canola varieties, *Mercedes* and *Inspiration*, were seeded on September 10, 2020 and none survived the winter of 2020-2021.
- This is the third year when these two varieties failed to survive during the winter at LUARS.

**2.1.4 Forage Crops/Varieties:**

√*Barley Varieties for Forage Production:*

- Fourteen varieties were evaluated for forage production.
- Highest forage dry matter yield was registered by *AAC Bell* (11.29 MT/ha; 11.3 % protein), *AB Tofield* (10.86 MT/ha; 9.6 % protein) and *Oceanik* (10.07 MT/ha; 10.7 % protein).
- *Synasolis* (11.9 %), *AB Hague* (11.5 %) and *AB Advantage* (11.3 %) had a high protein content.
- RFV was highest in *Oceanik* (145) followed by *AB Wrangler* (127).
- *Considering the dry matter yield and protein content, AAC Bell (2 row) was the best barley variety for forage production and it could be recommended for cultivation on farmers' fields! Its seed can be obtained from SeCan.*

√*Malting Barley Varieties for Forage Production:*

- Same malting varieties that were evaluated for grain production were tested for forage production.
- Highest forage dry matter yield (11.34 MT/ha) was obtained with *CDC Copper*. *CDC Churchill* (10.19 MT/ha) and *CDC Bow* (10.15 MT/ha) were the next best varieties for forage production.
- *AB Brewnet* (12.9 %), *Bentley* (12.7 %) and *CDC Bow* (12.1 %) had higher protein content than the other varieties.

√*California Malting Barley Varieties for Forage Production:*

- Three California varieties (*Butta 12*, *UC Tahoe* and *UC Capay*) were compared with two Canadian varieties (*CDC Bow* and *TR14617*) for forage production.
- *TR14617* (7.68 MT/ha) and *UC Tahoe* (7.16 MT/ha) gave higher dry matter forage yields than the other varieties (5.75-6.49 MT/ha).
- Protein content was lowest (11.9 %) in *UC Tahoe* and ranged from 13.3 % to 13.7 % in other varieties.

√*Alfalfa Varieties:*

- Two western alfalfa varieties (*Revolution MD* and *Response WT*) were compared with two Atlantic Canadian varieties (*AAC Trueman* and *Elite*); *WL319HQ* (RR alfalfa) was a check variety.
- Dry matter yield from two cuts varied from 4,822 kg/ha with *AAC Trueman* to 5,265 kg/ha with *Response WT*. However, the yield differences between the varieties were non-significant.
- First cut protein content varied from 19.1 % in *Elite* to 20.0 % in *WL319HQ* and from 20.6 % in *Elite* to 22.5 % in *WL319HQ* in the second cut.
- RFV was highest in *Response WT* (134) in the first cut and highest in *WL319HQ* (148) in the second cut. Generally speaking, higher RFV could mean higher milk yield.

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

- This is the first year when *Galega* gave somewhat lower dry matter yield than *alfalfa* because it was hit by a hard frost (-5° C) on June 21, which offset its growth and impacted the yield.
- Averaged over 2012 to 2021, *Galega* (5,218 kg/ha/year) produced higher dry matter yield than *alfalfa* (4,807 kg/ha/year).
- *Galega* had 1.8-4.4 % point higher protein content in the first cut and 2.5-4.7 % point higher protein content in the second cut as compared to *alfalfa*.
- *Galega* didn't exceed *alfalfa* in RFV in the first cut, whereas in the second cut it had up to ~11 % higher RFV than *alfalfa*.
- *Higher yield and higher protein content in Galega than in alfalfa, could make Galega a better fodder than alfalfa!*

√*Alternate Forage Legumes (seeded in 2020):*

- *Galega*, *sainfoin*, *alfalfa* and *red clover* were compared for their production potential and forage quality.
- This is the first year when *sainfoin* produced higher dry matter yield (5,043 kg/ha @ 30 kg seed/ha and 5,350 kg/ha @ 40 kg seed/ha) than *Galega* (4,511 kg/ha), *alfalfa* (4,476 kg/ha) and *red clover* (4,290 kg/ha).
- First cut protein content was highest with *alfalfa/Galega* (20.7/20.5) and lowest with *sainfoin* (14.4 %; at both the seed rates). First cut protein content in *red clover* was 19.2 %.
- Second cut protein content was highest (15.7 %) in *sainfoin* seeded @ 30 kg/ha.
- RFV in the first cut was highest (150) in *alfalfa*, whereas in the second cut, *sainfoin* @ 30 kg seed/ha equaled *alfalfa* in RFV (120) and the two topped in RFV among all forage legumes.

√*Corn Silage Varieties:*

- Ten silage corn varieties were evaluated for forage production and feed quality.
- Highest dry matter yields were recorded with *DKC26-40RIB* (24.9 MT/ha), *PS 2320 RR* – the tallest variety (24.8 MT/ha) and *DKC29-89RIB* (23.1 MT/ha). Dry matter yields in other varieties ranged from 18.5 MT/ha in *P7417AM* to 21.5 MT/ha in *DKC30-07RIB*/and *MS 6902 R*.
- Protein content was higher in *P7211AM* (10.1 %) and *PS 2320 RR* (8.47 %). Protein content in other varieties ranged from 6.26 % in *DKC26-40RIB* to 8.19 % in *DKC21-36RIB*.
- While the ADF and NDF values were lowest, the TDN and Energy values were highest in *PS 2320 RR*. This shows that *PS 2320* excelled in feed quality and it could have an excellent palatability.
- *Considering the dry matter yield, protein content and other quality parameters, PS 2320 could be recommended for cultivation on farms!*

√*Optimizing Seeding Rate in Kernza and Comparing its Forage Production Potential with Perennial Rye and in Mixture with Alfalfa:*

- Regrowth of *Kernza* was too poor to take the second cut. Therefore, only one cut was taken.
- Optimum seed rate of *Kernza* appeared to be 110 seeds/m<sup>2</sup>. At this rate, it produced 2,927 kg/ha dry matter yield. Dry matter yield from *Kernza* at other populations (70, 90 and 130 seeds/m<sup>2</sup>) varied from 2,521 kg/ha to 2,738 kg/ha.
- *Alfalfa + Kernza* (80:20 mixture) recorded the highest dry matter yield (5,602 kg/ha) in 2021 and also highest total dry matter yield over four years (2018-2021 – 19.76 MT/ha = 4,941 kg/ha/year). Dry matter yield from *alfalfa + Ace 1 (Perennial Rye)* 80:20 mixture was 5,206 kg/ha. However, *Ace 1* did not survive beyond winter 2018-2019 and *alfalfa + Ace 1* was virtually alfalfa alone.
- In the first cut, protein content was higher in *alfalfa + Ace 1* (80:20) mixture (18.0 %) followed by *Kernza* @ 70 seeds/m<sup>2</sup> (17.5 %). Protein content in *Kernza* at other populations (90-130 seeds/m<sup>2</sup>) ranged from 14.6 % to 16.2 %. In the second cut, *alfalfa + Kernza* (80:20 mixture) had higher protein content (19.6 %) than *alfalfa + Ace 1* (80:20) mixture (18.2 %)
- First cut RFV was highest in *Kernza* @ 70 seeds/m<sup>2</sup> (120) followed by *alfalfa + Ace 1* 80:20 mixture (119). RFV in other treatments varied from 108 to 114. In the second cut, higher RFV (131) was recorded with *alfalfa + Kernza* (80:20 mixture) than with *alfalfa + Ace 1* (80:20) mixture (126).

## 2.2 Fertilizer Management Practices and Growth Regulators/Biostimulants (Grain/Seed crops):

### 2.2.1 Cereals:

√*High Rates of N on Canola (2020) - Residual Effect on Spring Wheat (2021):*

- Residual effect of N applied to canola in 2020 from different sources at different rates (90-360 kg N/ha) was studied on spring wheat in 2021. N was not applied to wheat in 2021 except in No N treatment (in canola) that got 90 kg N/ha from urea for wheat.
- Urea @ 270 and 360 kg N/ha, urea + ESN @ 360 kg N/ha, urea superU @ 270 and 360 kg N/ha, urea + urea superU @ 360 kg N/ha and urea + ESN + urea superU @ 180 kg N/ha to canola without application of N to wheat gave equal or somewhat higher grain yield of wheat applied with 90 kg N/ha. This means that wheat could be grown without application of N after canola if canola got

higher rates of N (270-360 kg N/ha) application. This was more or less true for straw yield as well especially at 360 kg N/ha (to canola).

- Averaged over sources/blends of N, residual effect of N to canola on grain yield of wheat increased with the increasing rate of N from 90 kg N/ha (2.52 MT/ha) to 360 kg N/ha (4.02 MT/ha). The corresponding increase in straw yield was from 3.00 MT/ha to 4.73 MT/ha (with increasing rate of N from 90 to 360 kg N/ha).
- Residual effect of urea superU and urea + urea superU applied to canola on wheat grain yield appeared to be a bit better than that of urea/and urea + ESN.
- Pleasant surprise was that the residual effect of N @ 180 kg/ha applied through urea, ESN and urea superU (1:1:1 proportion on N basis) equaled that with higher rates of N (270 and 360 kg N/ha) from other fertilizers applied singly (urea or urea superU) or in combination of two fertilizers (urea + ESN or urea + urea superU).

√*Effect of Seeding Dates, Rates of Nitrogen and Manipulator on Spring Wheat (AAC Wheatland):*

- Treatments included all combinations of four seeding dates (May 13 to June 3 at weekly intervals), two N rates (80 and 160 kg N/ha) and two levels of Manipulator (no Manipulator spray and Manipulator spray @1.8 l/ha at tillering).
- Maximum grain (5.29 MT/ha), straw (6.05 MT/ha) and biomass yields (11.34 MT/ha) were obtained with seeding on May 13, application of N @ 80 kg/ha and no Manipulator spray.
- Averaged over N rates and Manipulator treatments, May 13 seeding produced the highest grain, straw and biomass yields. Later seeding dates didn't differ in their grain, straw or biomass yields.
- Increasing N rate from 80 to 160 kg/ha or the Manipulator spray didn't help in increasing grain, straw and biomass yields. Though Manipulator spray decreased the plant height from 75 to 72 cm.
- The results indicated that wheat should be seeded as soon as possible in the spring, 80 kg N/ha was sufficient for wheat and no Manipulator spray was required for a dwarf wheat variety such as AAC Wheatland.

√*Effect of Seeding Dates, Rates of Nitrogen and Manipulator on Spring Barley (Synasolis):*

- Treatments included all combinations of four seeding dates (May 13 to June 3 at weekly intervals), two N rates (80 and 160 kg N/ha) and two levels of Manipulator (no Manipulator spray and Manipulator spray @1.8 l/ha at tillering).
- Maximum grain yield (5.61 MT/ha) was recorded with seeding on May 13 and application of N @ 160 kg/ha. Manipulator spray at either of the two rates of N (80 and 160 kg/ha) didn't improve the grain yield.
- Straw yield was highest (6.42 MT/ha) with seeding on June 3 and application of N @ 160 kg/ha.
- Biomass yield was highest (10.90) with seeding on May 27 and application of N @ 160 kg/ha.
- Averaged over N rates and Manipulator treatments, there was no difference in grain yields with different dates of seeding. However, straw (5.48-5.92 MT/ha) and biomass (10.20-10.40 MT/ha) yields were higher with the two last dates of seeding than the first two dates of seeding.
- Averaged over seeding dates and Manipulator treatments, there was no significant difference in grain yield with 80 and 160 kg N/ha. Straw yield appeared to be higher and the biomass yield was actually higher with 160 kg N/ha than with 80 kg N/ha.
- Averaged over seeding dates and N rates, Manipulator spray didn't affect the grain, straw or biomass yields. Though it shortened the plants by 3 cm.

√*Comparative Performance of Manipulator and Moddus at Two Rates of Nitrogen in Spring Wheat (Brandon) and Spring Barley (Boroe):*

- Barley supplied with 160 kg N/ha and no spray of Manipulator or Modus produced the highest grain yield (5.03 MT/ha). Straw yield was highest (4.75 MT/ha) with wheat @ 80 kg N/ha without any application of Manipulator or Modus.
- Highest biomass yield (9.33 MT/ha) was registered with barley @ 80 kg N/ha sprayed with Manipulator.

- Averaged over N rates and Manipulator/Modus treatments, barley gave higher grain and biomass yields than wheat.
- Averaged over crops and Manipulator/Modus treatments, grain yield appeared to increase and straw and biomass yields increased with the application of N @ 80 kg/ha as compared to no N application.
- Averaged over crops and N rates, Manipulator/or Modus didn't affect grain, straw or biomass yields; though both lowered the plant height by 4-5 cm.

√*Winter Wheat Survival:*

- Effect of agrochemicals (seed treatment with fungicide + insecticide and spray of Abscisic acid, Seaweed Extract and Headline at tillering) at two rates of potassium application (recommended rate and double the recommended rate) was studied on winter wheat survival and yield during 2018-2021. However, winter wheat survived very well in all treatments during all the years.
- Averaged over three years, no significant difference was observed in the grain and straw yields with agro-chemicals or between the two rates of K (20 and 40 kg K<sub>2</sub>O/ha). Grain yield ranged from 5.35 kg/ha without any seed treatment or chemical spray to 6.47 MT/ha with Abscisic acid spray at tillering @ 21 g/ha.
- Straw yield was highest (8.86 MT/ha) without any seed treatment or chemical spray.

√*Population and NPK fertilizer regimes for Winter Rye: effect was studied on 4 varieties with spring barley (after fall fallow) as a check.*

- Lowering the rate of NPK fertilizers application from 100 %, but not the lowering of seed rate, lowered the grain yield (from 4.70 MT/ha with 100 % NPK Rate to 3.71 MT/ha with 50 % NPK rate and to 3.21 MT/ha without NPK).
- Surprisingly (i) highest straw and biomass yields were recorded with 50 % recommended seed rate; though the seed rate effect on grain, straw or biomass yields was non significant and (ii) highest straw and biomass yields were obtained without NPK.
- Spring barley kept as a check treatment yielded 3.86 MT grain/ha and 4.49 MT straw/ha
- Averaged over 2018 - 2021, grain, straw and biomass yields didn't vary significantly with the seeding rates (50, 75 and 100 % of recommended seed rates). Grain yield increased linearly with increase in NPK fertilizers rate from zero (3.30 MT/ha) to 100 % of recommended NPK rate (4.85 MT/ha). Straw yield appeared to be highest (6.10 MT/ha) with 50 % recommended NPK rate and biomass yield (10.66 MT/ha) seemed to be highest with 100 % recommended NPK rate.
- Averaged over 2018 - 2021, spring barley kept as a check treatment yielded 3.71 MT grain/ha and 3.62 MT straw/ha.

√*Canary Grass Variety and Fertilizer Regimes:*

- Two canary grass varieties (*CDC Calvi* and *CDC Cibo*) were compared with and without NPK fertilizers application @ 70 kg N + 20 kg P<sub>2</sub>O<sub>5</sub> + 20 kg K<sub>2</sub>O/ha.
- Grain/seed yield was extremely low (Trial mean 0.36 MT/ha). *CDC Cibo* outyielded *CDC Calvi* by 0.23 MT/ha. Straw yield was more or less the same in the two varieties; *CDC Calvi* 5.22 MT/ha and *CDC Cibo* 5.42 MT/ha.
- *CDC Calvi* but not *CDC Cibo* responded to NPK fertilizers application. Averaged over the two varieties, fertilizers application didn't influence grain, straw or biomass yield.

### 2.2.2 Grain Legumes and Oil Seeds:

√*Effect of Nitrogen and Sulphur on Lentils Grain Yield:*

- Treatments included all combinations of 3 rates of N (0, 22.5 and 45 kg N/ha) and 4 rates of S (0, 8, 16 and 24 kg S/ha).
- Grain yield was poor due to hot and dry summer and maximum grain yield (1.55 MT/ha) was obtained without application of N or S. Two years ago, trial mean yield from this experiment was 3.48 MT/ha.

- Averaged over 2019-2021, grain yield from check plot (no N or S) was the highest (1.87 MT/ha). Application of N or S didn't improve the grain yield over check. This means that the lentils could be grown without N and S fertilizers.

√*Effect of P and K on Lentils Grain Yield:*

- Treatments included all combinations of 3 rates of P<sub>2</sub>O<sub>5</sub> and 3 rates of K<sub>2</sub>O each @ 0, 20 and 40 kg/ha).
- Grain yield was very poor due to the hot and dry summer (trial mean of 1.16 MT/ha).
- Application of P or K had no significant effect on lentils grain yield. In other words, lentils didn't respond to application of P and K; may be because of low yield (1.22 MT/ha averaged over 2019-2021).
- From the two nutrient management experiments on lentils, it appears that the lentils could be grown without application on N, P, K and S!

√*Residual Effect of Winter Rye Cover Crop – Different Seeding and NPK Fertilizer Rates on Canola:*

- Winter rye cover crop was seeded in the fall 2020 at different seed and NPK fertilizers rates with a check (fallow plot without seeding rye) and its effect was studied on canola in 2021.
- Only 100 % seed rate and 100 % NPK fertilizers improved P status of the soil as compared to the fallow treatment. Other soil characters were not affected much by the treatments.
- The canola seed yield was low (Trial mean 2.65 MT/ha) and ranged from 1.88 MT/ha in fallow to 3.12 MT/ha with 50 % seed rate and 50 % NPK fertilizers to winter rye. This is the first year when treatments applied to winter rye gave higher seed yield of canola as compared to the fallow (check).
- Straw yields were highest with 50 % seed rate and either no NPK fertilizers (8.07 MT/ha) or 50 % of the recommended fertilizer rates (7.86 MT/ha) to winter rye.
- Averaged over NPK fertilizers' rates, 50 % seed rate produced the highest canola seed (2.99 MT/ha), straw (7.51 MT/ha) and biomass (10.5 MT/ha) yields.
- Averaged over seeding rates, the three fertilizer rates applied to winter rye resulted in similar seed, straw and biomass yields of canola.
- Averaged over three years (2018-'19 to 2020-'21) canola seed yield ranged from 3.85 MT/ha in fallow to 4.44 MT/ha with either 50 % seed rate and 50 % NPK fertilizers or 75 % seed rate and 100 % NPK fertilizers applied to winter rye. This shows that the canola did seem to benefit from the winter rye cover cropping.

√*Response of Canola (L252) to High Rates of N Application from Different Sources:*

- Application of N @ 90, 180, 240 and 360 kg/ha from urea, urea + ESN (2:1 ratio on N basis), urea superU, urea + urea superU (2:1 ratio on N basis) and urea + ESN + urea superU each @ 60 kg N/ha (total 180 kg N/ha) significantly improved the canola seed yield as compared to the check.
- Seed yields were highest with urea superU @ 270 kg/ha (3.81 MT/ha) or @ 360 kg N/ha (3.61 MT/ha) and urea + urea superU @ 360 kg N/ha - 2:1 ratio on N basis (3.54 MT/ha). Straw yield followed a similar trend to the seed yield.
- Averaged over N sources, response to N followed the Law of Diminishing Returns and increasing the N rate beyond 180 kg N/ha didn't result in significant increase in the seed yield (over and above 180 kg N/ha). This was true for straw and biomass yields too.
- Averaged over N rates, all fertilizers/their blends gave similar seed yields (3.10-3.30 MT/ha), which were higher than the yield obtained with a blend of urea, ESN and urea superU each @ 60 kg N/ha. Differences in straw or biomass yields with the sources of N or their blends were not significant.
- Averaged over 2020 and 2021, canola seed yields were highest at the N rates higher than 180 kg N/ha and were in the order of urea @ 270 kg N/ha (4.02 MT/ha) ≥ urea superU @ 360 kg N/ha (3.95 MT/ha) ≥ urea + ESN @ 270 kg N/ha (3.68 MT/ha). Urea superU @ 270 kg N/ha produced similar seed yield (3.62 MT/ha) to urea + ESN @ 270 kg N/ha (3.68 MT/ha).
- Based on the two years average, 270 kg N/ha could be considered an optimum rate of N for canola.
- But for the heat and moisture stress in the summer, seed yields and response to N could be better!

√*Effect of Apex, Top Phos, EXCELIS MAXX and Bio-Stimulants on Canola:*

- Apex (30 % N - 5 % ammoniacal N and 25 % urea N, 2.9 % Ca, 1.2 % Mg and 8 % S), or Top Phos (8 % N, 30 % P<sub>2</sub>O<sub>5</sub>, 0 % K<sub>2</sub>O and 4.8 % S) applied at equivalent rates of N/or P from other fertilizers (urea, ESN, ammonium sulphate and 0-45-0) didn't give higher canola seed yield than the fertilizers used by our growers.
- Seed yield was low due to hot and dry weather and ranged from 2.14 MT/ha with ESN, urea, AS, TSP and FL Gold @ 3l/ha at first petal falling to 2.70 MT/ha with ESN, urea, AS, TSP and Genea @ 3 L/ha at beginning bolting.
- Two other treatments that seemed bit better in seed yield were urea treated with EXCELIS MAXX; and TSP (2.60 MT/ha) and ESN, urea, AS, TSP and IRYS @ 3 L/ha at 2-3 leaves (2.49 MTha).
- Out of the Biostimulants (FA Starter, IRYS, FL Gold and Genea), Genea and IRYS seemed to improve the seed yield.
- Treatment of urea with EXCELIS MAXX (2.60 MT/ha) surpassed in seed yield from farmers' practice of applying N from a blend of urea, ESN and ammonium sulphate (2.44 MT/ha), when 48 kg S/ha was applied in both the treatments.
- Highest straw yield (7.07 MT/ha) was recorded with ESN, urea, AS, TSP and FL Gold @ 3 L/ha at beginning bolting and the highest biomass yield (9.40 MT/ha) was realized with ESN, urea, AS, TSP and IRYS @ 3 L/ha at 2-3 leaves.
- Averaged over 2020 and 2021, treatment differences in seed, straw and biomass yields were not significant.

√*Evaluation of MAP + MST as a Source of S for Canola (BY620TTF) Production:*

- MAP + MST (9-43-0-16), a blend of MAP (11-52-0) and MST (micro-ionized elemental S) was compared with ammonium sulphate and in blends with ammonium sulphate @ 36 kg S/ha.
- Canola seed yield (trial mean 2.09 MT/ha) was too low to properly evaluate the effect of S fertilizers. Dry weather in June and August impacted canola yield. July was dry too except for 50 mm rain on a single day in a short period, which didn't help much
- None of the treatments gave higher seed yield than the check – No S (2.53 MT/ha).
- Straw yield ranged from 5.72 MT/ha with ammonium sulphate @ 24 kg S/ha + MAP + MST @ 12 kg S/ha to 6.41 MT/ha with ammonium sulphate @ 18 kg S/ha + MAP + MST @ 18 kg S/ha.

√*Evaluation of SymTRX S10 as a Source of S for Canola (BY620TTF) Production:*

- SYMTRX S10 (14-24-0-10), a bio-based fertilizer containing 16 % O.M that could increase microbial activity, was compared with ammonium sulphate and in blends with ammonium sulphate.
- Maximum seed yield (4.39 MT/ha) was obtained with a blend of the two fertilizers (ammonium sulphate @ 12 kg/ha + SymTRX S10 @ 24 kg S/ha).
- In the comparison of the two fertilizers alone, ammonium sulphate gave higher seed yield (3.50 MT/ha) than SymTRX S10 (2.62 MT/ha) at the same rate of S (36 kg/ha).
- Plant height (103 cm) and straw yield (8.12 MT/ha) were the highest with ammonium sulphate @ 36 kg S/ha.

### **2.2.3 Forages:**

√*Alfalfa Row Spacing and Rates of Sulphur (S) Application:*

- Pre seeding S test in this experiment was 8 ppm S.
- Seed rate was kept the same with all the row spacing treatments. Highest alfalfa dry matter yield (7,450 kg/ha) from two cuts was obtained with missing one row after every two rows and application of S @ 48 kg/ha in two splits – half in early spring and half after the first cut. This treatment also gave the highest protein content in both the cuts - first (20.2 %); second (21.5 %).
- Averaged over S rates, missing one row after every two rows produced the highest first cut yield (3,319 kg/ha), whereas regular row spacings at 15 cm recorded the highest second cut yield (3,977 kg/ha).

- Dry matter yield from the two cuts was in the following order: missing one row after every two rows (6,613 kg/ha) ≥ regular rows - without missing any rows (6,438 kg/ha) ≥ missing alternate rows (6,120 kg/ha).
- Protein content with different row spacings/geometries varied from 18.7 to 19.1 % in the first cut and from 20.1 to 20.8 % in the second cut.
- RFV was highest with missing one row after every two rows in the first cut (133) and highest with missing alternate rows in the second cut (143).
- Averaged over row spacings, application of S @ 36 kg/ha and not @ 24 kg/ha significantly increased the alfalfa dry matter yield (from two cuts) from 5,864 kg/ha without S to 6,677 kg/ha with 36 kg S/ha. Increasing the S rate from 36 to 48 kg/ha didn't bring in significant improvement in the dry matter yield.
- Protein content was highest with 48 kg S/ha applied in two splits both in the first (19.6 %) and in the second cut (21.0 %).
- RFV in the first cut was highest (134) with S @ 36 kg/ha/or 48 kg S/ha applied in two splits. In the second cut, RFV didn't vary much with the rates of S application and ranged from 136 to 139.

### 2.3 Other Agronomic Practices:

#### √*Effect of Fungicides on Diseases and Yield in Spring Cereals:*

- Stratego (sprayed at tillering), Prosaro (sprayed at anthesis) and Cramba sprayed a week later than Prosaro were used to control foliar fungal diseases and FHB in spring cereals – wheat, barley and oats (total 12 treatments).
- There was hardly any disease incidence because of dry summer; FHB score in particular was zero. Consequently, none of the fungicide treatments gave higher grain yield than no fungicide spray (4.92 MT/ha; averaged over three cereals).
- In the three cereals, grain yield was in the order of oat (*AC Rigodon* 6.02 MT/ha) > barley (*CDC Bow* 4.49 MT/ha) > wheat (*AAC Wheatland* 3.99 MT/ha). Barley produced the highest (4.89 MT/ha) and wheat the lowest (2.81) straw yield.
- Averaged over 2020 and 2021, treatments' effect on grain and straw yields was similar to that in 2021.

#### √*Winter Rye Date and Rate of Seeding:*

- Possibility of getting good yield from winter rye by increasing seed rate with delay in seeding was explored.
- Increasing seed rate by 25-50 % with delay in seeding from September 25 to October 25 didn't help arresting the consistent decline in yield with each successive delay in seeding date.
- Grain, straw and biomass yields of winter rye with September 25 seeding were 4.85, 5.39 and 10.39 MT/ha. Corresponding values for October 25 seeding were 1.41, 2.18 and 3.59 MT/ha.

#### √*Effect of Winter Rye Cover Cropping with and without fertilizers on Spring Crops:*

- Winter rye as a cover crop was grown in 2020-2021 fall-winter with and without fertilizers and compared with fallow (no cover cropping) for its effect on six spring crops (wheat, barley, canola, soybean, lentils and flax) production.
- Spring crops were seeded on June 2 and were caught in hot and dry weather. The crops yields were relatively low.
- Winter rye cover cropping without application of NPK fertilizers to winter rye didn't increase crop grain/seed yields as compared to the fallow (no cover cropping).
- Winter rye cover cropping with application of NPK fertilizers to winter rye increased the wheat grain yield by 1.43 MT/ha, barley grain yield by 2.28 MT/ha and flax seed yield by 0.68 MT/ha, whereas there was no increase in canola, soybean and lentils seed/grain yields.
- Effect of winter rye cover cropping on straw yield was similar to that on the grain/seed yield of different crops.

- Averaged over cover crop treatments, grain/seed yields were in the order of wheat > soybeans > barley > flax > canola > lentils.
- Averaged over cover crop treatments, flax produced the highest straw (5.09 MT/ha) and lentils the lowest straw (1.22 MT/ha) yield. The straw yield in other crops ranged from 3.00 MT/ha in soybeans to 3.77 MT/ha in canola.

√*Optimizing Seeding Rate in Kernza and Comparing its Grain Production Potential with Perennial Rye:*

- *Kernza* was seeded @ 70, 90, 110 and 130 seed/m<sup>2</sup>.
- *Ace 1* (perennial rye) didn't survive to produce any grain yield.
- *Kernza* grain yield was extremely poor this year due to extremely hot and dry summer (Trial mean 0.19 MT/ha).
- Grain, straw and biomass yields were not affected by the seeding rates this year.
- *Kernza* grain yield in 2019 was close to 2 MT/ha.

√*Effect of EcoTea Seed Treatment on Different Crops (seeded on June 1, 2021):*

- EcoTea is plant beneficial microbes and was applied @ 4 g/kg seed.
- EcoTea appeared to increase grain yield of wheat (*AAC Wheatland*) and lower the grain yield of barley (*CDC Bow*). Soybean (*Bourke*) grain and canola (*BY6204TF*) seed yield wasn't affected by EcoTea.
- Averaged over EcoTea treatments, wheat (4.35 MT/ha) and barley (4.57 MT/ha) gave higher grain yield than soybean (3.20 MT/ha) and canola (2.39 MT/ha). Barley produced the highest straw yield (6.55 MT/ha); 1 MT/ha higher than that of wheat.
- Averaged over crops, EcoTea seed treatment didn't affect grain/seed, straw and biomass yields.

√*Effect of Seeding Dates and Rates on Borage:*

- Four seeding dates (May 14 to June 4 at weekly intervals) and three seeding rates (8, 12 and 16 kg/ha) were evaluated to find the optimum seeding date and rate.
- *Borage* was at peak flowering when it was hit by a killing frost on October 21. It seems that our growing season is too short for *Borage*.

## 2.4 Soil Health:

√*Effect of Crops and Cropping Systems on Soil Health:*

- Effect of 10 years old stand of alfalfa and Galega, 3 years alfalfa, 13 years and 3 years grass stands and 17 years of annual crops (mostly cereals) was studied on soil health through Vitellus Soil Health Test.
- Longer term alfalfa and Galega minimized the P (6 ppm) and K (58 ppm) contents of the soil. Longer term grass stand had low P (8 ppm), but good K (156 ppm) content in the soil. Long term annual cropping had a bit better P (12 ppm) and K (117) contents as compared to long term alfalfa and Galega.
- Organic matter (3.8 %) and pH (5.8) were lowest with annual cropping as compared to long term forage legumes or grasses cropping (organic matter 5.3-5.6 and pH 6.0-6.5).
- CEC was lower with long term forage legumes cultivation/or annual cropping (18.1-18.8) than with long term grasses stand (22.4).
- Nitrate N in the soil was the lowest (3 ppm) with the long term grasses stand and lower in long term alfalfa (8 ppm) than with Galega/or annual cropping (11 ppm).
- Solvita CO<sub>2</sub> carbon was lower with long term alfalfa (57 ppm) and annual cropping (55 ppm) than that with Galega/or long term grasses stand (82 ppm).
- Reactive carbon was highest (990 ppm) in long term Galega stands.
- Mineralizable N release was moderate in all crops/cropping systems though numerically highest in 3 years alfalfa (96 lbs/ac per year), higher with long term Galega and grasses stands (86 lbs/ac per year) than with long term alfalfa (70 lbs/ac per year) and annual cropping (68 lbs/ac per year).
- Soil Health Index was very low in long term alfalfa (23) and Galega (25) stands and low in other cropping systems (27-30).

## 2.5 Extension and Outreach:

LUARS, through its research, extension and outreach activities, have made a significant impact for the betterment of the agricultural industry particularly through ‘Crop Diversification’ and adoption of ‘Beneficial Nutrient Management Practices’. Area farmers continued to diversify their cropping systems, adding new crops/and varieties, clearing land and tile drainage. The impact of our Extension and Outreach activities could be seen in the form of favourable changes as follows:

- Thunder Bay Co-op brought in Truckloads of seeds (44 MT of CDC Bow barley, 15 MT of AB Cattelac barley, 430 bags of corn, and several bags of canola (L233P and L345PC). In addition, Thunder Bay Feeds also sold a lot of seeds and farmers directly procured Truckloads of Brandon wheat, Bono winter Rye and forage peas seeds from outside Thunder Bay.
- Ryan and Fritz Jaspers seeded 200 acres Brandon wheat (tested at LUARS), 270 acres under canola (largest canola acreage on a single farm), 125 acres corn under biodegradable plastic mulch, 120 acres Synasolis barley and nearly 100 acres each under alfalfa and grass hay. Jaspers created a new record by getting 2.5 MT grains/acre from their 200 acre Brandon wheat field grown after corn and canola. Wheat at LUARS was found to give higher yield after canola than after other crops! They recorded an average of 2.5 MT grain yield from barley, which is a pretty good yield and a lot of straw. Their average canola seed yield from 270 acres was 1.5 MT/acre (1.5 MT/acre from 90 acres direct seeded after alfalfa, 1.25 MT/acre from ~90 acres newly cleared field and 1.75 MT/acre from the rest of canola acres); 1.75 MT/acre canola seed yield is reasonably high!
- Gerrit Cramer got a record 3.5 MT/acre grain yield from Bono hybrid winter rye (tested at LUARS) from his 90 acres field. Cramer had applied ESN to winter rye in the seed row; a beneficial management practice tested at and recommended by LUARS. He also grew forage peas in over 50 acres.
- Allan and Henry Mol seeded winter wheat (cultivar AAC Gateway recommended by LUARS) and Sorghum Sudangrass (tested and demonstrated for good forage production at LUARS) in ~40 acres each for the first time and got good yields (nearly 2 MT/acre from winter wheat and 5 MT/acre each from the first and the second cut in Sorghum Sudangrass). Mols also grew AB Cattelac a new barley variety (tested at LUARS) for silage for the first time in 32 acres and got 250 MT (~8 MT/acre) forage production, which is quite high! They obtained 2.5 MT/acre grain yield from timely seeded CDC Bow barley in 65 acres and 2 MT/acre from late June seeded barley, which for late seeding is an excellent yield. Average corn forage yield from their 120 acres corn field was 18 MT/acre, which is very good. Their average canola seed yield from 65 acres field was 1.32 MT/ha.
- Richard Templeman grew Liberty canola for the first time in 90 acres and obtained 1.25 MT/acre seed yield. There is a dozen of canola growers (Ryan Jaspers, Mark Bolt, Joel/Mark Veurink, Ben Breukelman, Aaron Breukelman, Martin Schep, Jeff Schelhaas, Henry Streutker, Richard Tempelman, Gert Brekveld, Dennis Ellchook and Jeff Burke) in a 25 km radius from LUARS.
- Henry and Peter Aalbers grew winter rye in 11 acres (that produced 22 silage bales) and Sorghum Sudangrass in 14 acres (that yielded 70 silage bales) for the first time. Two more farmers, other than Aalbers and Mols that grew sorghum Sudangrass for the first time are Mike Huber and Bill Groenheide.
- Gert Brekveld first time grew AAC Wheatland, a high yielding Canadian Western Red Spring wheat variety, recommended by LUARS in 64 acres; 27 acres were combined with 1.8 MT grain yield/acre (highest wheat yield by Brekveld till date) and 37 acres were harvested for silage.
- Mark Bolt grew winter Triticale (successfully tried at LUARS) for the first time in ~40 acres.
- Fred Breukelman seeded 140 acres canola and obtained 1.4 MT seed yield/acre. He also grew 170 acres corn, 45 acres from which were combined for grain with a grain yield of 3.74 MT/acre (= 172 bu/acre).
- Ed Breukelman had seeded CDC Bow barley in 80 acres and got 2.1 MT/acre grain yield. He had seeded Hazlet winter rye in 50 acres that gave 2.2 MT grain yield/acre. His average seed yield from

80 acres Liberty canola was 1.4 MT/acre. He continued to grow corn under biodegradable plastic mulch.

- Bernie Kamphof seeded oats + tillage radish cover crop in 70 acres (direct seeded after barley), Gert Brekveld did that in 25 acres (15 acres on newly tiled drained land and 10 acres without tile drainage). Two other farmers that seeded oats + tillage radish cover crop are: Mike Huber and Timothy Janssens. Janssens grew it on sandy soil and the bison grazed it all. Darren Burgsteden seeded tillage radish (without oats) as a cover crop. Jeff Burke grew crimson clover as a cover crop. All these growers have seeded cover crop(s) for the first time!
- Jeff Burke grew Gehl hullless oats (tested at LUARS) for the first time this year in a few acres. He is planning to grow more next year for processing.
- Evan Grootenboer continued to grow fababeans (15 acres) for grains to feed his dairy cows. First timers to grow fababeans this year are Dan Matyasovszky (in ~40 acres) and Henry Streutker (in a few acres).
- Mark Veurink seeded 110 acres barley (grain yield 2.4 MT/acre), 100 acres Brandon wheat (grain yield 2.3 MT/acre), 85 acres Liberty canola (seed yield 1.5 MT/acre) and 150 acres silage corn (forage yield 15 MT/acre). Veurink also direct seeded AAC Gateway winter wheat this fall in 90 acres; 40 acres after alfalfa and 50 acres after silage corn. He had created a new record by getting a very high grain (2.8 MT/acre) and straw (6 large scale bales/acre) yield from winter wheat last year.
- Land clearing and tile drainage on farms continued!
- Farmers continued to use multiple sources of N (urea, ESN and ammonium sulphate) for crop production. Farmers are also applying ESN in the seed row; a practice recommended by LUARS. One producer applied ESN in seed row in over 600 acres for spring wheat, canola, barley, and corn production! Research at LUARS has proved that use of multiple sources of N instead of a single source was conducive to high yields.
- Inspired by research at TBARS/LUARS dairy farmers around Calgary continued to expand their acreage under MasterGraze corn. TBARS pioneered in research on MasterGraze corn that produces 8 MT dry matter yield/ha in 80 days. Its feeding to dairy cows improved milk yield by 3l/cow/day and butter fat yield from 3.93 % to 4.40 %.
- Richardson International Limited procured 9,400 MT grains/and seeds from local producers as at November 24, 2021 at a value of 4.7 million dollars from Thunder Bay and Rainy River Districts (up from ~3.8 million dollars last year); ~1,230 tonnes more will be received before the year end. I believe at least one more Grain Elevator procured grains from the area (volumes not known). This is in addition to some malting barley procured by the Canada Malting Company from our area.

*Thunder Bay remains the only place in Ontario, where Gehl (hullless oat) is grown!*

*Thunder Bay producers are continuing to renovate, expand/or make additions to their fields and dairy operations! Peter Aalbers put a new Robot Milk barn this year and Bernie Kamphof added a Robot to his new barn!*

**Dr. Tarlok Singh Sahota CCA  
Director LUARS Thunder Bay**

**November 30, 2021**

