PLANTY ORGANIC: LONG-TERM CROP ROTATION WITH PLANT-BASED NUTRITION

Summary

Planty Organic is a long-term farming experiment that began in 2012 at the SPNA experimental farm in Kollumerwaard. It focuses on organic crop production using only plant-based inputs. Instead of animal manure or synthetic fertilizers, the system uses legumes, cover crops, green manures, and "cut-and-carry" plant materials to feed the soil. The main crops include potatoes, pumpkins, grains, and grass-clover.

The need

Planty Organic began with a question from a group of organic arable farmers in the Northern clay region of the Netherlands: *How can we make better use of nitrogen in organic farming—and improve efficiency without relying on animal manure or synthetic fertilizers?*

That question sparked the start of the Planty Organic experiment in 2012. The research uses a crop plan typical for the region—potatoes, pumpkins, carrots, grains, and grass-clover—supported by green manures. What makes it unique is its commitment to plant-based inputs only.

For the first 10 years, no minerals or manure were added. Instead, grass-clover was harvested and returned to the field as fertilizer—a method known as “cut and carry.”

After this initial period, compost and bokashi were introduced into the system. However, even today, no animal manure or synthetic fertilizers are used—staying true to the plant-based approach that inspired the project.

The benefits

No Animal By-Products
Plant-based fertilizers contain no liquid manure, bone meal, or blood meal. This greatly reduces the risk of contamination with pathogens, hormones, or antibiotics—a key benefit, especially for organic farmers.

Healthier Soil and More Biodiversity
These fertilizers feed soil life by providing organic matter that supports beneficial microbes. Materials like vegetable compost and cover crops help build a living, resilient soil with better water retention and natural disease resistance.

Less Dependence on Livestock
Using plants and organic waste as fertilizer reduces reliance on animal manure—an important advantage in regions like the Netherlands, where organic manure is costly. It also supports a more circular, plant-based farming system.

Vegan-Friendly Certification
With growing demand for plant-based products, avoiding animal inputs can help meet vegan certification standards—opening doors to niche markets and premium pricing.

Lower Risk of Nutrient Leaching
Unlike synthetic fertilizers or liquid manure, many plant-based fertilizers release nutrients slowly, allowing crops to absorb them over time and reducing the risk of groundwater contamination.

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trans4num solution

Within the trans4num project, we are exploring how plant-based fertilization can shape the future of sustainable farming. Several ongoing experiments are helping us better understand its impact:

- **Microbial research with Wageningen University**

Wageningen University is studying our fields to compare the microbiological effects of plant-based nutrition with those of conventional organic farming systems.

- **On-farm implementation with over 20 farmers**

Since 2022, more than 20 arable farmers have started applying our knowledge to improve their use of cover crops—supported by one of the Netherlands' largest farmer cooperatives. Their advisors play a key role in sharing practical results.

- **Pioneering fully plant-based farming**

A small number of organic farmers have now fully transitioned to plant-based nutrition. At the moment, this is the only known method that enables 100% vegan-certified food production.

- **Farm of the Future**

We've launched a new long-term field experiment called The Farm of the Future, where we apply this knowledge in a conventional arable farming system. Nature-Based Solutions (NBS) guide our approach—combining innovation with environmental care.

What were the challenges / limitations in the implementation process?

One of the main challenges with plant-based fertilization is the mismatch between **nitrogen supply and crop demand over time**. This imbalance can lead to significantly lower yields for certain crops.

We currently lack detailed knowledge about the optimal timing and methods for applying plant-based fertilizers. Understanding how to synchronize nutrient release with crop needs is crucial for improving performance and reliability in fully plant-based systems.

What kind of resources do you need to implement the proposed solution?

Modeling tools like N-DICEA: Tools such as N-DICEA can help us analyze and even predict the optimal fertilization strategy by simulating nitrogen dynamics in organic systems. These models are essential for aligning nutrient supply with crop demand more precisely.

More knowledge about soil microbiology: We also urgently need a better understanding of the microbiological processes in the soil. Soil life plays a key role in how nutrients become available to plants—especially in systems that rely entirely on organic and plant-based inputs.

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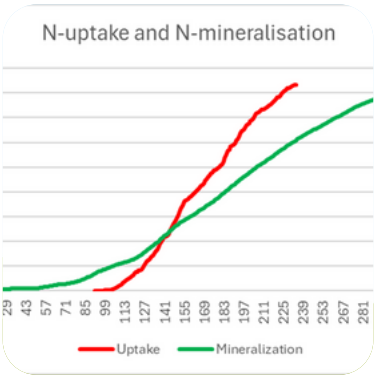
More information

- trans4num Dutch NBS site



Learn more about the project at https://trans4num.eu/en/

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