



Alternatives to timothy grown in mixture with alfalfa in Quebec

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CONTEXT

- The main grass associated with alfalfa, in Quebec, is timothy, although it has a limited regrowth potential under drought conditions.
- An increase in temperature and moisture stress is predicted with climate change.
- The warmer and dryer summers could negatively affect the productivity and persistence of timothy.

APPROACH

Objective

Measure the potential of five grasses as alternatives to timothy at three contrasted sites in Quebec:



- ★ = Normandin
- ★ = St-Augustin-de-Desmaures
- ★ = Ste-Anne-de-Bellevue

Methodology

→ Six binary mixtures of alfalfa (cv. Calypso) and:

Grasses	
Timothy (cv. AC Alliance)	Festulolium (cv. Spring Green)
Tall fescue (cv. Carnival)	Perennial ryegrass (cv. Remington)
Meadow fescue (common seed)	Meadow brome (cv. Fleet)

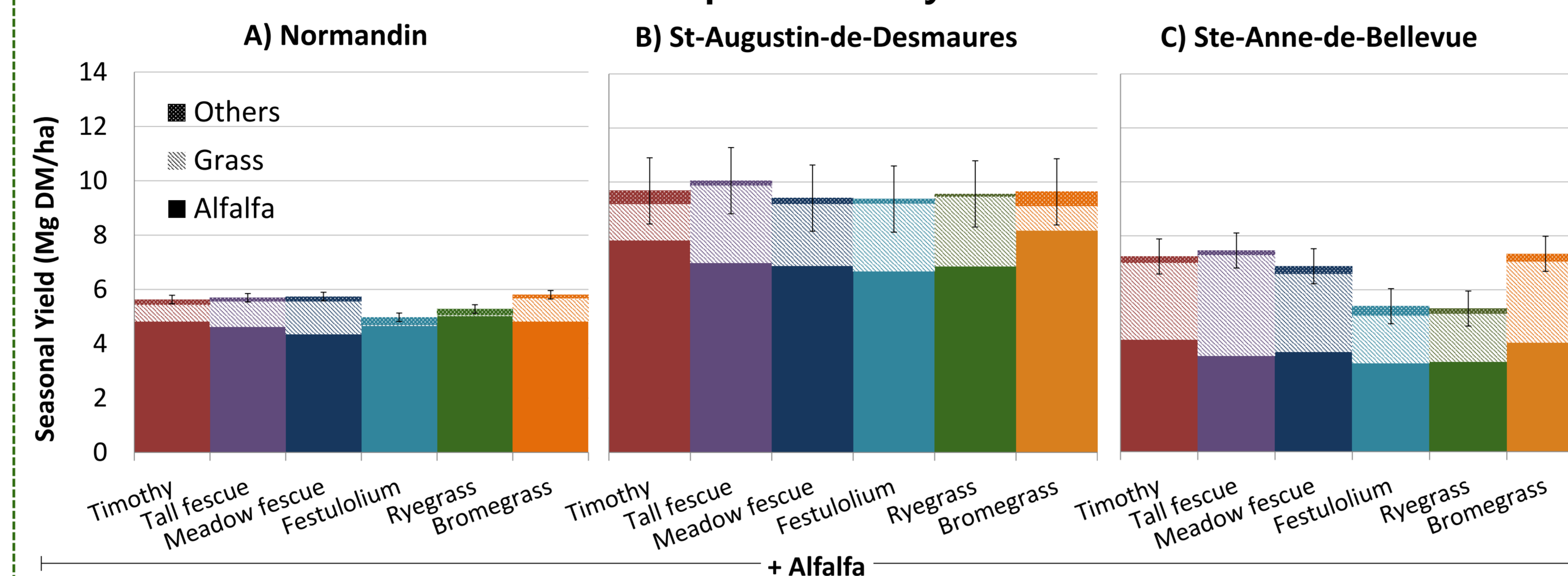
- Two developmental stages at harvest: early bud and early flower of alfalfa.
- Three production years: 2015, 2016 and 2017.
- Two to four harvests per year.



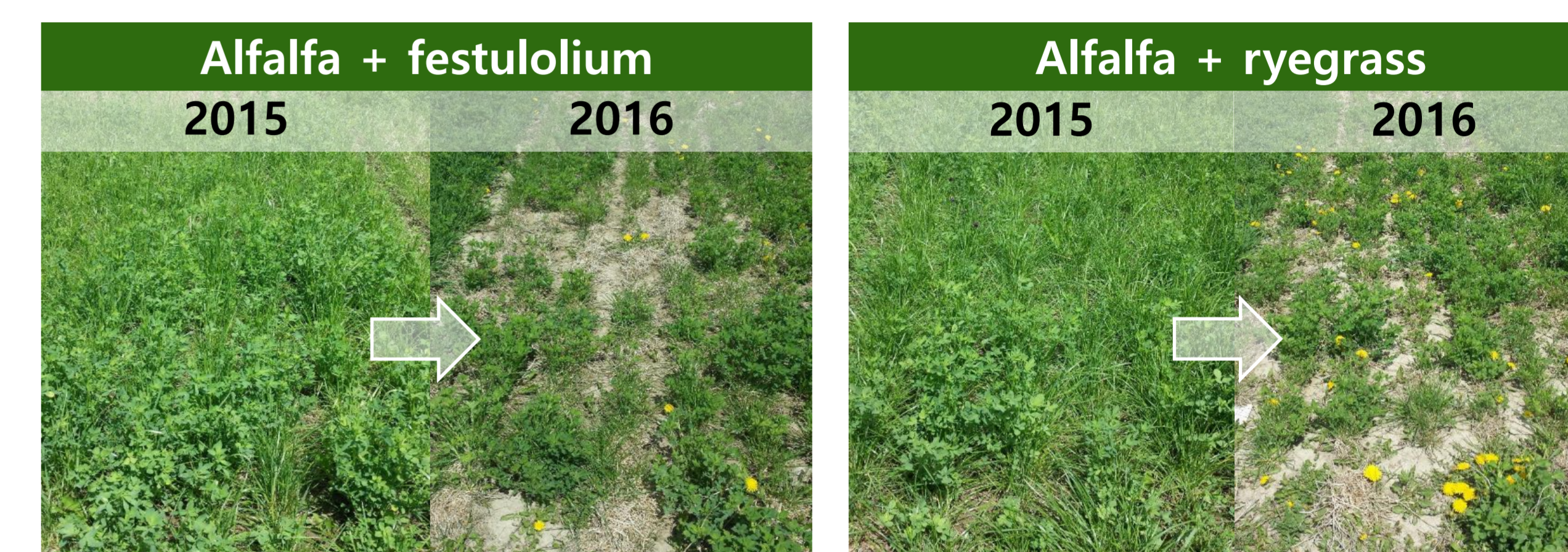
- Parameters measured
 - Dry matter (DM) yield.
 - Yield contribution of alfalfa, grasses and other species.
 - Crude protein, ADF, NDF, and total digestible nutrients contents.
 - *In vitro* digestibility of the dry matter (IVTD) and NDF (NDFd).
 - Estimated milk production per hectare (calculated from the DM yield, net energy of lactation, NDF, and NDFd).

RESULTS

Average seasonal yield of six alfalfa-grass binary mixtures for the first three production years.



Decrease in grass contribution in two mixtures between 2015 and 2016 at Ste-Anne-de-Bellevue.



Average seasonal yield of the mixtures (first 3 production years)

- At St-Augustin-de-Desmaures, the 6 mixtures had similar seasonal yields.
- At Normandin and Ste-Anne-de-Bellevue, yields for the mixtures with tall fescue, meadow fescue and meadow bromegrass were similar to that of the alfalfa-timothy mixture.
- Grass yield in the alfalfa-tall fescue mixture was similar to that of timothy, at St-Augustin-de-Desmaures and Ste-Anne-de-Bellevue.

- Mixtures with festulolium and perennial ryegrass had lower seasonal yields to the alfalfa-timothy mixture at Ste-Anne-de-Bellevue.
- The yield contribution of these two grasses was close to zero at Normandin.
- These two later sites have experienced particularly extreme winter conditions.
- **These results confirm the winter susceptibility of the festulolium and perennial ryegrass cultivars used in the project.**

Nutritive value of the mixtures (first 2 production years)

- None of the mixtures had a consistently greater or lower nutritive value than the alfalfa-timothy mixture (3 sites).
- Mixtures with festulolium and perennial ryegrass were sometimes associated with an lower estimated milk production per hectare of forage (Normandin and Ste-Anne-de-Bellevue).
- The other mixtures were associated with an estimated milk production per hectare that was comparable to the alfalfa-timothy mixture (3 sites).
- **The estimated milk production per hectare for the six mixtures follows a similar trend to seasonal yield.**

Effects of the developmental stages

- The seasonal yield was similar or greater when mixtures were harvested at the early flower stage of alfalfa (vs. early bud stage).
- The difference in yield between the two stages generally became more pronounced in the second and third production years.
- Forages harvested at the early flower stage had a lower nutritive value than those harvested at the early bud stage. They were, however, associated with a similar or greater estimated milk production per hectare.
- **Harvesting at the early flower stage of alfalfa seem to promote yield, persistence and estimated milk production.**

CONCLUSIONS

- None of the evaluated mixtures outperformed the alfalfa-timothy mixture in terms of seasonal yield and estimated milk production per hectare.
- Tall fescue, meadow fescue and meadow bromegrass seem to be potential alternatives in our current climatic context. In contrast, festulolium and perennial ryegrass did not perform well at two of the three sites.
- Results from a third production year for the nutritive value will allow us to finalize the identification of grasses that can preferentially be grown in mixture with alfalfa dairy producers in Quebec.

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