Perennial Cereal Grain Crop Trial

Note: This project is funded by RDAR and managed by Chelsey Hostetler of the Peace Country Beef and Forage Association

Background

Perennial cereal grain crops (PCGC) are grain crops that live and remain productive in the field for more than two growing seasons. Unlike most annual crops or grains, PCGCs have multi-year grain production, have no annual tillage, seed, and seeding costs, provide excellent weed control, and can also be used for forage. PCGCs can considerably increase the flexibility and profitability of mixed farming enterprises because of their ability to produce forage and grain, hence the term dual-purpose PCGC.

CARA is taking part in a study testing the resiliency and productivity of two PCGCs: ACE-1 and Kernza®. ACE-1 perennial rye was developed by Agri-Food Canada Research Centre in Lethbridge for silage and greenfeed. ACE-1 typically establishes quickly and competes well with weeds. It was found to produce more biomass than barley and fall rye, with a forage quality similar to barley. A drawback is that it has shown to produce less seed than high yielding fall rye, however improvement through breeding continues.

Kernza® is the name given to a grain of an intermediate wheatgrass currently under development at The Land Institute, located in Kansas. This perennial wheat has a number of ecological benefits and economic value as observed in good growing conditions, the seed heads can contain more seeds than annual wheat varieties. Roots of Kernza® have extended 10 feet or more where atmospheric carbon is delivered and there is efficient uptake of nutrients and water. It is a dual-purpose crop where American farmers have grazed the remaining leaves and stems following combine harvest of the grain.

Along with testing the grain and forage yields of both ACE-1 and Kernza® monocrops, we are also looking at PCGC/legume intercropping to observe soil health benefits and the reduction of annual fertility and production costs. The legumes used in this project are sainfoin, alfalfa and white clover.

To gain a good understanding of the establishment and viability of these PCGCs and intercropping effects, the Peace Country Beef and Forage Association (PCBFA) is leading a project involving 6 regional sites. CARA manages one of these sites, as well as Gateway Research Organization (GRO) at Westlock, Battle River Research Group at Forestburg, MacKenzie Applied Research Association (MARA) at Fort Vermillion and the University of Alberta at Breton.

Testing PCGCs under different climatic and soil conditions across the province will help determine the benefits of including these crops as part of crop rotations. Although dry conditions are apparent throughout the province, each partner group has established their sites and will be able to collect data for the next 3 years of the project.

Objectives

1. Evaluate establishment of perennial wheat and ryegrass varieties.
2. Determine appropriate seeding rates and methods (same or alternate row seeding) for PCGC/legume intercropping.
3. Provide yield and quality data from small plot replicated trials, including intercropping systems of PCGCs with alfalfa, white clover and sainfoin.
4. Evaluate specific soil chemical, physical and biological characteristics under different management options of perennial cereal wheat and ryegrass production
5. Determine the production costs and profitability and examine the production risks associated with the different treatments.

Observations:

Establishment at CARA's site has been challenged by drought conditions, herbicide resistant kochia and road construction. The trial was initially seeded at Madge Farms in 2022 but because of poor establishment was re-seeded at the J. Kuhn site in May of 2023.

After a dismal start to the trial in 2022 and the loss of the site due to road construction, the 2023 PCGC trial hosted by CARA did not fare much better. Crop emergence was delayed by insufficient moisture conditions following seeding, allowing for weed pressure. June was also a very hot month in the south of the province, reducing herbicide efficacy and resulting in the plots requiring hand weeding. Despite the adverse conditions, the perennial wheat and rye managed to germinate, whereas most of the legumes failed to emerge. On top of the poor climactic conditions of 2023, the site was challenged by enormous grasshopper numbers (considerable acres of crop across the region was negatively impacted). Two insecticide applications were made at the trial site, with limited impact on the infestation. Moisture conditions through the growing season did not improve, with only 50.6 mm (1.99") falling on the trial between the June 6 seeding date and August 31. The rainfall events never exceeded 10 mm (4/10") meaning much of the rain that did fall in likely did not reach the plant roots in the already dry soil.

ACE-1 Perennial Rye

Kernza Wheat

ACE Rye and Sainfoin Same Row Legume (no legume establishment)

ACE Rye and Alternate Row Legume (no legume establishment)