Tropentag, September 10-12, 2025, hybrid conference

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Assessment of continuous fertilisation effects on irugur soil series in a sunflower–maize cropping framework

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Abstract

In 2019, the Kumaraguru Institute of Agriculture, Tamil Nadu, India initiated a Permanent Manurial Experiment aimed at evaluating the long-term effects of various nutrient management strategies on soil fertility and crop productivity. The experimental treatments included: a control (no input), organic manuring, Soil Test Crop Response (STCR) -based inorganic fertilisation, Integrated Nutrient Management (INM) following blanket recommendations as per the Crop Production Guide (CPG), and STCR-based Integrated Plant Nutrient System (STCR-IPNS). These treatments were implemented under a sunflower–maize cropping sequence.

Over the course of five cropping cycles, the STCR-IPNS treatment consistently recorded the highest yields for both sunflower and maize. In contrast, the plot treated solely with organic manures showed a decline in fertility status during the first two cycles. However, by the third cropping cycle, this treatment demonstrated a significant improvement in soil organic carbon content, rising from an initial value of 0.28 % to 0.48 %.

Moreover, the availability of essential macronutrients—nitrogen (N), phosphorus (P), and potassium (K)—was notably higher in the STCR-IPNS treated plots, followed closely by the organically manured plots. Enhanced microbial and enzymatic activities were observed in plots receiving STCR-IPNS, organic manures, and INM based on blanket recommendations. This indicates a positive correlation between integrated nutrient application and biological soil health.

Although plots treated with inorganic fertilisers alone exhibited increased yields, they experienced a reduction in microbial activity, highlighting a potential long-term risk to soil vitality. The findings underscore the significance of adopting a balanced nutrient management approach. Specifically, the integration of soil test-based fertiliser application with organic amendments, as demonstrated in the STCR-IPNS treatment, not only boosts crop yield but also sustains soil health over time. This holistic method stands out as a sustainable strategy for modern agriculture.

Keywords: Long term impact, nutrient management, soil health, sustainable production

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