

Understanding the Manure Test Report



(Special Products Test Report)

Manure is a valuable farm resource that provides nutrients for crop production. Before spreading your fields with manure, you should know what it contains so that you're adding the right nutrients to the soil and not creating any environmental problems.

A manure test measures the amount of nitrogen, phosphorus, potassium, and several micronutrients to determine its fertilizing value. Nutrients in the manure can be matched to the requirements of a specific crop. Additional nutrient sources, such as fertilizer or compost, can be applied to balance what is lacking in the manure.

NOTE

Samples 'as received'

Test results are reported as received, or on a wet-basis rather than a dry-basis.

Laboratory Services reports test results 'as received' by the lab, or on a wet-basis, because that's the way manure is usually spread. The manure analysis also measures the % dry matter and the pH level.

The manure test is divided into two sections, as shown on the Special Products Test Report.

- Information on client and sample identification
- Results of the manure test

Client and Sample Identification

Client number

This is assigned to the producer the first time samples are taken to Laboratory Services. The client number remains the same for future samples.

Accession number

This is the unique identifier assigned by Laboratory Services to a single sample or a set of samples.

Samples reported

This is the date Laboratory Services produced the soil test report.

Samples received

This is the date Laboratory Services receives the samples for analysis.

Lab number

This is assigned by Laboratory Services to an individual sample for tracking and keeping records.

Type

identifies the sample type as manure, compost, or other organic material.

Sample ID

This is assigned to the sample by the client. It's often a name or a number.

Manure Test Results

Dry matter (%)

Dry matter indicates the dry weight of the manure after the water has been removed. The lab reports dry matter as the percentage of solids, which determines if it is liquid, semi-solid or solid.

Dry matter content in manure

- liquid — up to 10 per cent
- semi-solid — from 10 to 20 per cent
- solid — 20 per cent or more

pH

Manure is typically between pH 8-12, but don't expect manure to affect pH levels in soil.

- The pH scales ranges from 0 to 14, where 7 is neutral, below 7 is acidic, and above 7 is alkaline or basic.
- Each whole unit (1.0) is a ten-fold difference in the level of acidity. For example, pH 5.5 is ten times more acidic than pH 6.5.

Total nitrogen (%)

Nitrogen is reported as total nitrogen. This includes both the immediately available inorganic Ammonium-N (NH_4^+) and the slowly released organic nitrogen ($\text{NO}_3\text{-N}$). The amount of each type of nitrogen can vary dramatically (20 to 80 per cent), depending upon manure type and storage conditions.

Ammonium nitrogen is inorganic and immediately available to plants.

Organic nitrogen is released slowly, depending upon the livestock animal. The following shows the approximate amount available in the first year:

- dairy manure — 35 per cent
- beef manure — 25 per cent
- horse manure — 25 per cent
- sheep manure — 25 per cent
- chicken manure — 60 per cent
- hog manure — 50 per cent

Calculating total organic N weight in manure

Subtract the ammonium-N from the total N to determine organic N %.

$$\text{Total N} = \text{ammonium-N} + \text{organic N}$$

Multiply the organic N% by 10 to determine organic N in kilograms per tonne (t) of manure.

The available organic N available for the current year is multiplied by the animal % availability.

TIP

Ammonium-N — NH_4^+

Ammonium-N is immediately available to crops after land application.

Ammonium-N facts

- NH_4^+ is considered a quick-release nitrogen
- It's available the year it's applied to the crop
- It can easily be released as a gas, or volatilized, and lost into the environment if surface applied
- It's retained by 75 per cent if the manure is mixed into the soil immediately after application

TIP

Calculating total Ammonium-N (NH_4^+) by weight

Multiply the Ammonium-N % by 10 to determine Ammonium-N in kilograms per tonne (t) of manure.

$$NH_4^+ \text{ in } \% \times 10 = \text{total } NH_4^+ \text{ kg/t}$$

If the manure is surface applied, about **25%** of the total Ammonium-N will be available to the crop.

If the manure is mixed with the soil, about **75%** of the total Ammonium-N will be available to the crop.

Phosphorus (%)

Phosphorus is reported as total phosphorus, which includes forms that are available and unavailable to plants.

Phosphorus facts

- About 90 per cent of phosphorus is found in the solid portion of manure.
- Phosphorus is important for seed germination and root development. Fields with low phosphorus levels may not have well-developed root systems, leading to heavily-stressed plants during droughts. These fields will require re-seeding more often.
- It's important for vegetable, fruit, and grain maturity and quality.
- It improves nitrogen absorption by the crop.
- Research shows that it takes 3.5 kg of phosphorus, added through nutrients or removed during harvest, to change the level in a soil test by 1.0 kg/ha.

TIP

To convert phosphorus to its oxide available form of phosphate (P_2O_5), multiply phosphorus % by 2.29 to get the total P_2O_5 %. The manure report also provides this information.

P_2O_5 – phosphate (%)

Phosphorus has to be converted to phosphate (P_2O_5) to determine the phosphorus available to the plant. About 40 per cent of P_2O_5 is available in the first year of applying manure. Commercial fertilizers report the phosphorus amount in its oxide form, phosphate (P_2O_5).

TIP

Multiply P_2O_5 % by 10 to convert to P_2O_5 per tonne of compost (kg/tonne). 40% is available the year of application.

Potassium (%)

Potassium is reported as total potassium, which includes forms that are available and unavailable to plants.

TIP

To convert potassium to its oxide available form of potassium (K_2O), multiply potassium % by 1.2 to get the total K_2O %. The manure report also provides this information

Potassium facts

- Approximately 75 per cent of potassium is found in the liquid portion of manure.
- Potassium is important for growth, longevity and the over-wintering ability of perennial crops.
- Potassium is important for legumes. Nodules on legume roots are filled with bacteria that fix, or convert, nitrogen into a form that's usable by the plant. When legumes are grown on low-potassium soils, the bacteria can't fix as much nitrogen for the plant.
- Potassium is important for disease resistance and affects the taste and color of fruit and vegetables.
- Research shows that it takes 4.0 kg of phosphorus, added through nutrients or removed during harvest, to change the soil test level by 1.0 kg/ha.
- Levels of potassium in soil can decrease much more quickly than levels of phosphorus because crops remove significantly more potassium during harvest.

K₂O – potassium oxide

Potassium has to be converted to potassium oxide (K₂O) to determine the potassium available to the plant. About 90 per cent of P₂O₅ is available in the first year of applying manure. Commercial fertilizers report the potassium amount in its oxide form, K₂O.

TIP

Multiply K₂O % by 10 to convert to K₂O₅ per tonne of compost (kg/tonne). 90% is available the year of application.

Calcium (%)

Calcium is reported as the percentage by weight of calcium found in the manure.

Calcium facts

- Calcium is important for cell nutrition.
- It helps plants respond better to environmental and disease stresses.
- It improves uptake and use of other nutrients within the plant.

TIP

Calculating calcium (Ca) by weight in manure

Multiply the Ca (%) by 10 to determine total amount in kilograms per tonne (t) of manure.

$$Ca (\%) \times 10 = \text{total Ca (kg/t)}$$

Magnesium (%)

Laboratory Services reports magnesium as the percentage by weight of magnesium in the manure. Soils in Nova Scotia typically have medium to high levels of magnesium.

Magnesium facts

- Magnesium is important for plant photosynthesis.
- It helps legume nodules fix nitrogen.
- It helps move phosphorus within the plant.
- It helps prevent livestock disorders such as grass tetany and milk fever in cattle.

TIP

Calculating magnesium (Mg) and sodium (Na) by weight in manure

Multiply the Mg or Na (%) by 10 to determine total amount in kilograms per tonne (t) of manure.

$$Mg (\%) \times 10 = \text{total Mg (kg/t)}$$

$$Na (\%) \times 10 = \text{total Na (kg/t)}$$

Sodium (%)

Laboratory Services reports sodium as its percentage by weight found in the manure. Sodium isn't an important plant nutrient but can cause harm at high levels.

Iron (ppm)

This is the level of available iron found in manure. Laboratory Services reports it in parts per million (ppm), which is equal to one gram per tonne (g/t).

Iron facts

- Iron is important for crops that prefer acid soils such as blueberries, strawberries, grain, soybeans, and cole crops such as cabbage and broccoli.
- It's an important part of nitrogen-fixing in legume crops.

Manganese (ppm)

This is the level of available manganese found in manure. Laboratory Services reports it in parts per million (ppm), which is equal to one gram per tonne (g/t).

Manganese facts

- Manganese increases seed germination rates and reduces time to harvest because it increases phosphorus and calcium availability to the crop.
- A manganese deficiency can be a problem for soybeans if the field has high pH, heavy clays in the soil, and low soil Mn levels.
- Crops that have a high response to manganese are beans, cereals, soybeans, and vegetables.

Copper (ppm)

This is the level of available copper found in manure. Laboratory Services reports it in parts per million (ppm), which is equal to one gram per tonne (g/t).

Copper is an important nutrient for all animals except sheep, where it can be toxic even at low levels.

Copper facts

- High pH levels and high levels of phosphorus, zinc, and iron will decrease copper uptake in plants.
- Crops that respond to copper are alfalfa, grain, lettuce, onions, beets, spinach, blueberries, watermelons, and tomatoes.
- Some animal manures have high levels of copper from copper foot baths.
- Toxic affects from applying too much copper can last for years.

Zinc (ppm)

This is the level of available zinc found in manure. Laboratory Services reports it in parts per million (ppm), which is equal to one gram per tonne (g/t).

Zinc is important for root development. It can be tied up and unavailable to the crop when soil levels of phosphorus are over 1000 kg/ha.

Zinc facts

- Zinc affects the rate of maturation of both seed and stalks.
- Crops that respond highly to zinc are corn, beans, onions, and spinach.

Boron (ppm)

This is the level of available boron found in manure. Laboratory Services reports it in parts per million (ppm), which is equal to one gram per tonne (g/t).

In sensitive crops, boron is important in reducing nutritional disorders that affect marketability. Boron moves easily in the soil (leaches) so fields with low boron levels should receive annual applications when growing sensitive crops. Most fields in Nova Scotia have low levels of boron.

Boron facts

- Plant tissue tests can be better indicators of boron levels than a soil test.
- Boron is most available to crops when soil has a pH of 5 to 7.
- If levels are too low, below 0.5 ppm, sensitive crops should respond if you apply 1.1 to 2.2 kg/ha.
- Vegetables are sensitive to boron, especially root and cole crops. At levels below 0.7, many vegetables need between 1.1 to 3.3 kg/ha of boron.
- Alfalfa grows and survives longer with higher levels between 1-3 ppm.
- Clovers grow best between 0.5-2.0 ppm.
- Grain, corn, and grass grow best between 0.5-1.5 ppm.