

65 years-long research concludes: Mineral fertilizer supports sustainable agriculture

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Dülmen, Germany, September 5, 2023: The long-term trial (LTT) was conducted at Yara International's Hanninghof research center in Dülmen, Germany, and studied the long-term effects of nutrient management in farming. The study concludes that balanced application of mineral fertilizer is part of sustainable crop production, with minimal environmental impact.

Established in 1958, the LTT portrays the pivotal role of balanced nutrition in soil health maintenance. The research findings address the challenges facing the global food system, and the increasingly urgent need for effective resource management to ensure a resilient food system while protecting the environment.

- *The global food system is faced with fundamental challenges: We need to produce more nutritious food to feed a growing world population, while transforming the way in which food is produced, to build healthier soil, reduce greenhouse gas emissions and create a more sustainable food system. This study shows that applying the right nutrients, in the right amount, at the right time and at the right place, brings both environmental benefits and farmer profitability, says Rejane Souza, SVP Global Innovation at Yara International.*

The relationship between nutrient application and soil fertility is best studied in LTTs because soil fertility develops gradually. Therefore, evaluating its effect on crop production requires monitoring over a long time and proper data documentation. It can take decades before changes become visible, for example, trends of crop yield and effects of the environment on agriculture or vice versa.

Since agriculture is removing nutrients from the soil with each harvest, an efficient replacement of nutrients back into the soil is required to sustain crop yields. While an unbalanced application of nutrients results in low nutrient use efficiency and high environmental pollution, the Hanninghof study concludes that the best solution to achieve both effective and sustainable agriculture is a balanced combination of mineral nutrients and integration of organic fertilizer available on the farm with mineral fertilizer.

- *Agriculture's deep connection to the world economy, human societies, and biodiversity makes it one of the most important frontiers for global conservation. More than six decades of research demonstrates that a balanced and combined application of mineral and organic fertilizers supports the social, economic and environmental aspects of sustainable agriculture. This science-based approach to crop nutrition management is a legacy for sustainable food production because it increases crop yields and farmer prosperity, says Dr. Dejene Eticha, senior scientist at Yara International.*

Key findings from Hanninghof LTT

- **Increased soil health:** Application of mineral and organic fertilizers increased soil organic carbon (SOC) compared to the treatments without any fertilizer. This was also observed in many long-term studies around the globe; e.g., in Magruder LTT at Oklahoma, Aula et al. (2016) reported a significant increase in soil organic carbon content through the application of either nitrogen and phosphorus, or nitrogen, phosphorus and potassium combined compared to plots without any fertilizer.
- **Increased water use efficiency:** The use of nitrogen, phosphorus, potassium and magnesium fertilizer resulted in the highest water use efficiency compared to omitting nutrients or using just manure alone. Omitting nutrients decreased water use efficiency by up to 63%.
- **Improved profitability:** Application of the mineral nutrients; nitrogen, phosphorus, potassium and magnesium fertilizers as a balanced nutrition resulted in the highest yield and income of crop. Omitting nutrients reduced crop yield and resulted in an economic loss of between 89 and 812 USD per hectare.

The study, titled *Effect of Balanced and Integrated Crop Nutrition on Sustainable Crop Production in a Classical Long-Term Trial*, was conducted by scientists Melkamu Jate and Joachim Lammel. The

Hanninghof trial involved crops grown on 16 plots of loamy sand soil that were given either organic fertilizers, mineral fertilizers (Nitrogen, Phosphorus, Potassium and Magnesium), various combinations of the two or neither of the above.

The complete long-term trial can be read here.

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About Yara:

Yara grows knowledge to responsibly feed the world and protect the planet. Supporting our vision of a world without hunger and a planet respected, we pursue a strategy of sustainable value growth, promoting climate-friendly crop nutrition and zero-emission energy solutions. Yara's ambition is focused on growing a nature positive food future that creates value for our customers, shareholders and society at large and delivers a more sustainable food value chain.

To achieve our ambition, we have taken the lead in developing digital farming tools for precision farming and work closely with partners throughout the food value chain to improve the efficiency and sustainability of food production. Through our focus on clean ammonia production, we aim to enable the hydrogen economy, driving a green transition of shipping, fertilizer production and other energy intensive industries.

Founded in 1905 to solve the emerging famine in Europe, Yara has established a unique position as the industry's only global crop nutrition company. We operate an integrated business model with around 17,000 employees and operations in over 60 countries, with a proven track record of strong returns. In 2022, Yara reported revenues of USD 24 billion. www.yara.com

About Yara Agronomic Research and Development (YARD):

Yara Agronomic Research and Development (a.k.a. YARD) is a diverse and engaged global team with broad and deep expertise. YARD focus on innovation and value capture by ensuring agronomically sound content embedded in all new solutions development or expanded reach/value capture of current solutions, regardless of the type of solution (fertilizers, biostimulants, recommendations, tools, services, knowledge sharing, etc.).

Attachments

- Rejane Souza
- Hanninghof Field Trial
- Hanninghof Research Center

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