



**Applied Forage & Cow-Calf Research Lardner Lab**

**FACT SHEET  
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# **CHOOSING THE RIGHT FORAGE FOR GRAZING: LEGUMES, GRASSES, AND MIXTURES COMPARED IN WESTERN CANADA**

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## **Introduction**

Perennial forages are important for beef cattle production in western Canada because they provide low-cost feed and make use of land unsuitable for annual crops. Producers often use legume-grass mixtures because they can produce high forage yields and tolerate changing weather conditions better than monocultures (Peprah et al., 2021). Since forage stands are expected to last many years, selecting productive and persistent forage varieties is important for maintaining profitability in cow-calf operations. However, most forage varieties are tested using small plot harvest methods rather than grazing animals, which may not reflect real pasture conditions. Cattle also prefer some forage species over others (Damiran et al., 2003), which can affect pasture use and animal performance. This study evaluated cool-season forage monocultures and mixtures under intensive grazing to measure forage yield, nutritive value, botanical composition, and grazing preference.

## **Study Site and Management**

The study was conducted from 2019 to 2021 at the Livestock and Forage Centre of Excellence Cow-Calf Teaching Unit near Clavet, Saskatchewan. The site is in the Dark Brown Soil zone of Saskatchewan. Before the study began, the land had been used for annual crop production. In spring 2018, weeds were controlled using glyphosate herbicide, and barley was seeded as a cover crop along with nitrogen fertilizer. The barley was harvested as greenfeed in August 2018.

After harvest, perennial forage treatments were seeded using recommended seeding rates for the region. Treatments included 3 alfalfa varieties (3006, 3006ALF; Cronus, CronusALF; and Foothold, FootholdALF), sainfoin (SF, var. AC Mountainview), meadow brome grass (MBG, var. AC Armada), orchardgrass (OG, var. Killarney), and 8 legume-grass mixtures (3006ALF-OG, 3006ALF-MBG, CronusALF-OG, CronusALF-MBG, FootholdALF-OG, FootholdALF-MBG, SF-OG, and SF-MBG). Plots were arranged in randomized blocks to compare forage performance under the same growing conditions.



### **Grazing Management**

Yearling beef steers were used for grazing trials from 2019 to 2021. Steers were weighed at the beginning and end of each grazing period and evenly assigned to paddocks based on body weight. Grazing periods lasted 9 to 20 days, depending on forage availability and weather conditions, from June through September. During dry conditions in 2019, stocking density was increased after preference measurements to ensure more uniform grazing. In all years, cattle grazed the forages to about a 5 cm stubble height.

### **Forage Yield and Botanical Composition**

Forage yield was measured before each grazing period to estimate the amount of feed available for cattle. In each treatment plot, four small sample areas were clipped to a 5 cm stubble height. Samples were separated by plant type, including grass, legume, and other plant material, weighed and dried to determine dry matter yield and the proportion of each forage species present in the stand.

Botanical composition was calculated based on the dry weight of each plant component within the sample area. Total forage yield was determined by combining the weight of all aboveground plant material collected from each plot and expressing it as lb of dry matter per acre. After separation, forage samples from each treatment were combined, ground, and prepared for laboratory analysis to evaluate forage quality.

### **Grazing Preference**

Three large paddocks (8.7 acres each) were divided into 14 forage treatment plots that were randomly arranged. The outside of each paddock was fenced, but no fences separated the forage plots so cattle could graze freely across treatments. Grazing preference (GP) was measured by counting cattle grazing in each treatment using visual and drone observations. Grazing preference percentage was calculated as the proportion (%) of animals grazing each forage type during scans [GP, % = (animal number each treatment/all animal number)/100%].

## **Results and Discussion**

### **Weather**

The study was conducted under mostly normal temperatures but drier than average conditions, including drought periods that likely affected forage growth and productivity.

### **Maturity Staging**

Forage maturity affects quality and grazing value. Legumes (alfalfa and sainfoin) progressed from early bud to flowering stages, while grasses ranged from vegetative to reproductive stages across grazing periods and years. These maturity differences influence forage availability, digestibility, and animal performance, highlighting the importance of timing grazing to optimize productivity (for details see Sim et al., 2024).

### **Forage Production and Composition**



Forage production was strongly influenced by dry weather conditions and differences among forage species (see Sim et al., 2024). Alfalfa monocultures, particularly 3006ALF, consistently produced the highest forage yields, while orchardgrass produced the lowest yields (**Table 1**). Meadow brome grass generally outperformed orchardgrass because it recovered better after grazing and persisted longer under dry conditions. Sainfoin provided moderate yields and good forage quality, but its persistence was lower, especially under intensive grazing. Grass-legume mixtures often produced similar yields to grass monocultures, but lower yields than pure alfalfa stands because the legume portion in mixtures was relatively low. Orchardgrass declined over time due to drought stress and poor regrowth after grazing, whereas meadow brome grass increased in persistence because of its strong regrowth ability. Weather conditions also affected production, with lower yields observed during dry periods and better forage growth following above-average rainfall. Overall, the results suggest that alfalfa and meadow brome grass are better adapted to dry grazing conditions in Saskatchewan than orchardgrass or sainfoin, and that selecting persistent forage species is important for maintaining productivity in drought-prone environments.

**Table 1.** Pre-graze forage yield

| Treatment <sup>1</sup> | Total DMY, lb/ac | DMY by Species, lb/ac |        |                     |
|------------------------|------------------|-----------------------|--------|---------------------|
|                        |                  | Grass                 | Legume | Others <sup>2</sup> |
| 3006ALF                | 2,092            | –                     | 1,904  | 188                 |
| 3006ALF-OG             | 1,141            | 488                   | 650    | 3                   |
| 3006ALF-MBG            | 1,214            | 946                   | 268    | 0                   |
| CronusALF              | 1,690            | –                     | 1,405  | 285                 |
| CronusALF-OG           | 1,136            | 531                   | 563    | 42                  |
| CronusALF-MBG          | 1,312            | 1,103                 | 190    | 20                  |
| FootholdALF            | 1,845            | –                     | 1,604  | 241                 |
| FootholdALF-OG         | 1,098            | 515                   | 579    | 4                   |
| FootholdALF-MBG        | 1,169            | 967                   | 172    | 30                  |
| SF                     | 1,363            | –                     | 1,023  | 340                 |
| SF-OG                  | 814              | 458                   | 343    | 14                  |
| SF-MBG                 | 1,188            | 968                   | 178    | 42                  |
| OG                     | 642              | 614                   | –      | 29                  |
| MBG                    | 1,355            | 1,264                 | –      | 91                  |

<sup>1</sup>3006ALF, Alfalfa var. 3006; CronusALF, alfalfa var. Cronus; FootholdALF, alfalfa var. Foothold; SF, sainfoin var. AC Mountainview; MBG, meadow brome grass var. AC Armada; OG, orchardgrass var. Killarney.  
<sup>2</sup>Other species include any non-seeded plants such as redroot pigweed and foxtail barley (weeds).

### Forage Quality

Forage quality varied among the different forage species and mixtures (**Table 2**). Alfalfa, especially 3006 and Foothold varieties, produced the highest protein and best overall feed quality. Sainfoin also provided high-quality forage with good energy value. Orchardgrass generally had better nutritional value than meadow brome grass, while meadow brome grass had higher fiber and lower digestibility. Mixtures with a greater proportion of legumes had higher protein and energy content than grass-dominant mixtures. Overall, alfalfa-based forages provided the most nutritious feed under Saskatchewan's dry grazing conditions.



## Grazing Preference

Steers consistently favored legume forages such as alfalfa (GP = 9.5 to 10.1%) and sainfoin (GP = 8.0%) over grasses. Legume monocultures were most preferred because they generally produced higher yields, better nutritional value, and lower fiber content (**Table 2**). Legume-grass mixtures were moderately preferred, while pure grass stands, especially orchardgrass, were least preferred (GP = 5.1%).

Interestingly, cattle selected sainfoin even when it was more mature, suggesting that factors beyond plant maturity influence grazing behavior (Damiran et al., 2003). The relationship between forage quality and cattle preference was relatively weak, indicating that animals do not base their choices solely on nutrient content.

Grazing preferences also varied slightly across years and grazing periods. Importantly, mixing legume with grass can help reduce the risk of bloat, a digestive disorder. No bloat cases were observed in this study, likely due to effective grazing management practices.

**Table 2.** Forage chemical composition and preference

| Treatment <sup>1</sup> | CP, %DM | TDN, %DM | GP <sup>2</sup> , % |
|------------------------|---------|----------|---------------------|
| 3006ALF                | 17      | 61.2     | 10.1                |
| 3006ALF-OG             | 12.7    | 60.6     | 6.4                 |
| 3006ALF-MBG            | 9.7     | 58.7     | 5.4                 |
| CronusALF              | 14.8    | 60.8     | 9.5                 |
| CronusALF-OG           | 13.3    | 60.8     | 5.4                 |
| CronusALF-MBG          | 11.4    | 59.9     | 8.3                 |
| FootholdALF            | 16.8    | 62.6     | 10.5                |
| FootholdALF-OG         | 12.6    | 61.5     | 5.6                 |
| FootholdALF-MBG        | 9.7     | 59.7     | 7.5                 |
| SF                     | 12.7    | 63.0     | 8.0                 |
| SF-OG                  | 11.5    | 61.5     | 5.9                 |
| SF-MBG                 | 9.0     | 59.9     | 5.7                 |
| OG                     | 10.1    | 59.8     | 5.1                 |
| MBG                    | 8.2     | 58.6     | 6.5                 |

<sup>1</sup>3006ALF, Alfalfa var. 3006; CronusALF, alfalfa var. Cronus; FootholdALF, alfalfa var. Foothold; SF, sainfoin var. AC Mountainview; MBG, meadow bromegrass var. AC Armada; OG, orchardgrass var. Killarney.

<sup>2</sup>Grazing preference was calculated as the proportion of animals actively grazing a given treatment (0% = no preference (no animals); 100% = maximum or all animals observed at the treatment).

## Implications

Alfalfa-based systems are the most attractive to cattle and may support better grazing efficiency in intensive systems. Meadow bromegrass is a more reliable grass option than orchardgrass under grazing pressure. Sainfoin may still be useful for forage quality but is less suitable where yield and persistence are priorities, especially in dry conditions.

## References

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