TraceBIO™

Nutrient Cycling Indicator Report

CROP	GROWER	FARM	FIELD	SAMPLING DATES
Potato	sample 1	MCCAIN	1	06/27/2023

Sample Name	Sample Date	Tags	Crop	Bacterial Diversity	Denitrification Potential	Nitrate Ammonification Potential	Nitrification Potential	Oxygen Availability	Phosphorus Mineralization Potential	Phosphorus Solubilization Potential
88997	06/27/23		Potato	1195.79	0.52	0.16	0.29	67.02	0.6	1.09

*** All measurements are unitless**

Legend	Crop	Bacterial Diversity	Denitrification Potential	Nitrate Ammonification Potential	Nitrification Potential	Oxygen Availability	Phosphorus Mineralization Potential	Phosphorus Solubilization Potential
	Potato	<1104.17	>0.5	<0.08	>0.26	<73.82	<0.49	<0.73
		>1524.59	< 0.35	>0.16	< 0.22	>79.69	>0.59	>0.87

Indicator	Definition
Bacterial Diversity	Bacterial Diversity •The bacterial diversity indicator is a unitless index that takes into account the number of species present (richness) as well as the relative abundance of each species (balance or evenness). •This diversity indicator includes both bacteria and archaea, which are classified as prokaryotes and both are typically unicellular organisms. Certain soil processes are carried out either by bacteria or archaea or both. For example, both groups are involved in nitrification. To ease communication we use the term “bacterial” diversity instead of “prokaryotic” diversity, as the former is more familiar to most users. •Bacterial diversity is expected to be higher at moderate soil pH (not very acidic nor very alkaline) and in soils that experience minimal disturbances, such as no-till. Bacterial diversity also tends to increase with decreasing soil moisture content.
Denitrification Potential	Nitrate (NO_3^-) → Dinitrogen/Nitrous Oxide (N_2/N_2O) • Denitrification is a process where specific soil organisms convert nitrate to gaseous forms of nitrogen. • The Denitrification indicator represents the abundance of genes belonging to denitrifying organisms and are specifically involved in these nitrogen transformation processes. • This form of loss mainly occurs in waterlogged soils with reduced oxygen availability. Addressing the source of waterlogging or making multiple in-season nitrogen applications are ways to mitigate nitrogen loss through denitrification.
Nitrate Ammonification Potential	Nitrate (NO_3^-) → Ammonium (NH_4^+) • The Nitrate ammonification indicator represents the abundance of genes belonging to organisms that have the capability of converting nitrate to ammonium. • This process can contribute to nitrogen retention by counteracting nitrogen loss from leaching or denitrification, particularly under low oxygen conditions and at higher soil pH. • This process is also known as Dissimilatory Nitrate Reduction to Ammonium (DNRA).

Indicator	Definition
Nitrification Potential	Ammonium (NH_4^+) → Nitrate (NO_3^-) • Nitrification is a process where specific soil microorganisms convert ammonium to nitrate, which is the form of nitrogen that is most susceptible to loss. • The Nitrification indicator represents the abundance of genes belonging to nitrifying organisms and which are specifically involved in this process.
Oxygen Availability	• The Oxygen availability indicator reflects the oxygen status of the soil by quantifying the amount of organisms that are adapted to low oxygen levels. • This indicator gives us insight into the porosity and waterlogging of soil and contributes to the interpretation of other microbial indicators that are sensitive to oxygen, such as Denitrification.
Phosphorus Mineralization Potential	Organic Phosphorus → Phosphate (PO_4^{3-}) • The Phosphorus mineralization indicator represents the abundance of genes belonging to organisms that release available phosphorus from organic forms. • This allows phosphorus that is stored in soil organic matter to be added to the plant-available pool.

Indicator	Definition
Phosphorus Solubilization Potential	Non-Labile Phosphate (PO_4^{3-}) → Plant-Available Phosphate (PO_4^{3-}) • The Phosphorus solubilization indicator represents the abundance of genes belonging to organisms that are involved in the process of liberating phosphate from soil minerals. • This allows previously plant-unavailable phosphorus to be added to the plant-available pool.