

IMPROVING NITROGEN (N) MANAGEMENT IN CREEPING RED FESCUE SEED PRODUCTION IN THE PEACE RIVER REGION

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The Peace River region is at the heart of Canada's turf and forage seed industry. In 2024, the region produced approximately 14,742 metric tonnes of grass and legume seed, with grass seed accounting for 92% of total production. Among grass seed crops, creeping red fescue accounted for the largest share (53.1%), with approximately 7,228 metric tonnes of seed produced (Yoder & Gauthier, 2025). The Peace River region also accounts for approximately 99% of Canada's creeping red fescue seed production (Fairey, 2006; Wong, 2020). These numbers demonstrate the importance of creeping red fescue to the regional turf seed industry and the need to continually refine management practices that maintain seed yield while improving production efficiency.

The challenge of perennial grass and legume seed production

Creeping red fescue differs from many annual crops because producers do not receive a seed harvest during the establishment year. When a field is seeded in spring, growers invest in establishing and managing the crop and then have to wait until the following growing season for the first seed harvest.

Weather adds another layer of uncertainty. Precipitation in the Peace River region can be and have been highly variable, and the effects of moisture conditions during the growing season and fall can carry over into the next. Fall is a crucial period for creeping red fescue seed production because many of the physiological processes that determine the following year's seed yield begin during this period. As temperatures decline and day length shortens, the crop transitions from vegetative growth toward reproductive development. During the fall, tillers become established and undergo the developmental changes necessary for flowering and seed production in the following growing season. Therefore, crop condition and nutrient availability during this period can have important consequences for subsequent seed yield. The dry conditions experienced during the 2025 growing season, followed by limited fall precipitation, provided a clear example of the challenges faced by the creeping red fescue seed crop. Field observations during the 2026 season suggested that these conditions affected crop growth and subsequent seed yield.

From a producer's perspective, these challenges are crucial. Unlike annual crops such as canola, perennial grass and legume seed production requires a longer-term commitment. Despite these challenges, perennial grass and legume seed production remains an integral component of cropping systems in the Peace River region. Therefore, researchers and producers must continue working

together to refine management practices that improve production efficiency, and maintain the profitability of perennial grass and legume seed production.

Working together for better perennial grass seed production

The Integrated Forage Crop Management Program at Agriculture and Agri-Food Canada's Beaverlodge Research Farm has a long history of working with producers and grass seed industry to improve seed yield and quality in the Peace River region. This work involves collaboration with universities, industry stakeholders, producers and applied research organizations such as the Peace Region Forage Seed Association (PRFSA) and SARDA Ag Research.

Among the many research projects underway at the Beaverlodge Research Farm, I am conducting my M.Sc. research on N dynamics in creeping red fescue seed production. This research is being conducted under the supervision of Dr. Nityananda Khanal, Forage Scientist at Agriculture and Agri-Food Canada's Beaverlodge Research Farm, and Prof. Dr. Scott Chang at the University of Alberta.

Our research focuses on comparing N applied at different times - early fall, mid-fall and late fall of the establishment year, as well as early spring of the following production year - to determine how application timing affects crop growth, N uptake and seed productivity.

However, understanding fertilizer efficiency requires looking beyond seed yield alone.

Following N through the cropping system

N entering an agricultural field does not necessarily end up in the harvested crop. Some is taken up by plants, some remains in the soil and some can leave the cropping system through different pathways. For this reason, our research takes a whole-system approach to N management. We are tracking major N inputs, including fertilizer and atmospheric N deposited through rain and snow. At the same time, we are measuring important pathways through which N can be lost from the cropping system, including nitrous oxide emissions, ammonia volatilization and nitrate leaching. By combining these measurements with crop N uptake and seed yield, we can develop a more complete N budget for creeping red fescue seed production.

This approach can help answer several important questions: Does changing fertilizer timing improve crop N uptake? Can fall-applied N perform as effectively as spring-applied N? Does application timing influence N losses? And, ultimately, can fertilizer timing be adjusted to maintain crop productivity while improving N-use efficiency and mitigate N losses?

The goal is not simply to identify which application timing produces the highest yield in a particular year. Rather, we want to understand **where the N goes** and how fertilizer management can be refined to make better use of every unit of N applied. Better synchronization between fertilizer application and crop N demand could potentially improve fertilizer-use efficiency, reduce environmental N losses and help producers obtain greater value from their fertilizer investment.

Project progress

The project is designed as a multi-year, multi-site experiment. The site established in 2024 has now completed two years of seed production, while the site established in 2025 has completed its first year of seed production. With the completion of the second production year at the 2025 site, we will evaluate the effects of N application timing across sites and production years and develop a comprehensive N budget for creeping red fescue seed production.

Data and samples collected throughout the experiment are currently being analyzed to determine how N application timing affects crop N uptake, seed productivity, soil N dynamics and potential N losses.

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