Soil Science: The Nitrogen Cycle, Nitrogen Fixers, and Fertilizer Dynamics Explained

These plants elevate nitrogen levels in the soil, essential for other plants’ protein production and chlorophyll synthesis, crucial for their growth and photosynthesis. Utilizing nitrogen fixers in gardening involves interplanting them with nitrogen-demanding plants, ensuring a balanced soil ecosystem.

Nitrogen-Fixing Plants

While these nitrogen-fixing plants themselves don’t fix nitrogen, they create an environment conducive to nitrogen-fixing bacteria. Clover, for instance, develops nodules in its roots that host significant quantities of these bacteria. The ammonium produced by these bacteria gradually enriches the soil, benefiting neighboring plants and microorganisms. Upon the death of the plant, these bacteria disperse into the soil, becoming a reservoir for future plants’ nitrogen requirements.

Role of nitrogen fixing organisms

Nitrogen’s movement in soil differs: loose nitrogen can be carried away by water, contributing to potential soil erosion, but nitrogen bound within organisms remains unaffected. Fertilizers, adding pure nitrogen without the essential organisms, create runoff during rainfall, leading to water pollution. Additionally, loose nitrogen is prone to volatilization, emitting significant amounts of nitrous oxide, a potent greenhouse gas. This pure nitrogen excess can negatively impact soil ecosystems, disrupting earthworm populations, beneficial root fungi, and altering soil pH, ultimately affecting bacterial communities crucial for soil

health.

When nitrogen gets depleted or washes away, the absence of these vital organisms hampers plants’ ability to acquire more nitrogen naturally. This dependency on external fertilizers exacerbates the problem, disrupting the natural nitrogen cycle. These organisms’ significance extends beyond nitrogen supply; root fungi associated with them also facilitate the uptake of essential minerals vital for plant growth and health.