forage. The forage crop may be swathed or directly grazed for biomass harvest. The assessment of dual-purpose winter canola (canolage) has largely utilized swathing or mowing to 'simulate grazing'. However, the impacts of swathing are likely different than the impacts of grazing on the seed yield. From 2017 to 2020 we conducted three canolage trial involving live cattle rather than swathing. We believe these results are useful in understanding the impacts of grazing on yield as well as the potential for widespread canolage production in the inland Pacific Northwest. At two different locations and years, Dusty (2017) and Creston (2019), canola seeded in July successfully survived the winter and was harvested the following year. In Dusty during 2017, the severity of grazing was found to decrease canola seed yield (Table). At Dusty in 2018, the canola was seeded in May in the hopes of allowing for two grazing events. The early seeding ended with a killing drought in the fall of 2018 in the ungrazed canola and drought that reduced seed yields to 700 lbs/acre in the grazed canola. The fact that the grazed canola did not completely succumb to drought, while the ungrazed canola did, indicates that grazing had the effect of reducing water usage. Soil moisture probes supported this conclusion as the canola that was grazed had reduced fall moisture usage when compared with the ungrazed canola. The best approach to dual-purpose winter canola in the inland Pacific Northwest appears to be an early July planting and an August or September grazing. Future research will continue to assess the impacts of grazing on winter survival and seed yield in an attempt to optimize canolage production systems in the region.

| | Treatments | Yield (lbs/a) | Grazing pressure |
|---|---|---|---|
| Dusty* 2017-2018 | Pasture 1 | 2460 | Heavy |
| | Pasture 2 | 2140 | Severe |
| | Pasture 3 | 3320 | Light |
| | Ungrazed | 3380 | None |
| Dusty** 2019-2020 | Grazed | 700 | Severe |
| | Ungrazed | 0 | None |
| Creston*** | Grazed | 1820 | Heavy |
| | Ungrazed | 2840 | None |

*No replication

**May planting resulted in drought

***Replicated strips w/ commercial combine

## Peaola Yield and Land Equivalence Ratio Experiments

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Peaola is the practice of inter cropping peas and canola in the same field at the same time. Intercropping is a common practice in many subsistence systems around the world but is not common in large scale commodity production in industrial agriculture. In recent years there has been a growing interest in the potential for oilseed legume intercropping in industrial agriculture. Research has been conducted in both Australia and Canada and found that legume-brassica systems have the potential to outperform the monoculture comparisons. Beginning in the fall of 2019 the researchers at WSU began establishing pea-canola (peaola) intercropping trials in the grain fallow region of E. Washington. An attempt to establish winter peaola was made at both Ralston and Davenport. However, due to low moisture only the site at Davenport was successfully established. The Davenport site consisted of three N fertilizer rates 0, 30, and 60 lbs/acre. In the spring of 2020 a single spring peaola trial was established near Colfax. At the Colfax site only one fertilizer rate was applied to the peaola. In order to compare intercropping systems to monoculture systems the land equivalence ratio (LER) is calculated. The land equivalence ratio is calculated by summing the relative yields of whatever crops are mixed into the intercrop. The relative yields are calculated using the following equations Relative Pea Yield = Intercropping Pea Yield / Monoculture Pea Yield and Relative Canola Yield = Intercropping Canola Yield / Monoculture Canola Yield. LER can be thought of as an index of over yielding on a per acre basis. When calculating the LER the monocultures of both crops will always have a value = 1. In the Davenport and Colfax locations the LER of the peaola was found to be significantly greater than the control monoculture treatments (Table 1). While the LER is a useful tool for determining the overall over yielding, it does not capture the full picture. Another consideration is the relative yield of the peas and the canola as the price differentials between canola and peas may be great. A comparison of the relative yields shows whether the system is biased to a higher proportion of peas or canola (Fig. 1). The results from Davenport and Colfax show that the system is biased towards canola. With canola being a more marketable crop in the current economic state, we find this encouraging. While yields were quite low at Colfax due to insect damage and shattering loss, the increased LER from peaola was still encouraging. The first year of data from this study has been profitable for increasing our understanding of the potential for peaola in eastern Washington. Future research will focus on stand establishment, fertilizer rates, and insect ecology in peaola systems.

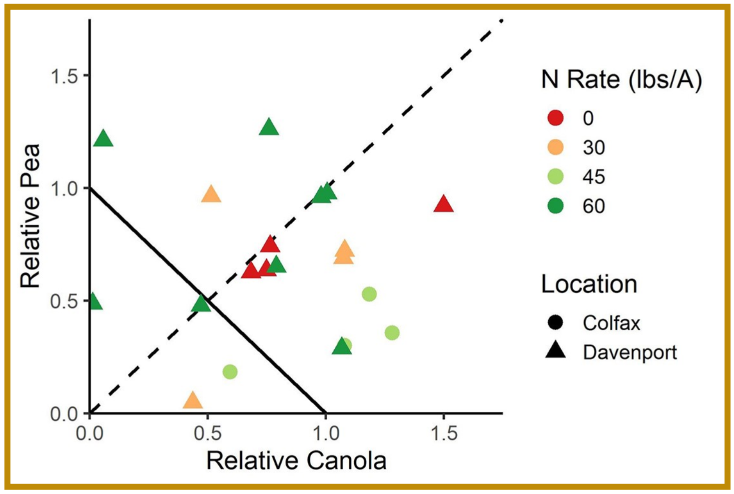


**Figure 1. Relative pea vs. relative canola yield from peaola trials conducted harvested in 2020. Trials conducted at the Colfax location were spring seeded, while the trial conducted at Davenport were fall seeded. All points to the right and above the solid line have a cumulative LER of above 1. The points to the left and above the dashed line favor a higher proportion of peas relative to the control, and the point to the right and below the line favor a higher proportion of canola relative to the control. No significant trend in LER, relative pea, or canola yield was found based on N rate.**

**Summary of LER Table 1**

| | | |
|---|---|---|
| Peaola | 1.46 | a |
| Canola | 1.00 | b |
| Pea | 1.00 | b |
| CV | 33.50% | |

| Location | Crop System | N Rate (lbs/A) | Canola | Peas | LER |
|---|---|---|---|---|---|
| Colfax | Canola | 90 | 694 | 0 | 1.00 |
| Colfax | Pea | 0 | 0 | 1273 | 1.00 |
| Colfax | Peaola | 45 | 718 | 436 | 1.38 |
| Davenport | Canola | 60 | 1960 | 0 | 1.00 |
| Davenport | Pea | 0 | 0 | 2455 | 1.00 |
| Davenport | Peaola | 0 | 1810 | 1794 | 1.65 |
| Davenport | Peaola | 30 | 1520 | 1487 | 1.38 |
| Davenport | Peaola | 60 | 1259 | 1938 | 1.43 |
| Significance | | | | | |
| Location | | | *** | *** | ns |
| Cropping System | | | *** | *** | * |
| N Rate | | | . | ns | ns |
| Location X Cropping System | | | ns | . | ns |