2024

4R in Canada: A National Overview

2024 Fertilizer Use Survey

FERTILIZER CANADA

4Rs in Practice

Canadian farmers are already global leaders in sustainable agriculture. Over the past 10 years, we have seen a large increase in efficiency as production levels rose, while farmers continue to adopt new technologies and apply 4R principles.

The Fertilizer Use Survey provides credible data that helps us understand nutrient management practices across the country. It offers valuable insight into the current state of 4R adoption in Canada and informs our efforts to support continuous improvement in agricultural sustainability. This research goes beyond numbers to capture farmer attitudes, motivations, and challenges.

Background

The Fertilizer Use Survey is a long-standing initiative led by Fertilizer Canada and its stakeholders, conducted annually since 2014. Its purpose is to assess fertilizer application practices and gauge awareness and adoption of 4R Nutrient Stewardship among growers across Canada.

Collecting and tracking fertilizer best management practices (BMPs) is vital to developing sustainability metrics and understanding potential adoption across Canada. The survey creates a baseline to measure year-over-year data and provides valuable insights into the motivations and understanding of growers when considering 4R Nutrient Stewardship strategies.

The 2024 Fertilizer Use Survey was funded by the Alberta Wheat Commission, Canadian Canola Growers Association, Christian Farmers Federation of Ontario, Fertilizer Canada, Grain Farmers of Ontario, Ontario Agri-Business Association, Ontario Federation of Agriculture, Manitoba Crop Alliance, Saskatchewan Wheat Development Commission, the Canola Council of Canada and Réseau Végétal Québec.

Data is collected through an online survey from an unbiased database of Canadian farmers. The data is self-reported and not validated by a third party.

Survey Methodology

About the Survey

The surveys were conducted between November 7, 2024, and March 17, 2025. The average length for survey completion was between 24 to 31 minutes, and a $25 to $50 incentive was offered to farmers for their participation. The online survey was programmed and tested by Stratus Ag Research, with questionnaire development modified by Stratus Ag Research and with input from Fertilizer Canada. A total of 1,258 farmers responded to the 2024 survey. The data is self-reported and not validated by a third party. The 2024 survey included canola and spring wheat producers in Western Canada (Alberta, Saskatchewan and Manitoba), feed and malt barley producers in Manitoba, grain corn and soybean producers in Ontario, grain corn producers in Quebec and potato producers in Prince Edward Island.

Use of the Survey

The Fertilizer Use Survey provides a high-level understanding of fertilizer use in Canada, with many organizations benefiting from the data. Fertilizer Canada uses it to advocate to all levels of government on policies that impact fertilizer application, as well as incentives and support for farmers to increase adoption. Academic institutions use the results in their research, including in meta-analysis research. Agriculture publications also use data for media stories.

4R Survey Takeaways

1. **Grower use of innovative products, such as enhanced efficiency fertilizers (EEFs), has increased for most crops.** EEFs, including nitrogen stabilizers and controlled release products, help producers to minimize nutrient losses in the field and control nutrient availability to the crop at the right time, reducing greenhouse gas emissions without sacrificing yield (FitzPatrick, 2024). Since 2023, the use of EEFs has either increased or remained similar for all crops in the survey (Figure 9). The continued and increased utilization of EEFs not only shows growers are willing to try fertilizer technologies but also indicates growers are beginning to see the benefits associated with EEFs and their role in minimizing nitrogen losses.

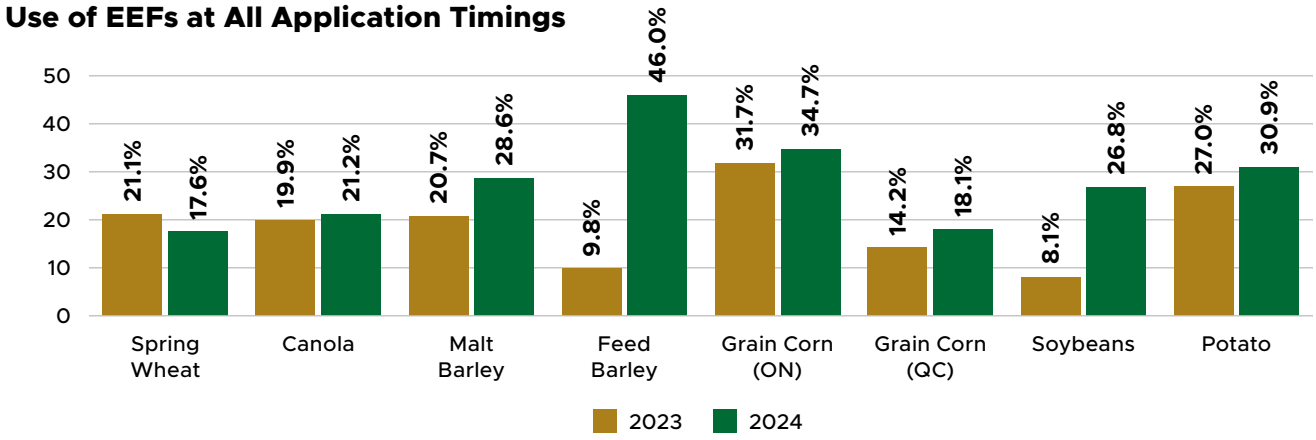


Figure 9: Use of EEFs at all application timings represented as the percentage of primary nitrogen volume treated with various types of EEFs in 2023 and 2024.

2. **Feed barley acres have seen a shift in nitrogen application timings,** from nitrogen applications in the fall of the previous year to applications being made in the spring at planting in 2024.

3. **Growers are utilizing soil testing to have a deeper understanding of what's happening in the field.** By conducting a soil test, growers are able to better tailor their fertilizer plans to best suit their field needs –allowing growers to increase efficiency, optimize yield, and protect the environment (Halsall, 2022). The frequency of soil testing for phosphorus and nitrogen remains similar year over year. Despite this, it is important to note there was no substantial decrease in frequency of soil testing, with a majority of respondents testing every one to three years.

4. **There are notable discrepancies between 4R compliance and formal 4R plans.** Most surveyed Canadian producers were familiar with the concept of 4R Nutrient Stewardship and believe they are 4R compliant, yet there were still many growers who do not have a formal 4R plan in place. It is important to note, that this does not indicate that growers are not developing a 4R plan, they may be developing a plan independently without getting formal recognition. This signals the need to give growers increased incentives, extension support, and reduce perceived complexity in both developing their 4R plans and highlighting the benefits of formalizing a 4R plan.

5. **Similar to 2023, lack of incentive remained the main barrier to implementing a 4R plan.** Despite this, of the growers who do have a 4R plan in place, more than half of these growers believed there was an economic benefit to implementing a 4R plan – although this was not the main benefit. There remains an opportunity to demonstrate a return on investment for 4R Best Management Practices (BMP) implementation, while also emphasizing the long-term benefits through tangible results.

What is 4R?

4R Nutrient Stewardship is a science-based suite of BMPs for farmers to optimize nutrient uptake by using the right source of nutrients at the right rate, at the right time, in the right place.

The 4Rs are interdependent, meaning any change to one must consider the others. The most effective 4R strategies are developed holistically, ensuring that changes in timing, rate, place or source work together to improve efficiency.

Right Source

Select the right blend of nutrients specific to the crop's needs, soil properties and regional conditions.

Right Rate

Apply nutrients to meet the crops' needs, considering nutrients already in the soil and all sources (e.g., livestock manures, commercial fertilizers and atmospheric nitrogen fixed by legumes). Complete annual soil testing to determine what nutrients the soil needs.

Right Time

Apply fertilizer at the right time for optimal crop uptake/absorption, which may include multiple applications. Avoid applying on frozen, snow-covered, or saturated soils to reduce the risk of nutrient loss to the environment.

Right Place

Apply nutrients in the right place for optimal crop uptake below the soil surface. Respect recommended setback distances for nutrient application near waterways.

Levels of 4R Nutrient Stewardship

4R Nutrient Stewardship practices are categorized into three levels – basic, intermediate and advanced – for each of the four R's (Right Source @ the Right Rate, Right Time, Right Place®). The practice's level will depend on the region, crop and soil.

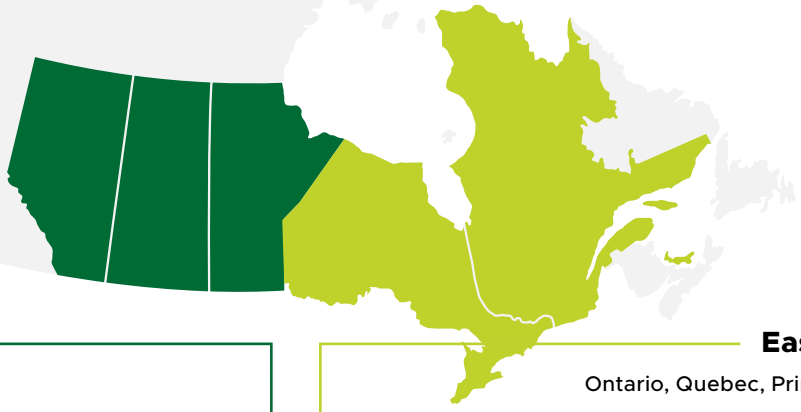
Progressing from basic to advanced 4R practices represents an evolution toward greater nutrient use efficiency and more refined management. While not every element source, rate, time and place will change at each stage, the improvements made at each level are designed to deliver measurable gains in overall efficiency.

Levels of 4R's are determined by the 4R Guidance Tables developed by Fertilizer Canada in partnership with industry experts and researchers. The guidance focuses on the four primary nutrients commonly applied in Canadian cropping systems: nitrogen (N), phosphorus (P), potassium (K) and sulphur (S). BMPs are presented in organized tables and categorized by region, crop and type of soil.

The more advanced the 4R practices are, the greater the efficiency level becomes and the greater the environmental benefit becomes (ie: reduction in greenhouse gas [GHG] emissions). Practices are not stand-alone and should be considered as suites of practices that work together toward the goal of improving nutrient use efficiency and reducing nutrient losses from the cropping system. General progression is based on the following concepts:

- **Basic:** Practices are generally consistent with 4R principles. A significant portion of growers already have these in place or are willing to move to them in the short term (1-2 years).
- **Intermediate:** Practices are fully consistent with 4R principles and may be transitional to advanced practices. Adoption of intermediate-level practices may occur over the medium term (1-3 years), particularly when they involve investment in new technology.
- **Advanced:** Practices are fully consistent with 4R principles and may be considered aspirational and/or best in class. Adoption of a full suite of advanced-level practices may occur over a longer time frame (3-6 years), particularly when they involve investment in new technology.

An Overview of Survey Respondents



Western Canada

Alberta, Saskatchewan, Manitoba

ALBERTA, SASKATCHEWAN, MANITOBA

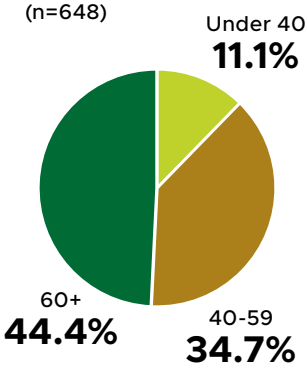
- **Canola** (n=536), **spring wheat** (n=543)
- **Cow/calf** (18.4%), **poultry** (6.3%), **backgrounding** (5.6%)

MANITOBA

- **Feed barley** (n=53), **malt barley** (n=42)
- **Cow/calf** (21.9%), **poultry** (19.2%), **hogs** (16.4%)

AGE BREAKOUT OF RESPONDENTS WESTERN CANADA

(n=648)



AGE BREAKOUT OF RESPONDENTS MANITOBA

(n=73)

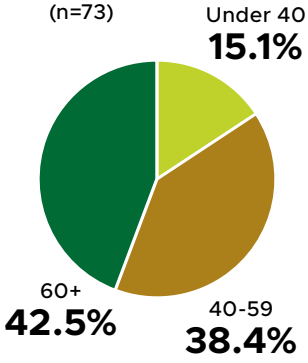


Figure 1: Age breakout of Western Canadian (AB, SK and MB canola and wheat growers (n=648)) and Manitoba (malt and feed barley (n=73)) respondents.

Eastern Canada

Ontario, Quebec, Prince Edward Island

ONTARIO

- **Grain corn** (n=339), **soybeans** (n=409)
- **Dairy** (10.5%), **cow/calf** (8.7%), **hogs** (7.3%)

QUEBEC

- **Grain corn** (n=134)
- **Dairy** (29.1%), **hogs** (6.0%), **poultry** (2.2%)

PRINCE EDWARD ISLAND

- **Potatoes** (n=39)
- **Feedlot** (15.4%), **cow/calf** (12.8%), **sheep/goats** (2.6%)

AGE BREAKOUT OF RESPONDENTS EASTERN CANADA

(n=610)

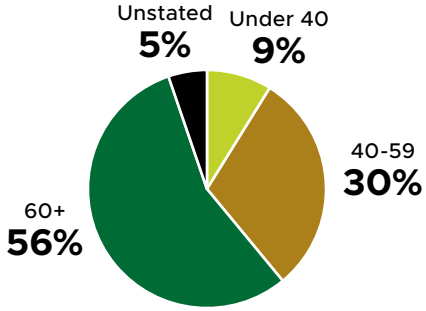
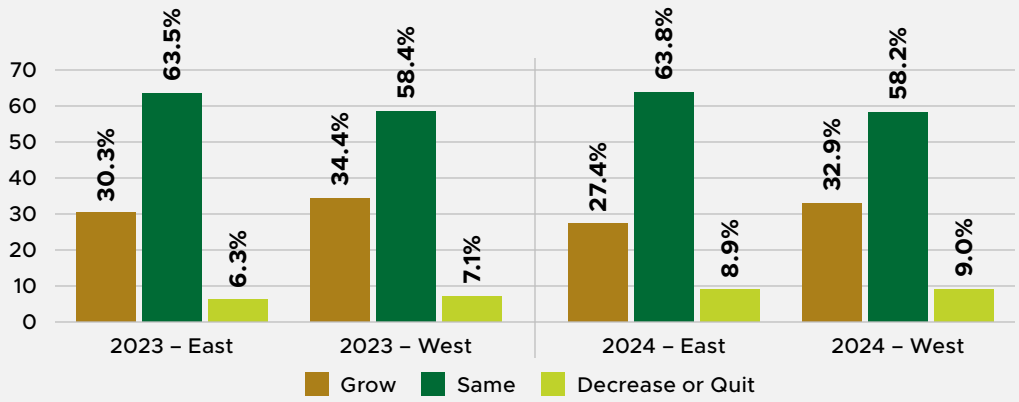


Figure 2: Age breakout of Eastern Canadian respondents in percentages (n=610)

Future Plans for the Operation

Figure 3: Future plans for the operation of Eastern and Western Canadian survey respondents. The data is represented as the percentage of survey respondents in the east and west for 2023 and 2024.



Awareness and Adoption of 4Rs

Familiarity of 4Rs

In both Western Canada and Ontario, just under one-third of growers reported being “very familiar” with 4R concepts in 2024, relatively unchanged from the previous year. Manitoba stands out with a significant increase among malt and feed barley growers, rising from 28% in 2023 to 42.5% in 2024, the highest across all surveyed groups. While familiarity levels are lower among corn producers in Quebec, the data presents an opportunity for continued outreach and engagement in the region.

Trend

- **4R concept familiarity has remained relatively consistent year over year, apart from malt and feed barley growers in Manitoba, where there has been an increase in the percentage of growers who are very familiar with the 4R concept (Figure 4).**

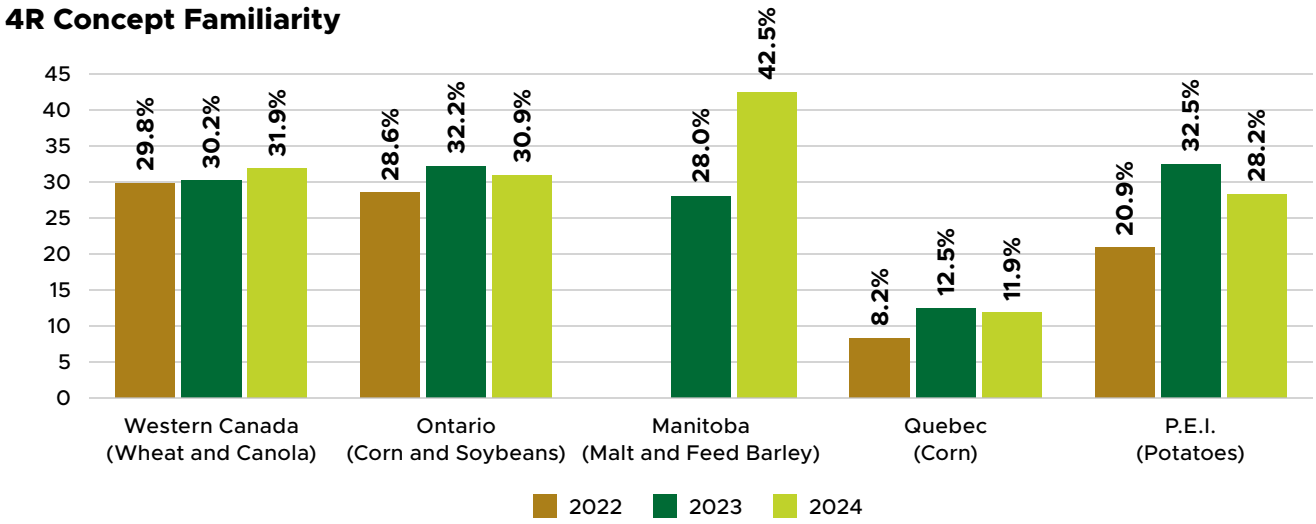


Figure 4: Percentage of growers who said they were very familiar with 4R practices from 2022 to 2024 shown by region.

Grower Adoption of 4R

Similar to 2023, grower adoption and awareness of 4R has remained relatively the same. 64.6% of surveyed Canadian growers believed they complied with 4R stewardship practices.

Based on the grower responses, we estimate that just under 13M acres in Canada were 4R compliant in 2024, representing 28% of acres. The greatest challenge to achieving basic 4R compliance is the "Right Rate," due to growers not setting field-specific nitrogen rates. Compliance improves significantly when growers receive third-party agronomic advice.

While most surveyed Canadian producers are familiar with the concept of 4R Nutrient Stewardship and believe they are 4R compliant (Figure 5 and 6), there are still many growers who do not have a formal 4R plan in place.

Growers Who Believe They Comply with 4R

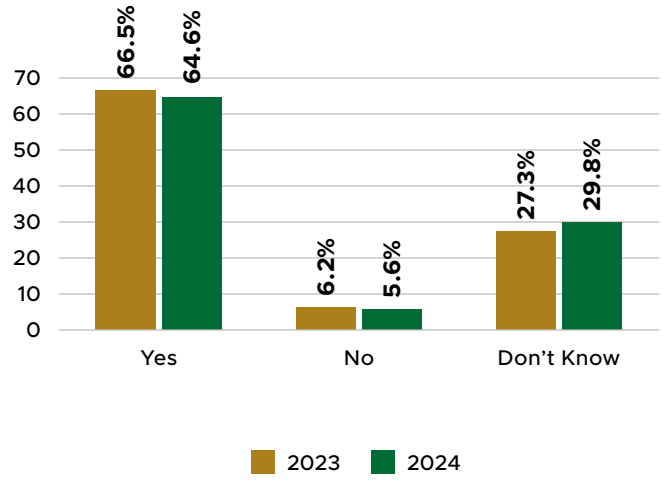


Figure 5: Percentage of surveyed Canadian producers who believe they comply with 4R Nutrient Stewardship practices in 2023 (n=1405) and 2024 (n=1258).

Growers Who Are Familiar With the 4R Concept

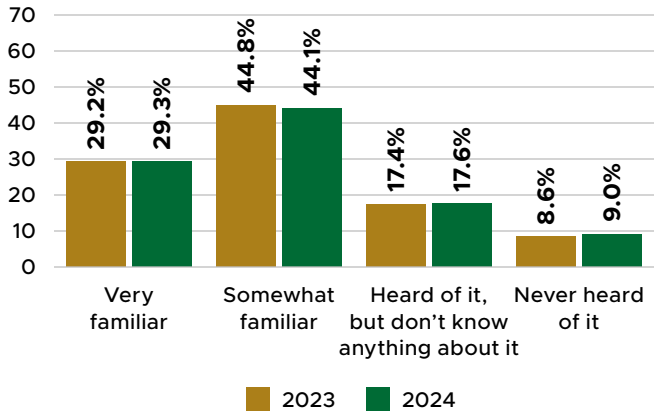


Figure 6: Percentage of surveyed Canadian producers who are familiar with the 4R concept in 2023 (n=1405) and 2024 (n=1258)

Growers Who Have a Formal 4R Plan in Place

While over half of surveyed Canadian producers report feeling compliant with the 4Rs, 79.6% still do not have a formal 4R plan in place in 2024 (n=1258). This figure remains nearly unchanged from 2023, where 80.5% reported the same (n=1405). Only a slight increase of 0.9% was observed in producers with a formal plan year-over-year.

This shared sentiment persists across both Eastern and Western Canada, pointing to a consistent national trend. The small year-over-year improvement signals that opportunity still exists to close the gap between perceived compliance and documented implementation. Collaborating with a 4R Designated Agronomist or 4R Certified Retailer continues to be a vital step in helping growers develop formal 4R plans.

4R Nutrient Stewardship plans are tailored to each grower's farm, providing a customized set of BMPs that optimize fertilizer investments, maximize nutrient uptake, and reduce environmental impacts. By implementing a 4R plan, farmers can also ensure their acres are eligible to be counted under Fertilizer Canada's 4R Designation Program. In 2024 alone, over nine million acres were reported as 4R-managed, demonstrating Canadian farmers' commitment to sustainability and reinforcing their environmental responsibility to consumers, regulators, and markets.

Growers Who Work with a 4R Retailer/Agronomist

In 2024, 35.8% of Canadian growers said they were working with a 4R Certified Retailer or Agronomist; however, only 17.3% of growers had a 4R plan (Figure 7 and 8). Of those without a formal plan, 53.3% were still working with a certified advisor. This shows a clear difference between receiving support and having a documented plan, suggesting there is room to connect certified advice with formal 4R implementation, while highlighting the benefits of receiving certified advice.

Growers Who Have a Formal 4R Plan in Place

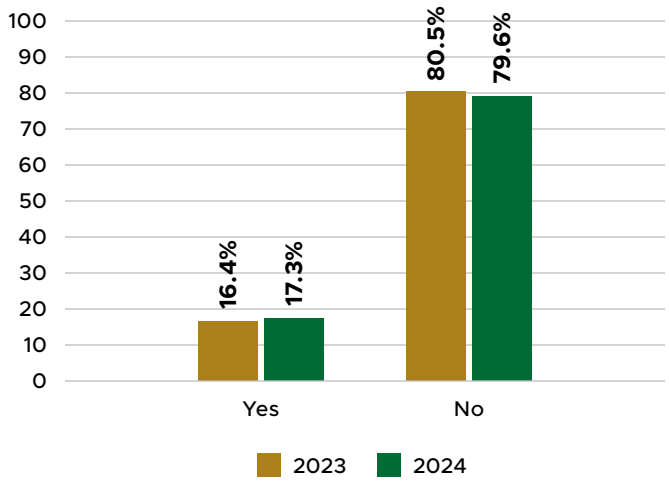


Figure 7: Percentage of surveyed Canadian producers who have a formal 4R plan in place in 2023 (n=1405) and 2024 (n=1258).

Growers Who Work With a 4R Certified Retailer/Agronomist and Have a Formal 4R Plan

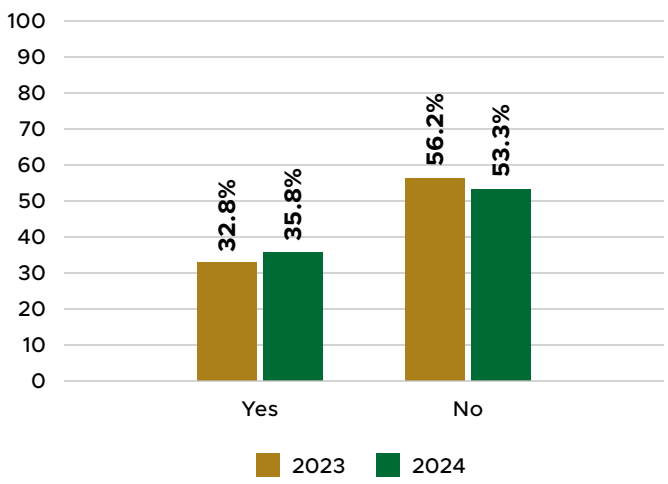


Figure 8: Percentage of surveyed Canadian producers who have a formal 4R plan in place and work with a certified retailer or agronomist in 2023 (n=1405) and 2024 (n=1258).

Reasons Why Some Farmers Have Not Adopted 4R Practices

In 2024, 5.6% of surveyed Canadian growers indicated their current practices are not aligned with the 4Rs. Among this group, the top reasons for not adopting 4R practices were:

1. Lack of the right equipment **38.6%**
2. Lack of time and manpower **32.9%**
3. Lack of information/ knowledge **27.1%**
4. Lack of proven benefits **27.1%**
5. Timing, logistics and cost to implement **20.0%**

Results from across the country show that lack of equipment, cost, education and time are the main reasons why farmers are not currently adopting or implementing 4R practices.

However, there are subtle differences regionally. Lack of time and manpower was the second most important barrier to adoption among surveyed Eastern Canadian producers (13.9%, n=36). In Western Canada, a lack of proven benefits was also stated as a barrier to adoption (7.8%, n=51). These regional variations demonstrate how motivations and barriers can vary, potentially requiring a regional approach to education and grower messaging.

Barriers and Benefits to Adopting 4R Plans

Benefits of Having a 4R Plan in Place

(n=217)

1. You know you are using the best environmental stewardship practices in place **69.1%**
2. Improved soil quality and nutrient availability **65.4%**
3. Credible agronomic advice based on 4R Nutrient Stewardship **61.3%**
4. You know you are using the most up-to-date, science-based fertilizer practices **55.8%**
5. Increase in economic return **49.8%**

Barriers for Putting a 4R Plan in Place

(n=889)

1. Lack of incentive **14.6%**
2. Lack of proven benefits **12.0%**
3. Too complex to implement **11.7%**
4. Not a service provided by your agri-retailer **11.0%**
5. Lack of information/ knowledge **9.7%**

The above data outlines the need for continued education that attaches value and tangible results to 4R Nutrient Stewardship. When looking at familiarity, compliance and adoption, we see the majority of growers being aware of and believing they are compliant with 4R practices, yet formal adoption still remains low.

Some of the main barriers holding growers back from adopting best practices include cost (both time and money), complexity and lack of access to information. These challenges highlight the importance of making 4R guidance easier to access and understand, leading to growers feeling more confident applying these practices.

Frequency of Soil Testing Nitrogen and Phosphorous

Soil testing is a crucial step in determining nutrient levels in the soil so nutrient management plans can be tailored to maximize productivity (Ontario.ca, 2022).

Frequency of soil testing remained relatively consistent for both nitrogen and phosphorous from 2023 to 2024. Producers continue to test for nitrogen more frequently than phosphorus, with annual testing being more common for nitrogen. For phosphorus, the most common practice is testing every three years. In both 2023 and 2024, over 55% of respondents reported testing for nitrogen and phosphorus between every year and every three years (Figure 10).

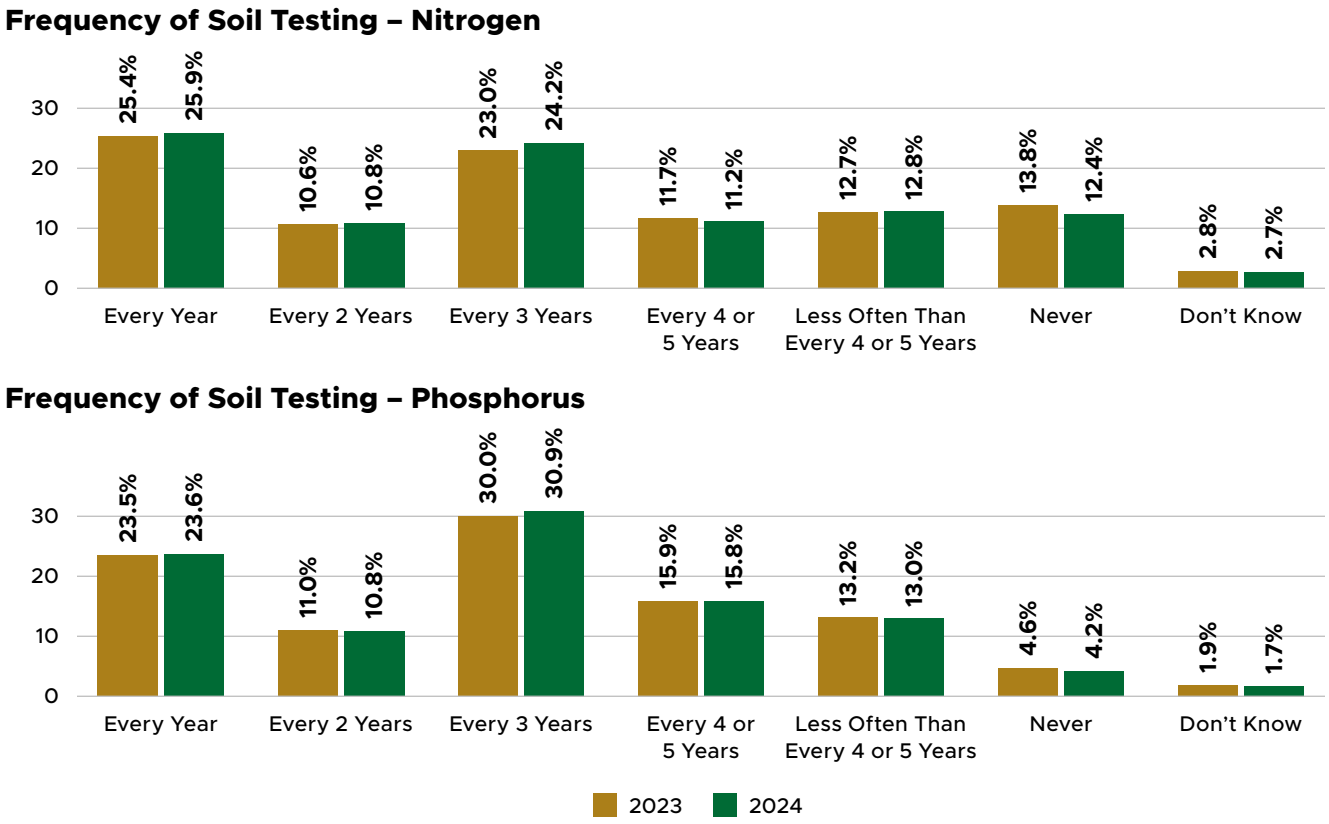


Figure 10: Frequency of soil testing for nitrogen and phosphorous by surveyed Canadian producers represented as the percentage of respondents for both nitrogen and phosphorous in 2023 (n=1,405) and 2024 (n=1,258).

Results By Crop From Across Canada

Potatoes

TIMING

Nitrogen: 89.0% of potato acres had nitrogen applied in the spring at planting, with a slight shift in growers applying nitrogen in the fall of the previous year (10.8%) (n=39). Research has shown that split application of nitrogen reduces nitrate leaching from potatoes by as much as 32% (Burton & Nyiraneza, 2018).

Phosphorous: 74.8% of potato acres were treated with phosphorous at planting (n=39).

Potassium: 98% of potato acres were treated with potassium at planting (n=39).

SOURCE

Nitrogen: At all application timings, 31.6% of the nitrogen volume applied was in the form of Calcium Ammonium Nitrate, 18.3% was DAP and 17.5% was ESN/SuperU (n=38).

Phosphorous: At all application timings, 68.7% of the total phosphorus volume applied in potatoes was in the form of DAP (n=26).

Potassium: At all application timings, 62.6% of the total potassium volume applied was in the form of dry potash (n=36). The use of dry potash continues to trend lower year over year.

PLACEMENT

Nitrogen: 67.8% of potato acres applied nitrogen in furrow at planting (n=38).

Phosphorous: 72.0% of potato acres applied phosphorus in furrow at planting.

Potassium: 86.5% of potato acres applied potassium in furrow at planting (n=36).

RATE

Nitrogen: 60% of the nitrogen volume applied to potatoes was applied at a rate between 150-179.9 lb/ac (n=38).

Phosphorous: 88% of phosphorus volume applied to potatoes was applied at a rate between 120-159.9 lb/ac (n=26).

Potassium: Overall, potassium application rates are variable, with 23.9% of potassium volume being applied at a rate between 150-159.9 lb/ac (n=36) and 16.0% of potassium volume being applied at a rate between 200-209.9 lb/ac (n=36).

NITROGEN STABILIZERS

- 9.3% of acres treated with nitrogen utilized a nitrogen stabilizer (n=33); this decreased from 2023 where 13.7% of acres utilized a nitrogen stabilizer (n=34).

BIOSTIMULANTS

- 25.6% of potato growers utilized biostimulants on their potato acres (n=39).

ENHANCED EFFICIENCY FERTILIZERS

- 30.9% of nitrogen volume applied was done in a protected form (n=37); this edged higher from 2022 and 2023.

Trends

- **With 143% of potato acres being treated with nitrogen, potato growers are utilizing multiple sources of nitrogen on their acres.**
- **Calcium Ammonium Nitrate (53%), Super U (40.5%) and Urea (26.3%) being the top 3 most commonly used nitrogen sources.**

Spring Wheat

TIMING

Nitrogen: 85.8% of spring wheat acres were treated with nitrogen in the spring at planting (n=543).

Phosphorous: 84.1% of spring wheat acres were treated with phosphorus in the spring at planting (n=543).

Potassium: 34.8% of spring wheat acres were treated with potassium in the spring at planting (n=543); despite a drop from 2016 to 2021, potassium applied during this time has remained stable since 2021.

SOURCE

Nitrogen: At all application timings, 54.0% of the total nitrogen applied to spring wheat acres were applied in the form of Urea (n=535).

Phosphorous: At all application timings, 75.3% of the total phosphorus applied to spring wheat acres was applied in the form of MAP (n=492).

Potassium: At all application timings, 85.1% of the total potassium applied to spring wheat acres was applied in the form of dry potash (n=224).

PLACEMENT

Nitrogen: Nitrogen placement in the spring at planting was done either through side-banding (35.6% of acres) or mid-row banding (39.6% of acres) (n=535). Incorporating urea reduces ammonia loss by 34% (Woodley et al., 2020).

Phosphorous: 39.8% of spring wheat acres had phosphorus seed-placed in the spring at planting (n=492).

Potassium: Potassium placement in the spring at planting was done through mid-row banding (12.2% of spring wheat acres), side-banded (11.6% of spring wheat acres), or seed placed (10.7% of spring wheat acres) (n=224).

RATE

Nitrogen: 72% of the nitrogen volume was applied at a rate between 80-135 lb/ac.

Phosphorous: 70% of the phosphorus volume was applied at a rate between 20-45 lb/ac (n=492).

Potassium: 72% of the total potassium volume applied was done at a rate between 15-35 lb/ac (n=224).

NITROGEN STABILIZERS

- There has been little change since 2022 in the number of acres treated with a nitrogen stabilizer, with 7.5% of acres treated with nitrogen utilizing a stabilizer in 2024 (n=491).

BIOSTIMULANTS

- There has been a small increase from 2023 to 2024 in the use of biostimulants, with 6.5% of spring wheat growers utilizing a biostimulant in 2023 (n=635) and 7.0% utilizing a biostimulant in 2024 (n=543).

ENHANCED EFFICIENCY FERTILIZERS

- There has been little change in the use of EEFs since 2021 with 17.6% of nitrogen volume being applied in a protected form in 2024 (n=531).

Trend

- **Year over year, spring wheat growers are keeping up with BMPs, specifically with nitrogen and phosphorus applications occurring in the spring at planting (Figure 11).**

Nitrogen and Phosphorus Applications in the Spring at Planting on Spring Wheat Acres

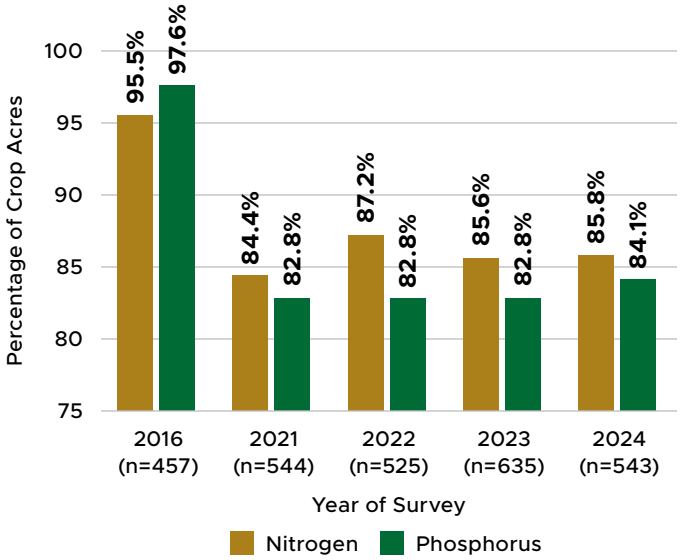


Figure 11: Year over year visualization of the percentage of spring wheat acres that had nitrogen and phosphorus applied in the spring at planting.

Canola

TIMING

Nitrogen: 82% of canola acres were treated with nitrogen in the spring at planting (n=536).

Phosphorous: 85.6% of canola acres were treated with phosphorus in the spring at planting (n=536).

Potassium: 30.9% of canola acres were treated with potassium in the spring at planting (n=536); this has continually edged lower since 2020.

SOURCE

Nitrogen: At all application timings, 53.5% of the total nitrogen volume applied to canola was done in the form of Urea (n=536).

Phosphorous: At all application timings, 69.4% of the total phosphorus volume applied to canola was done in the form of MAP (n=497).

Potassium: At all application timings, 81.0% of the total potassium volume applied to canola was done in the form of dry potash (n=202).

PLACEMENT

Nitrogen: 37.1% of canola acres placed nitrogen in the spring at planting by either side-banding (37.1%) or mid-row banding (36.4%) (n=536).

Phosphorous: 41.2% of canola acres has phosphorus seed placed at planting (n=497); secondarily, 27.2% of canola acres has phosphorus side-banded at planting (n=497).

Potassium: The method for potassium placement in the spring at planting varied, with 11.2% of canola acres being side-banded, 9.3% of acres being seed placed and 8.8% of acres being mid-row banded (n=202).

RATE

Nitrogen: 75% of the nitrogen volume applied to canola was applied at a rate between 90-155 lb/ac (n=536).

Phosphorous: 77% of the total phosphorus volume was applied at a rate between 25-55 lb/ac (n=497).

Potassium: The application rate of potassium varied in 2024, with 17.9% of the potassium volume applied to canola being applied at a rate between 30 to 34.9 lb/ac and 17.5% of potassium volume being applied at a rate between 50+ lb/ac (n=202).

NITROGEN STABILIZERS

- 12.6% of canola acres treated with nitrogen utilized a nitrogen stabilizer (n=498). Since 2021, the use of nitrogen stabilizers has trended upwards year over year.

BIOSTIMULANTS

- From 2023, there was a slight increase in the number of canola growers using a biostimulant, from 6.1% (n=578) in 2023 to 8.4% (n=536) in 2024.

ENHANCED EFFICIENCY FERTILIZERS

- 21.2% of nitrogen volume applied to canola was applied in a protected form (n=528). The use of EEFs continues to increase year over year.

Trends

- **The adoption of EEFs, nitrogen stabilizers and biostimulants continues to trend upward.**
- **Among these, nitrogen stabilizers have shown a steady increase in use since 2021, though overall adoption levels remain modest (Figure 12).**
- **According to research, nitrification inhibitors, a type of nitrogen stabilizer, reduce average nitrous oxide emissions by more than 30% (Eagle et al., 2017) (Fan et al., 2022) (Thapa et al., 2016).**

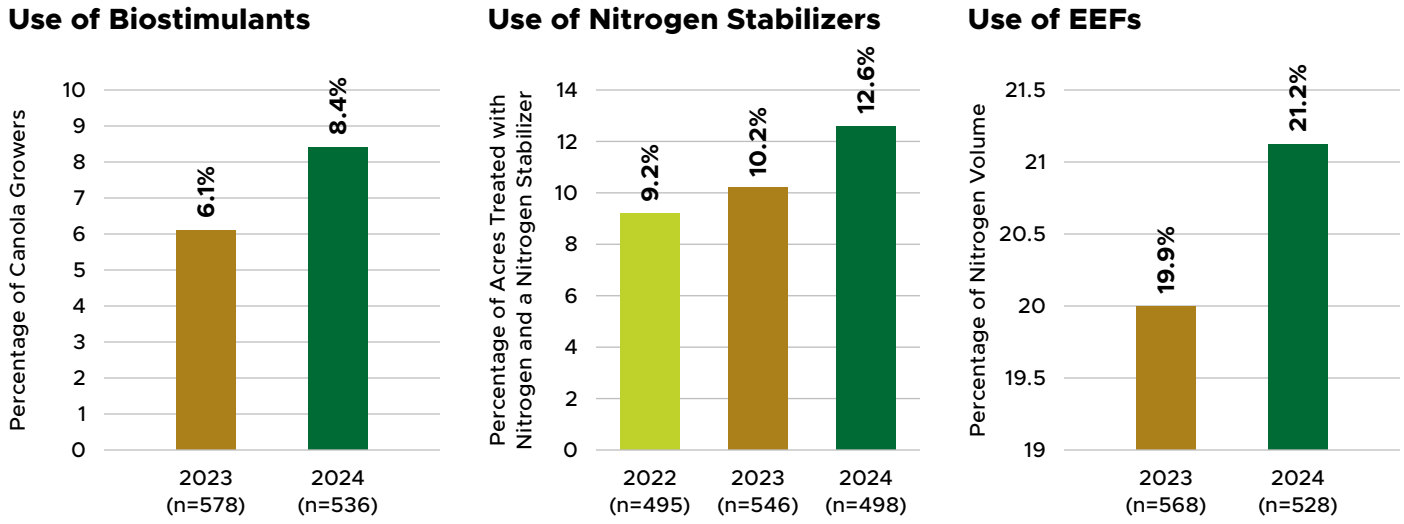


Figure 12: Year over year use of biostimulants, EEFs and nitrogen stabilizers amongst surveyed canola growers from 2022-2024.

Soybeans

TIMING

Nitrogen: 7.7% of soybean acres were treated with a nitrogen fertilizer in the spring before planting (n=409); this equates to 50.6% of nitrogen volume applied during this time (n=268).

Phosphorous: 26.9% of total soybean acres were treated with phosphorus in the spring before planting (n=409); there were also 17.6% of soybean acres that had phosphorus applied in the fall of the previous year (n=409).

Potassium: 34.6% of total soybean acres were treated with potassium in the spring before planting (n=409).

SOURCE

Nitrogen: At all application timings, 55.6% of the total nitrogen volume was applied in the form of MAP (n=268).

Phosphorous: At all application timings, 89.2% of phosphorus volume applied to soybeans was applied in the form of MAP (n=248).

Potassium: At all application timings, 85.2% of potassium volume applied to soybean was done in the form of dry potash (n=296).

PLACEMENT

Nitrogen: 6.2% of soybean acres treated using nitrogen was broadcasted on the soil surface followed by incorporation in the spring before planting (n=268).

Phosphorous: 18.9% of soybean acres had phosphorus broadcast followed by incorporation in the spring before planting; 3.6% of soybean acres had phosphorus broadcast followed by incorporation in the fall of the previous year (n=248).

Potassium: 22.4% of soybean acres treated with potassium was broadcast on the soil surface followed by incorporation in the spring before planting (n=296).

RATE

Nitrogen: 60.6% of nitrogen volume was applied to soybean acres at a rate between 5 to 24.9 lb/ac (n=268).

Phosphorous: Rate at which phosphorus was applied to soybean acres varied, with spikes at various points such as 15.7% of phosphorus volume was applied at a rate of 70 to 74.9 lb/ac and 34.1% of phosphorus volume was applied at a rate between 40 to 54.9 lb/ac (n=248).

Potassium: Depending on potassium carry-over and soil type, potassium may not be required year after year, therefore the rate ranges of potassium applied to soybean acres were scattered, with no pronounced spikes in rate ranges (n=296).

NITROGEN STABILIZERS

- 8.3% of soybean acres were treated with a nitrogen stabilizer in 2024 (n=45).

BIOSTIMULANTS

- 11.0% of soybean growers utilized a biostimulant on their soybean acres in 2024 (n=409).

ENHANCED EFFICIENCY FERTILIZERS

- 26.8% of total nitrogen volume applied to soybean acres was applied in a protected form (n=51); 8.1% of total nitrogen volume was applied in a protected form in 2023 (n=59).

Trends

- **MAP continues to represent over 80% of the total phosphorus volume applied to soybeans.**
- **The average phosphorous and nitrogen rates in soybeans have increased from 2023 to 2024, but a linear analysis shows on average phosphorus rates are slowly declining while nitrogen rates have remained relatively the same (Figure 13).**
- **The use of EEFs has increased from 2023, with the total nitrogen volume being applied in a protected form in 2024 being substantially higher (Figure 9).**

Average Nitrogen and Phosphorus Rates in Soybeans

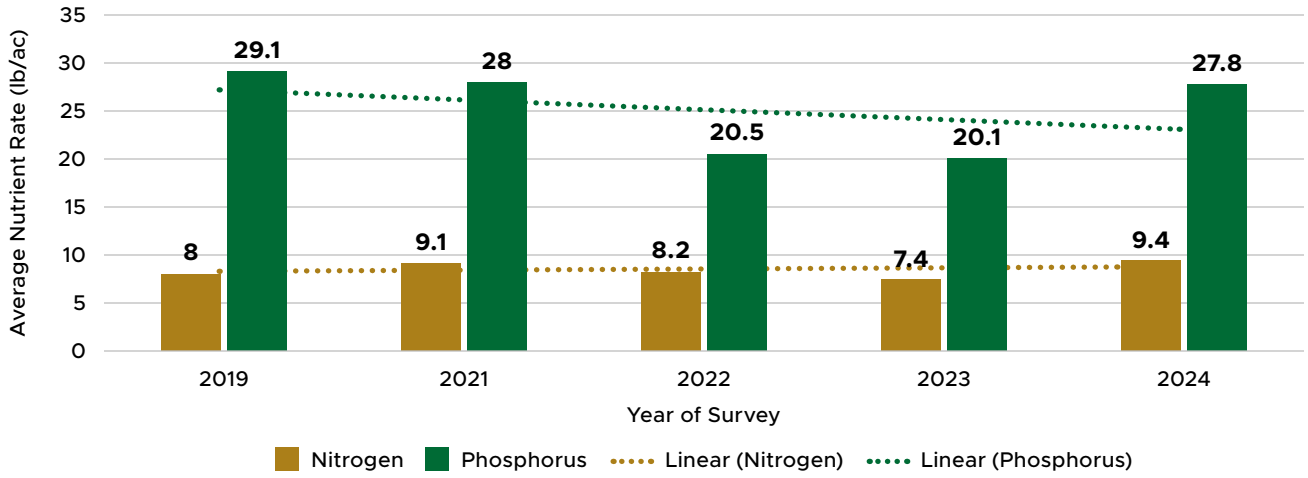


Figure 13: The average nitrogen and phosphorus rates (lb/ac) in soybean crops 2019-2024.

Grain Corn

TIMING

Nitrogen: 66.9% of grain corn acres had nitrogen placed in-crop (n=571).

Phosphorous: 81.7% of grain corn acres had phosphorus placed in the spring at planting (n=571).

Potassium: 51.5% of grain corn acres had potassium placed in the spring at planting (n=571).

SOURCE

Nitrogen: The greatest volume of nitrogen (lbs of nitrogen) was applied to grain corn acres post-plant/in-crop at 177M lbs of nitrogen; 31.3% of nitrogen volume was applied in the form of UAN (28%) post-plant/in-crop (n=571).

Phosphorous: The greatest volume of phosphorus (lbs of phosphorus) was applied to grain corn acres in the spring at planting at 88M lbs of phosphorus; 54.9% of phosphorus volume was applied in the form of MAP in the spring at planting (n=571).

Potassium: The greatest volume of potassium (lbs of potassium) was applied to grain corn acres in the spring at planting at 67M lbs of potassium; 74.5% of the potassium volume was applied in the form of dry potash (n=571).

PLACEMENT

Nitrogen: 28.1% of grain corn acres treated post-plant/in-crop with subsurface banded nitrogen (n=571).

Phosphorous: 45.3% of grain corn acres treated in the spring at planting with side-banded phosphorous (n=571).

Potassium: 34.0% of grain corn acres treated in the spring at planting with side-banded potassium (n=571).

RATE

Nitrogen: The average rate of application at all timings for nitrogen was 165.0 lb/ac of nitrogen (n=571).

Phosphorous: The average rate of application at all timings for phosphorus was 53.9 lb/ac of phosphorus (n=571).

Potassium: The average rate of application at all timings for potassium was 64.9 lb/ac of potassium (n=571).

NITROGEN STABILIZERS

- 34.1% of grain corn growers that applied nitrogen utilized a nitrogen stabilizer with their nitrogen applications (n=422).

ENHANCED EFFICIENCY FERTILIZERS

- 30.2% of total nitrogen applied to grain corn utilized an EEF (n=536); the highest percentage of nitrogen applied in a protected form occurred in the spring, pre-plant (33.9%); however, when considering total volume, the most nitrogen volume was applied in a protected form post-plant/in-crop with 53M lbs of protected nitrogen (Figure 14).

Volume as Primary and Protected Forms by Application Timing

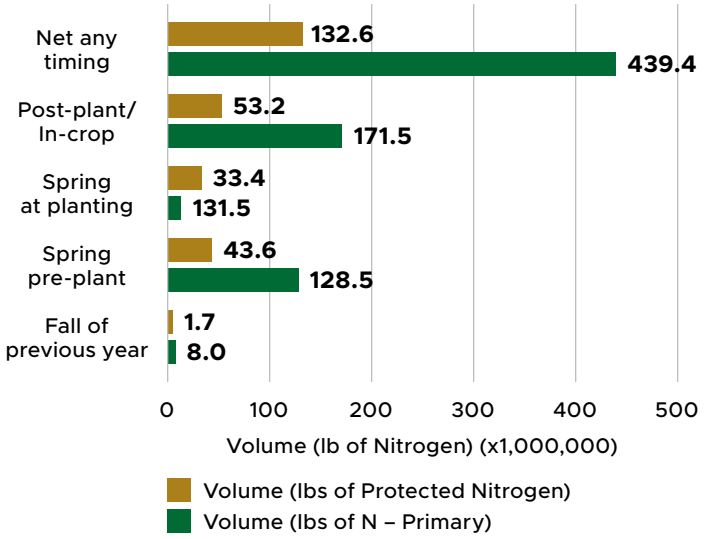


Figure 14: Volume of primary nitrogen and the volume of nitrogen applied in a protected form in pounds of nitrogen (x1,000,000).

Trends

- Figure 14 shows we are seeing more grain corn producers applying nitrogen in a protected form post-plant, at-plant or spring pre-plant.
- Applying nitrogen in a protected form plays an important role in mitigating losses and maximizing nutrient availability.

Feed Barley

TIMING

Nitrogen: 44.7% of feed barley acres applied nitrogen in the spring at planting (n=53).

Phosphorous: 41.2% of feed barley acres applied phosphorous in the spring at planting (n=53).

Potassium: 22.9% of feed barley acres applied potassium in the spring at planting (n=53).

SOURCE

Nitrogen: At all application timings, 45.2% of nitrogen volume applied to feed barley was in the form of Urea (n=53); the use of ESN/SuperU increased from 2023 from 6.3% to 16.9% (n=53), with the use of these products being done primarily in the spring before planting.

Phosphorous: At all application timings, 70.3% of the total phosphorous volume in 2024 was applied in the form of MAP (n=53).

Potassium: At all application timings, 84.7% of potassium volume in 2024 was applied in the form of dry potash (n=53).

PLACEMENT

Nitrogen: Majority of feed barley acres had nitrogen placed either side-banded (15.5%) or mid-row banded (16.2%) in the spring at planting (n=53).

Phosphorous: Majority of feed barley acres, seed placed phosphorus in the spring at planting (26.0%, n=53).

Potassium: If potassium was applied in the spring before planting, the majority of crop acres are being broadcast with potassium on the soil surface then incorporated (14.9%, n=53); if applied in the spring at planting, acres are either side-banded (7.9%) or seed placed (9.9%) with potassium (n=53).

RATE

Nitrogen: 63% of the total nitrogen volume applied at all times was applied at a rate between 70-110 lb/ac (n=53).

Phosphorous: 73% of the total phosphorous volume applied at all times was applied at a rate between 25-45 lb/ac (n=53).

Potassium: 65% of total potassium volume was applied at a rate between 15-35 lb/ac (n=53).

NITROGEN STABILIZERS

- 37.8% of feed barley acres treated with nitrogen utilized a nitrogen stabilizer across all application times (n=44); this is up from 2.5% of feed barley acres in 2023 (n=70).

BIOSTIMULANTS

- 3.8% of feed barley growers reported using a biostimulant in 2024 (n=53).

ENHANCED EFFICIENCY FERTILIZERS

- 46% (2024, n=50) of total nitrogen volume was applied in a protected form in 2024; whereas 22.2% (n=54) and 9.8% (n=72) of total nitrogen volume used an EEF in 2022 and 2023, respectively.

Trends

- **Compared to 2023, we saw a shift from nitrogen applications in the fall of the previous year to applications being made in the spring at planting.**
- **Since 2022, average nitrogen rates in feed barley (lb N/ac) have continually decreased.**
- **In comparison to 2022 and 2023, the use of EEFs at all placement times in feed barley significantly increased in 2024.**
- **There was a decrease in the reported use of biostimulants in feed barley.**

Malt Barley

TIMING

Nitrogen: 60.1% of malt barley acres had nitrogen applied in the spring at planting (n=42); malt barley acres treated with nitrogen in the spring before planting returned to similar levels as in 2022 (~25%, n=48 in 2022 and n=42 in 2024).

Phosphorous: 50% of the total malt barley acres were treated with phosphorous in the spring at planting (n=42); similar to 2022, there were more acres being treated with phosphorus in the spring before planting (18.3%, n=48).

Potassium: 31% of malt barley acres were treated with potassium in the spring at planting (n=42); similar to 2022, there were more acres being treated with potassium in the spring before planting (10.5, n=42 in 2024).

SOURCE

Nitrogen: At all application timings, 37.4% of nitrogen volume applied to malt barley was applied in the form of Urea (n=42); similar to 2022, 17.8% of nitrogen was applied in the form of ESN/SuperU in 2024 (n=42).

Phosphorous: At all application timings, 77.5% of phosphorus volume applied to malt barley was applied in the form of MAP (n=42).

Potassium: At all application timings, 71.3% of potassium volume applied to malt barley was applied in the form of dry potash (n=42).

PLACEMENT

Nitrogen: 28.2% of malt barley acres mid-row banded nitrogen at planting (n=42).

Phosphorous: 27.5% of malt barley acres seed placed phosphorus in the spring at planting (n=42); if applied in the spring before planting, phosphorus was broadcast on the soil surface with either no incorporation (9.9%) or followed by incorporation (7.9%) (n=42).

Potassium: 20.5% of malt barley acres seed placed potassium in the spring at planting (n=42); if applied in the spring before planting, potassium was broadcast on the soil surface with either no incorporation (4.1%) or followed by incorporation (6.4%) (n=42).

RATE

Nitrogen: 74% of nitrogen volume applied to malt barley was applied at a rate between 80-120 lb/ac (n=42).

Phosphorous: 72% of the phosphorous volume was applied at a rate between 30-45 lb/ac (n=42).

Potassium: 25% of the potassium volume was applied at a rate of 20 to 25 lb/ac (n=42).

NITROGEN STABILIZERS

- 29% of malt barley acres treated with nitrogen utilized a nitrogen stabilizer (n=38); this is up from 2023 where 13.3% of acres treated with nitrogen utilized a nitrogen stabilizer (n=36).

BIOSTIMULANTS

- 7.1% of malt barley growers utilized biostimulants in 2024 (n=42).

ENHANCED EFFICIENCY FERTILIZERS

- 28.6% of total nitrogen volume applied to malt barley utilized an EEF (n=41) with majority of EEF use being done in the spring at planting (54.3%, n=13).

Trends

- **There have been more malt barley growers shifting their fertilizer applications (nitrogen, phosphorous and potassium) from during planting to prior-to planting.**
- **Increase of 15.7% of acres using nitrogen stabilizers.**

A New Chapter in Nutrient Management: The Future of the 4Rs

Canadian farmers are leaders in sustainable agriculture, but there is still an opportunity for improvement. Supporting farmers to increase adoption of 4R practices will further enhance environmental stewardship, support strong crop yields and help farmers maximize their profitability.

Improving Data and Emission Measurement Tools

Accurate data is vital to understanding the current state of 4R adoption in Canada and for the development of thoughtful, smart policies. Strengthening data collection should be foundational to Canada's environmental and food security goals. Updating the National Inventory Report (NIR), Canada's primary tool for measuring greenhouse gas emissions, with data from the Fertilizer Use Survey would help ensure 4R Nutrient Stewardship BMPs are recognized and incorporated. This would better reflect farm-level improvements and provide a more accurate picture of emissions from fertilizer use in Canadian agriculture.

Enhancing Support for Growers

Consistently, a top barrier to adoption in the Fertilizer Use Survey is the expense and the lack of incentives. Fertilizer Canada has been working with all levels of government and industry to help support and empower growers to increase adoption of 4Rs.

4R Protocol Aspiration

A 4R protocol is a set of requirements farmers follow to improve nitrogen management in a cropping system and estimate GHG emission reduction to earn offsets that can be sold in a carbon market. This provides a financial incentive to farmers to adopt more expensive practices that reduce emissions. While there is not currently a national 4R protocol, Alberta has the Nitrous Oxide Emission Reduction Protocol (NERP), which is approved for use within Alberta's greenhouse gas management framework. Fertilizer Canada has been advocating for the development of a national 4R protocol and national carbon market to help incentivize emissions reduction from the application of fertilizer.

4R Programming in Canada

4R DESIGNATION PROGRAM

The 4R Designation program educates Professional Agrologists and Certified Crop Advisors (CCAs) on in-depth sustainable fertilizer principles, allowing them to provide tailored advice to farmer customers. The program aims to recognize growers executing 4R plans and demonstrate their sustainability commitment.

The 4R Designation program includes four steps:

1. **Education** – Fertilizer Canada offers an online, three-part training program. Certified Crop Advisors who complete the program earn 5.5 continuing education credits.
2. **Attestation** – Agri-retailers and agronomists attest they have met the conditions to be a 4R Designated agri-retailer or 4R agronomist through education, training and experience. This allows them to prepare and sign off on 4R Nutrient Stewardship Plans.
3. **Support Growers** – Provide growers with information and guidance to implement the 4Rs.
4. **Submit Acres** – Designated 4R agronomists submit acres following the principles of 4R Nutrient Stewardship on behalf of their grower customers, which are counted by Fertilizer Canada.

4R CERTIFICATION PROGRAM

The 4R Certification Program is a voluntary initiative designed for nutrient service providers, including agri-retailers, agricultural service providers and certified professionals. It evaluates the participants' adherence to 4R Nutrient Stewardship practices, focusing on training and education, nutrient recommendations and application, and documentation. Certification requires completing a third-party audit conducted by the Agrichemical Warehouse Standards Association (AWSA), which is repeated every two years. Presently, the program is exclusively available in Ontario.

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Appendix A

Survey Overview by Province

WESTERN CANADA (INCLUDING ALBERTA, SASKATCHEWAN AND MANITOBA) (n=648)

- Data collected during period of November 7, 2024, to December 9, 2024
- Average length was 29 minutes
- Farmers paid $25 as an incentive for participation

MANITOBA (n=73)

- Data collected during period of November 7, 2024, to December 9, 2024
- Average length was 29 minutes
- Farmers paid $25 to $40 as an incentive for participation

ONTARIO (n=437)

- Data was collected during period of November 18, 2024, to March 3, 2025
- Average length was 29 minutes
- Farmers paid $25 to $50 as an incentive for participation

QUEBEC (n=134)

- Data collected during period of December 1, 2024, to March 17, 2025
- Average length was 31 minutes
- Farmers paid $40 to $50 as an incentive for participation

PRINCE EDWARD ISLAND (n=39)

- Data collected during period of November 18, 2024, to March 10, 2025
- Average length was 24 minutes
- Farmers paid $50 as an incentive for participation