Climate:

- Fall soil moisture measurements can be a good indicator of what soil moisture at seeding will be like.
- These are soil moisture measurements taken in the fall of 2018 and 2019
- Whereas Carman had approximately 25-50 mm of soil moisture in the 0-30cm depth in the fall of 2018, the same location had approximately 50-75 mm of soil moisture in the 0-30cm depth in the fall of 2019.
- We can see in these two figures that going into the 2020 field season there was likely higher soil moisture when compared to the 2019 field season

Climate:

- This graph shows 2019, 2020, and long-term total precipitation from April to August. In addition, it includes the 2019, 2020, and long-term mean temperature from April to August.
- The 2020 mean temperatures were generally warmer throughout the field season, when compared to the 2019 and long-term mean temperatures.
- What is especially important to note is the May and June precipitation. While May in both 2019 and 2020 had low levels of precipitation when compared to the long-term mean, the month of June in the 2020 field season had significantly more precipitation than the month of June in the 2019 growing season

Field Season Photos 1:

- What resulted were three very different growing environments
- The 2019 trial was marked by excellent establishment of peas, and excellent establishment of the barley crop, which is quite evident in the photo to the left.
- The early seeding 2020 trial was marked by good establishment of peas, but poor establishment of the barley crop
- Weed communities were similar in the 2019 trial and the early seeded 2020 trial. Common weeds were lamb's quarters, wild buckwheat, Canada thistle, and smart weed. The diversity in weeds is especially evident in the centre photo.
- The 2020 late seeding was different in that pea and barley establishment were both relatively good. However, in the 2020 late seeding the major weed was green foxtail, which you can see in the photo to the right essentially blanketed the entire trial

Field Season Photos 2:

- These are some photos of each trial mid-season
- Again, you can see the excellent establishment of the barley within the 2019 trial and the excellent establishment of green foxtail in the late seeded 2020 trial

- Unfortunately, both 2020 trials also suffered from grasshopper damage, which likely impacted grain yields

Results – Biomass at Maturity:

- These results represent treatment differences, across environments.
- The results show that the pea + high barley seeding rate of barley decreased average pea biomass by 25%.
- While, the pea + high barley seeding rate significantly reduced pea biomass, it also significantly reduced weed biomass by 44%.
- In addition, the pea + medium barley seeding rate significantly reduced weed biomass by 35%.
- Understandably, there were significant differences in barley biomass among treatments, because as you increase the seeding rate of barley, barley biomass will increase.
- What is also interesting is that there were no significant differences in total crop biomass among treatments. This indicates that while there was interspecific competition between the pea and barley crops, the overall net primary productivity was still similar across treatments

Photos at Harvest:

- Crops were harvest in early to mid-August each year
- Crops were separated using a dockage sorter
- We can see at harvest the higher density of mature barley plants in the 2019 trial when compared to the early seeded 2020 trial

Results – Grain yield:

- These results represent treatment differences, across environments. I have also included weed biomass results, as well.
- The results show that the pea + high barley seeding rate significantly reduced pea grain yield by 16%. So, by incorporating a high rate of barley into your pea crop, you may only reduce your pea grain yields by 16%, while potentially reducing weed biomass by 44%.
- Understandably, there were significant differences in barley grain yields among treatments, because as you increased the seeding rate of barley you should end up increasing your yield of barley.

Grain Yield Interactions:

- There were also significant environment*treatment interactions identified in the pea and barley grain yield results
- On the left we have pea grain yield results, clustered by environment. It is evident by the downward trend that the environment*treatment interaction is taking place in the 2019 trial. However, a similar downward trend is also taking place in the early seeded 2020 trial, as well.
- The 2019 pea grain results, likely occurred due to the lack of spring soil moisture and June precipitation, resulting in poor pea establishment, but excellent barley establishment. The increased barley establishment would have also decreased pea yields through competition.
- On the right we have the barley grain yield results, clustered by environment. These results almost mirror the pea grain yield results. So, where the environment was not conducive to optimal pea establishment and growth, we see greater barley yields and greater differences among treatments.
- On one hand you could look at these graphs and decide that when the companion crop in a pea-intercrop has optimal conditions it may result in greater reductions in pea grain yield.
- But you could also look at these graphs and believe that when environmental conditions are not optimal for pea establishment and growth, a companion crop like barley may be able to fill that void, generate a marketable product, while also suppressing weeds.