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Nutrient Management: The Key to Profitable Rice Farming

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INTRODUCTION

Rice cultivation is adaptable to both arid and aquatic environments, thriving across a diverse array of latitudes and varying soil, climatic, and hydrological conditions. It is predominantly cultivated in the humid and subhumid regions of the tropics and subtropics. The global average yield for irrigated rice stands at 5 tons per hectare; however, this figure exhibits significant variability at national, regional, and seasonal levels. In tropical regions, proficient rice farmers can achieve yields of 7 to 8 tons per hectare during the dry season, while yields during the wet season typically range from 5 to 6 tons per hectare, influenced by reduced solar radiation due to cloud cover. Conversely, the productivity of rainfed upland and flood-prone deep-water rice remains low, stagnating around 1.0 tons per hectare (Dobermann and Fairhurst, 2000). To attain high grain yields, modern rice varieties necessitate an adequate supply of essential nutrients. The intensification of rice production and the anticipated future demand will require knowledge-driven strategies for the efficient utilization of all inputs, including fertilizers. An imbalanced application of fertilizers not only exacerbates the deficiencies of nitrogen, phosphorus, potassium, and micronutrients in the soil (Ladha *et al*., 2003) but also proves to be economically unviable and poses environmental risks.

To elevate rice productivity, the implementation of refined nutrient management practices has become indispensable within contemporary rice cultivation techniques. The efficiency of nutrient use in rice can be significantly augmented through the strategic application of both inorganic and organic nutrient sources, tailored fertilizer application rates, optimal methods, and precise timing of fertilizer application, alongside effective water management, soil pH regulation, and the selection of high-yielding cultivars suited to specific environments. The importance of proficient nutrient management in rice cannot be overstated, as it plays a crucial role in boosting yields and profitability in the short term while also fostering superior ecological management in the long run.

Why is nutrient management important in rice?

- **Increased yield:** Nutrient management can help to increase rice yields by ensuring that the crop has access to the nutrients it needs to grow and produce a good harvest.
- **Improved quality:** Nutrient management can also help to improve the quality of rice grain. For example, adequate nitrogen fertilization can lead to larger grains with higher protein content.
- **Reduced costs:** Nutrient management can help to reduce input costs by ensuring that fertilizer is applied efficiently and that nutrient losses are minimized.
- **Improved soil health:** Nutrient management can also help to improve soil health by maintaining the levels of essential nutrients in the soil.

Consequences of poor nutrient management in rice

Poor nutrient management can lead to several negative consequences, including:

- ✓ **Reduced yields:** Rice plants that do not have access to the nutrients they need will not reach their full potential, resulting in reduced yields.
- ✓ **Poor grain quality**: Poor nutrient management can also lead to poor grain quality. For example, inadequate nitrogen fertilization can lead to small grains with low protein content.
- ✓ **Increased costs**: Poor nutrient management can lead to increased input costs due to over-fertilization and nutrient losses.
- ✓ **Degraded soil health**: Poor nutrient management can also lead to degraded soil health. This is because the excessive use of fertilizer can lead to soil acidification and the loss of essential nutrients.

Integrated Plant Nutrient Management in Rice

The Integrated Pest and Nutrient Management (IPNM) approach in rice cultivation significantly contributes to the health of soils that typically have low organic matter levels, a common issue in South Asia (Katyal et al., 2001). In recent years, many long-term experiments on rice-based cropping systems in South Asia have shown that integrated management of different organic materials and mineral fertilizers resulted in positive impact on productivity of the rice and improve the soil organic carbon content.

CONCLUSIONS

Fertilizers represent 20–25% of the overall production costs in lowland rice farming. As a result, enhancing rice yields per unit area through effective nutrient management practices has become a crucial aspect of contemporary rice production technology. To maximize the efficiency of nutrients applied as fertilizers, improve agronomic performance, and boost rice yields, there is a growing emphasis on transitioning from generic fertilizer guidelines to tailored, site-specific nutrient management strategies. The challenge moving forward is to integrate innovative technologies into actionable management practices, ensuring that all rice farmers, including those with limited resources, can implement effective nutrient management techniques.

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