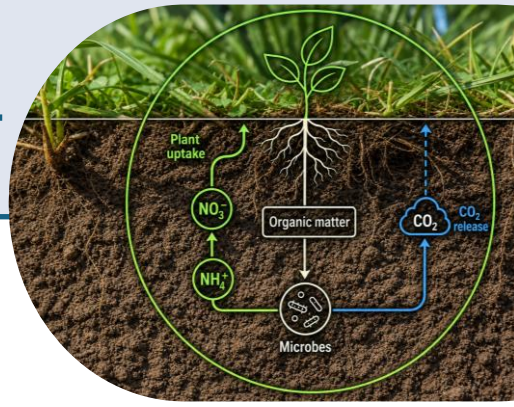
MINERALIZABLE NITROGEN, AND CARBON MINERALIZATION POTENTIAL

Soil Science Factsheet: Indicators of Soil Health



Potentially mineralizable nitrogen (PMN) and carbon mineralization potential (CMP) are lab tests that show what soil microbes can release from organic matter within a certain time span under ideal conditions. PMN shows how much nitrogen (N) may be released. CMP measures microbial "breathing" by measuring carbon dioxide (CO_2) released after soil is rewetted.

Together, these tests show how active soil biology is and how well nutrients are cycling. They are best used to track changes in the same field over time. They are not stand-alone soil health scores, and PMN is not a fertilizer recommendation.

Why do they matter ?

- They measure active soil processes, not only total organic matter content. Total organic matter changes slowly; PMN and CMP can respond sooner when management changes.
- They show how well soil biology is cycling carbon and nitrogen. This matters for residue breakdown, nutrient release, and long-term soil function.
- They often respond positively to cover crops, manure or compost amendments, crop residues, diverse rotations, and reduced tillage.

Measuring soil respiration and the mineralization of soil organic matter by soil organisms can provide indirect indicators of soil function and health. However, these results should be interpreted together with other soil properties (Image Credit: Creative Commons Attribution 3.0 Unported CC BY 3.0)

How can farmers use the results?

- Refine soil management by tracking changes in soil biological activity and nutrient cycling in a field over time.
- Compare management practices within a field or farm, such as cover crop versus no cover crop, or compost-treated versus untreated areas.
- Use the results with an advisor to ask whether active carbon and nitrogen cycling are improving, staying the same, or declining.
- Identifying soil conditions limiting crop production. Always interpret PMN and CMP together with other soil information, such as nutrients, pH, soil organic carbon, bulk density, aggregate stability, drainage, compaction, and water-holding capacity.

Important limitations

- Results can change with season, soil moisture, temperature, fresh residues, manure, recent tillage, and sample drying or storage. Use the same sampling depth, season, lab method, and sample handling each time. The B.C. Soil Health Assessment Protocol (SHAP) supports consistent sampling (see link below).
- Soil type matters. Texture, drainage, pH, mineralogy, climate, and field history can affect results. Avoid ranking different fields against each other.
- Analytical methods matter. Different labs may use different incubation times, temperatures, wetting steps, and ways to measure CO_2 or nitrogen, even how they report the results. Do not mix methods when tracking trends. The B.C. Soil Health Assessment Protocol (SHAP) supports consistent testing (see link below).
- Higher is not always better. A very high CMP after fresh manure or residue may show fast breakdown, but it does not prove that long-term soil carbon is increasing.

Interpreting PMN and CMP together

	Low CMP **< 35 mg CO_2-C/kg soil/24 h***	**High CMP** **> 75 mg CO_2-C/kg soil/24 h***
Low PMN **< 6 mg N/kg soil/week***	**Low activity, low N release** Soil biology may be limited, and little nitrogen is being released. Consider building organic matter with cover crops, residues, compost, or manure where appropriate. Also check compaction, drainage, pH, and moisture.	**Active microbes, low N release** Microbes are active, but little nitrogen is being released. Nitrogen may be limited or tied up in high-carbon residues, such as straw. Consider legumes, N-rich compost or manure, or better fertilizer timing.
High PMN **> 18 mg N/kg soil/week***	**Good N release, lower short-term microbial activity** The soil can release nitrogen, but short-term microbial activity appears low. There may be limited fresh carbon, or soil conditions may be slowing microbes. Consider cover crops, fresh residues, compost, or manure, and check moisture, aeration, compaction, and pH.	**High activity, high N release** This often suggests strong biological activity and good nitrogen cycling. Match manure and fertilizer timing with crop demand, avoid over-application, keep living roots where possible, and reduce fall or winter nitrate loss risk.

*Values are based on B.C. data (2024) measured across a wide variety of cropping systems and regions in B.C. using SHAP standards. Other methods may give different results.

The ranges are not pass/fail limits. They show plausible values under B.C. conditions only. They should not be used to compare farms or fields, because soil type, climate, and cropping history strongly affect the results. Rather than focusing on whether a value is labelled low or high, use the same methods to track whether results are improving, declining, or staying the same within the same field over time.

Find more information:

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Soil Health Assessment Protocols

Soil Health Assessement
B.C. Ministry of Agriculture and Food

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Nutrient Management

Nutrient Management, Tools and Programs
B.C. Ministry of Agriculture and Food

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Why Compost?

Compost Management
B.C. Ministry of Agriculture and Food

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Other resources and references

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