Agriculture et Agroalimentaire Canada

## **Forage Research**

Quebec Research and Development Centre, Agriculture and Agri-Food Canada, Québec, QC.







# **Quebec Research and Development Centre**



# Forage expertise



### **Genetic : Annie Claessens**

To identify **new breeding criteria** and **methodologies** to develop better **cultivars** 



### **Biochemistry : Annick Bertrand**

To use **physiological and biochemical** approaches to modulate the response of perennial forages to abiotic stresses and improve their nutritional value



### Molecular biology : Solen Rocher

To develop **molecular genetics tools** and techniques to support the perennial forage breeding program



### **Phytopathology : Patrice Audy**

To improve **resistance to diseases** by the use of modern molecular approaches

# Forage expertise



#### Nutritive value : Gaëtan Tremblay

To improve **nutritional value** of forage through management practices (choice of species and cultivars, cultural practices, harvest and storage)



### Ecophysiology and agronomy : Marie-Noelle Thivierge

To quantify **ecosystem services** provided by perennial forages; to optimize their yield and persistence through management practices and to increase **plant nutrient use efficiency** 



#### Agro-ecosystem modeling : Guillaume Jego

To develop and use agroecosystem **simulation models** to study interactions between agricultural production and environmental impacts



#### **Crop management : Julie Lajeunesse**

To assess and to promote the **agronomic potential** of perennial forage, biomass and berry crops.

## Mandate

To increase the place of perennial forages in cropping systems and to promote their use by ruminants, while lowering their production cost and environmental impact



## Projects

Leading 8 projects on forages Collaborating to more than 10 projects on forages

# Breeding alfalfa for freezing tolerance

Context

• The short-term persistence of alfalfa in Canada is largely attributable to its insufficient freezing tolerance. The development of winter hardy cultivars within field nurseries his a long, costly, and highly unpredictable process.

Objectives

- To develop and evaluate a faster and more repeatable approach under controlled conditions to incorporate freezing tolerance into cultivars with high agronomic value
- Identify molecular markers that are associated with the level of freezing tolerance Outcomes
- Make new cultivars of alfalfa with increased freezing tolerance commercially available to Canadian beef and dairy producers

Breeding alfalfa for lower fall dormancy and greater winter hardiness

Context

- To extend the grazing season and increase the hay supply, beef producers in the North Western prairies require alfalfa cultivars with greater winter hardiness AND late season yield.
- Winter hardiness in alfalfa is associated with early-season dormancy and reduced late-summer growth.

Objectives

• To select, through an improved indoor recurrent selection method, and field-test genotypes with enhanced fall growth (reduced fall dormancy) and winter hardiness suitable for dormancy region 1 and 2

Outcomes

• Development of winter-hardy cultivars with late season yield adapted for grazing

# Breeding alfalfa for high energy

Context

- When fed to cow, high energy forages promote a better use of nitrogen (N), leading to greater milk and milk fat productions and reducing N loss in environment.
- Breeding for high energy in forages is difficult because sugar concentration in the plant is strongly influenced by environmental conditions and plant development stages

Objectives

 To identify and test a new reliable selection trait less dependant on environmental conditions to develop alfalfa with high energy content (mono-, diand oligo-saccharides, starch and pectin)

Outcomes

• Development of new alfalfa genetic material for beef and milk productions

# Rhizobium for non-bloating legumes

Context

- **Rhizobium** have the capacity to fix atmospheric nitrogen (N) in a form available for the plant thus increasing the yield without additional input
- There is currently no rhizobium to inoculate **sainfoin, red clover, birdsfoot trefoil, and alsike clover** in Canada.

Objectives

• To identify cold-efficient rhizobia strains that nodulate these non-bloating legume species in pastures

Outcomes

 Make promising strains of rhizobia commercially available to Canadian beef and dairy producers

# Evaluation of highly digestible alfalfa cultivars

### Context

- Several alfalfa cultivars or populations were selected for increased digestibility.
- Productivity and nutritive value of these highly digestible alfalfa cultivars have not been tested under the climatic conditions of Quebec.

## Objectives

• To assess the value, in terms of agronomic and economic performances, of using highly digestible alfalfa cultivars on dairy farms in Quebec.

### Outcomes

• To determine whether the adoption of a highly digestible alfalfa is beneficial to dairy farms in Quebec's agricultural context (guideline for adoption...).

# Root traits of perennial forage mixtures

Context

- Root traits of perennial forage species are known to express seasonal patterns and to be affected by N fertilization and defoliation.
- The influence of these factors is still poorly understood, especially in forage mixtures.

Objectives

• To monitor root traits of perennial forage mixtures subjected to defoliation and different N sources during successive growing seasons.

Outcomes

• To obtain better insights into root contribution to soil organic carbon

Management practices to increase forage yield and alfalfa persistence in mixtures

Context

- Adding grasses to legumes crop are a promising way to increase annual forage yield, to reduce weed prevalence, and even to improve legume persistence under difficult winter conditions.
- Seeding an annual companion crop at establishment of perennial forage mixtures have positive effects on weed control and forage yield

Objectives

 To assess the effect of management practices such as adding grasses and/or companion crop to an alfalfa-timothy mixture on crop yields and alfalfa persistence

### Outcomes

To identify better forage management practices to improve alfalfa establishment and alfalfa-based forage yield, and improve our knowledge on alfalfa-based mixtures and companion crops (or To provide recommendations for beef producers on management practice improving alfalfa establishment and alfalfa-based forage yield)





