

Quick Field Nitrogen Planning

Accounting for Nitrogen Credits Before Applying Fertilizer

Nitrogen (N) can be supplied to a crop from several sources, including fertilizer, legumes, manure, compost and residual N from previous applications. If these N credits are not accounted for, more fertilizer may be applied than the crop requires, increasing input costs and reducing nitrogen-use efficiency. Excess N is also more vulnerable to losses through leaching, ammonia volatilization, denitrification and runoff, with potential impacts on water and air quality.

This sheet is intended as a quick field-level planning tool for Nova Scotia farmers and agronomists. It helps estimate the additional fertilizer N required after accounting for major N credits already available to the crop. The goal is to support more efficient fertilizer use while maintaining crop nutrient needs. It is not a replacement for a comprehensive Nutrient Management Plan or crop-specific professional advice where these are required.

Use the [Field Nitrogen Worksheet](#) to record the values calculated in each step and determine the remaining fertilizer N requirement.

HOW THE CALCULATION WORKS

Start with the crop N requirement as provided in the soil test report and subtract the applicable N credits. Do not count the same N source twice.

Crop N requirement – legume cover crop N credit – current-year plant-available manure N – residual manure N – plant-available compost N – other documented N, if applicable = **Remaining fertilizer N requirement**

EXAMPLE FIELD SCENARIO USED THROUGHOUT THIS FACTSHEET

A corn field has a crop N requirement of 150 kg N/ha. The previous cover crop was red clover with at least 2.2 t/ha of above-ground dry matter at termination. Poultry manure is applied in spring at 3 t/ha and incorporated within one day. The field also receives a residual N credit from manure applied the previous year. Finished compost is applied at 8 t/ha. Any remaining N requirement is supplied with urea (46-0-0). These illustrative values are used throughout the worked example.

Step 1: Determine the Crop N Requirement

The crop N requirement is the starting N recommendation for the crop being grown. For a Nova Scotia field, use the current N recommendation on the soil-test report or current crop-specific regional guidance when that is more appropriate.

The standard soil test does not directly measure crop-available N. The N recommendation is generated for the crop selected on the soil submission form and represents a general crop requirement. If the crop has changed from that shown on the soil test, the lab can rerun the results to provide the relevant crop specific recommendations.

Record in worksheet: Crop N requirement = ____ kg N/ha

Field example - Step 1: Crop N requirement = 150 kg N/ha

Learn more: [Soil Test Report Interpretation for Nova Scotia](#)

Step 2: Determine N Credit from Legume Cover Crops

Legume cover crops can supply N to the following crop as N is released from residues and roots. For routine field planning, use the rule-of-thumb credits below only where the legume stand is well established and has at least approximately 2.2 t/ha (1 ton/ac) of above-ground dry matter at termination.

Table 1. Rule-of-thumb N credits for legume cover crops

Following crop	N credit
Crop other than corn	45 kg N/ha
Corn	80 kg N/ha

Source: [Nitrogen Credits from Legume Cover Crops](#)

These generic values are based on Ontario guidance. Actual N supply varies with species, biomass, stand quality, termination timing, tillage, weather and the following crop.

More field-specific option: If cover-crop biomass and tissue N concentration are available, use the detailed N-credit method in the [supporting legume N credit factsheet](#) instead of the rule-of-thumb credit.

Record in worksheet: N credit from legume cover crops = ____ kg N/ha

Field example - Step 2: The previous cover crop was red clover with at least 2.2 t/ha of above-ground dry matter at termination, followed by corn.

Legume cover crop N credit = 80 kg N/ha

Step 3: Manure Calculations

Complete both parts where applicable: (A) current-year plant-available N and (B) residual N from previous manure applications.

A. Determine current-year plant-available N from manure

Total manure N is not equivalent to plant-available N. Plant-available manure N comes from two pools: ammonium-N ($\text{NH}_4\text{-N}$), which is immediately available if retained after application, and organic N, which becomes available through mineralization.

The method below is intended for spring-applied manure. For late-summer or fall applications, use the fall-applied N availability guidance in the [manure factsheet](#).

I. Check the manure analysis and units

Use a recent manure analysis whenever possible. For a solid manure calculation, use nutrient concentrations on an as-received (as-applied) basis. If the report provides only dry-basis values, convert them before calculating the field application.

As-applied nutrient % = dry-basis nutrient % $\times$ (dry matter % $\div$ 100)

Example: manure that is 15% dry matter and 2% N on a dry basis contains 0.30% N as applied: $2 \times 0.15 = 0.30\%$

II. Separate ammonium-N and organic N

$$\text{Organic N (\%)} = \text{Total N (\%)} - \text{NH}_4\text{-N (\%)}$$

Example: 3.15% total N – 0.37% NH₄-N = 2.78% organic N

III. Convert nutrient concentration to kg N applied per hectare

Solid manure : 1% nutrient = 10 kg nutrient/t

$$\text{kg N/ha} = \text{N concentration (\%)} \times 10 \times \text{manure rate (t/ha)}$$

Liquid manure reported as a percentage : 1% nutrient = 10 kg nutrient/m³

$$\text{kg N/ha} = \text{N concentration (\%)} \times 10 \times \text{manure rate (m}^3\text{/ha)}$$

IV. Estimate how much Ammonium-N is retained

Spring-applied NH₄-N can be lost as ammonia gas if manure remains on the soil surface. Use the retention factor that matches the application method and incorporation timing.

Table 2. Proportion of Ammonium-N from spring-applied manure retained in the soil

Application / incorporation	Proportion retained
Injected / covered	1.00
Incorporated within 1 day	0.75
Incorporated within 3 days	0.50
Incorporated within 5 days	0.40
Not incorporated	0.35

Source: [How to Interpret a Manure Analysis Report](#)

These factors are for average weather conditions. For non-injected manure, add 0.10 under cool conditions (<10°C) and subtract 0.10 under warm conditions (>20°C).

$$\text{Available NH}_4\text{-N (kg N/ha)} = \text{NH}_4\text{-N applied} \times \text{retention factor}$$

V. Estimate organic N available in Years 1–3

Organic N availability depends on manure type, C:N ratio and application timing. Use the factor that best matches the manure.

Table 3. Estimated organic N availability from manure

Manure category	Application time	Year 1	Year 2	Year 3
Poultry	Before June 15	0.30	0.15	0.05
Poultry	June 15–Sept 15	0.15	0.20	0.05
Poultry	After Sept 15	0	0.30	0.05
Other livestock, C:N <15	Before June 15	0.20	0.10	0.05
Other livestock, C:N <15	June 15–Sept 15	0.10	0.20	0.05
Other livestock, C:N <15	After Sept 15	0	0.30	0.05
C:N 15–25 (high bedding)	Before June 15	0.10	0.20	0.10
C:N 15–25 (high bedding)	June 15–Sept 15	0	0.20	0.10
C:N 15–25 (high bedding)	After Sept 15	0	0.10	0.10

Source: [How to Interpret a Manure Analysis Report](#)

Very high-bedding manure (C:N >25) can temporarily immobilize N and requires additional interpretation; use the full [manure factsheet](#) for that situation.

Available organic N (kg N/ha) = organic N applied × applicable availability factor

VI. Calculate plant-available manure N

Plant-available manure N = available $\text{NH}_4\text{-N}$ + available organic N

Record in worksheet: Current-year plant-available manure N = ____ kg N/ha

Field example - Step 3A: Current-year manure

Poultry manure: total N = 3.15%; ammonium-N = 0.37%; application rate = 3 t/ha; applied before June 15 and incorporated within one day.

Organic N = 3.15 - 0.37 = 2.78%

Organic N applied = 2.78 × 10 × 3 = 83.4 kg N/ha

$\text{NH}_4\text{-N}$ applied = 0.37 × 10 × 3 = 11.1 kg N/ha

Incorporation within one day gives an ammonium-N retention factor of 0.75 (Table 2).

Retained ammonium-N = 11.1 × 0.75 = 8.3 kg N/ha

Poultry manure applied before June 15 has a Year 1 organic-N availability factor of 0.30 (Table 3).

Available organic N = 83.4 × 0.30 = 25.0 kg N/ha

Current-year plant-available manure N = 8.3 + 25.0 = 33.3 kg N/ha

B. Account for residual N from previous manure applications

Some manure organic N continues to mineralize in the years following the application year. If manure was applied in the previous one or two years, use the Year 2 or Year 3 factor in Table 3 and the original amount of organic N applied. Do not credit the old NH_4N again.

Residual manure N credit = original organic N applied $\times$ Year 2 or Year 3 factor

Record in worksheet: Residual manure N credit = _____ kg N/ha

Field example - Step 3B: Residual manure

For illustration, the previous-year poultry manure application supplied 50 kg organic N/ha at application. Using the Year 2 poultry factor of 0.15: $50 \times 0.15 = 7.5$ kg N/ha residual manure N credit.

Step 4: Determine Plant-Available N from Compost

Most N in finished compost is in organic forms and is released slowly. For a quick first-year estimate, use the compost C:N ratio and total N concentration to select an availability factor. Use a recent compost analysis and check whether the nutrient values are reported on a dry basis or as received. If total N is reported on a dry basis, first convert it to an as-applied concentration.

As-applied N % = dry-basis N % $\times$ (dry matter % $\div$ 100)

Then calculate total N applied

Total N applied (kg N/ha) = as-applied N (%) $\times$ 10 $\times$ compost rate (t/ha).

Table 4. Estimated plant-available N from compost during the first year after application

C:N ratio	Total N (% dry wt.)	Available N as % of total N	Available N as % of organic N
Below 10:1	Above 2%	10%	5%
10:1–20:1	1–2%	5%	2%
Above 20:1	Below 1%	0%	0%

Source: [How to Interpret a Compost Analysis Report](#)

Quick method: When working from total N, multiply the total N applied by the applicable 'Available N as % of total N' factor from **Table 4**.

Plant-available compost N = total N applied $\times$ first-year availability factor

Note: This is a general first-year estimate. Compost can also contain immediately available nitrate-N and ammonium-N. Where mineral N is analyzed, or where compost is applied in the fall, use the detailed guidance in [How to Interpret a Compost Analysis Report](#). Very high C:N compost (>30:1) can immobilize mineral N and should be interpreted cautiously. For additional background on organic N release, see [Nitrogen Mineralization from Organic Fertility Sources](#).

Record in worksheet: Plant-available compost N = _____ kg N/ha

Field example - Step 4

Finished compost: 50% dry matter, 2% total N on a dry basis, C:N ratio = 15:1, application rate = 8 t/ha.

As-applied N = $2 \times 0.50 = 1.0\%$.

Total N applied = $1.0 \times 10 \times 8 = 80 \text{ kg N/ha}$.

For a C:N ratio of 10:1-20:1, the first-year factor is 5% of total N.

Plant-available compost N = $80 \times 0.05 = 4.0 \text{ kg N/ha}$.

Step 5: Calculate Total N Credits and Remaining Fertilizer N Requirement

Add all applicable N credits, then subtract the total from the crop N requirement.

Total applicable N credits = legume cover crop N credit + current-year plant-available manure N + residual manure N + plant-available compost N + other documented N, if applicable

Remaining fertilizer N requirement = crop N requirement – total applicable N credits

If the result is zero or less, no additional fertilizer N is required for this year's crop. If the result is greater than zero, apply the required fertilizer to meet the crop N needs.

Field example - Step 5

Legume cover crop N credit = 80.0 kg N/ha

Current-year plant-available manure N = 33.3 kg N/ha

Residual manure N credit = 7.5 kg N/ha

Plant-available compost N = 4.0 kg N/ha

Total applicable N credits = $80.0 + 33.3 + 7.5 + 4.0 = 124.8 \text{ kg N/ha}$

Remaining fertilizer N requirement = $150.0 - 124.8 = 25.2 \text{ kg N/ha}$

Step 6: Convert Remaining N to a Fertilizer Product Rate

Fertilizer product rate (kg/ha) = remaining fertilizer N (kg N/ha) ÷ fertilizer N fraction

Field example - Step 6

Urea (46-0-0) contains 46% N, so the N fraction is 0.46.

Urea product rate = $25.2 \div 0.46 = \text{approximately } 55 \text{ kg urea/ha}$.

Before finalizing the application, also check whether manure or compost supplies more phosphorus (P) or potassium (K) than the crop requires. Organic amendments should not be applied solely to meet N needs if doing so creates an excessive P or K application

QUICK 4R CHECK BEFORE APPLICATION

- Source – Is the fertilizer source appropriate for the crop and field conditions?
- Rate – Have all applicable N credits been accounted for without double-counting?
- Time – Can N be applied closer to crop demand or split where appropriate?
- Place – Is the application method/placement suitable for reducing losses and improving crop access?
- Conditions – Are soil moisture, drainage and the weather forecast suitable for application?
- Balance – If manure or compost is used, are P and K additions also appropriate for the field?

Learn more: [4R Nutrient Stewardship](#)

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