Site Specific Nutrient Management for Rice

Sushanta Kumar Jata
Dr. M. Nedunchezhiyan
Dr. K. Laxminarayana

Nutrient management is a major component of a soil and crop management system. Knowing the required nutrients for all stages of growth and understanding the soil's ability to supply those needed nutrients is critical to profitable crop production. Site specific nutrient management is applying those concepts to areas within a field that are known to require different management from the field average.

Site specific crop and soil management is really a repacking of management concepts that have been promoted for many years. It is basically taking a systematic approach to applying sound agronomic management to small areas within a field that can be identified as needing special treatment.

The component of site-specific management may not be new but we have the capability with new technology to use them more effectively. Site specific management include practices that have been previously associated with maximum economic yield management, best management practices as well as general agronomic principles. The systematic implementation of these practices in to site specific systems is probably our best opportunity to develop a truly sustainable agriculture system.

At present the site specific nutrient management for rice crop is developed and adopted by the farmer all over the world.

What is Site Specific Nutrient Management

Many of nutrients required by rice plants come from soil. But the supply of nutrients is typically insufficient to meet the nutrient requirements for high rice yields. The use of fertilizer is consequently essential to fill the gap between the crop needs for nutrients and the supply of nutrient from soil and available organic inputs.

Principle of SSNM

Site Specific Nutrient Management (SSNM) is an approach to feeding rice with nutrients as and when needed. The application and management of nutrients are dynamically adjusted to crop needs of the location and season. The SSNM approach aims to increase farmers profit through:

(i) Increased yield of rice per unit of applied fertilizer.
(ii) Higher rice yields, and
(iii) Reduced disease and insect damage.

The features of Site Specific Nutrient Management are:

1. Optimal use of existing indigenous nutrient source such as crop residues and measures.
2. Application of Nitrogen (N), Phosphorous (P) and Potassium (K) fertilizer is adjusted to the location and season specific need of the crop.
(a) Use of the leaf colour chart ensures that nitrogen is applied at the right time and in the amount needed by the rice crop which prevent wastage of fertilizer.

(b) Use of nitrogen omission plots to determine the P & K fertilizer required to meet the crop needs. This ensures that phosphorous and potassium are applied in the ratio required by the rice crop.

3. Local randomization for application of zinc, sulphur and micronutrients are followed.

4. Selection of most economic combination of available fertilizer sources.

5. Integration with other integrated crop management (ICM) practices such as the use of quality seeds, optimum plant density, integrated pest management and good water management.

Why use Site Specific Nutrient Management

(a) Nutrient use efficiency:

Under current management practices, the rice crop takes up only one bag in three of nitrogen (H) fertilizer applied to the rice. Additionally, farmers often fail to apply Nitrogen (N), Phosphorous (P), and Potash (K) in the optimal ratio to meet the need of rice plants. Site Specific Nutrient Management (SSNM) provides an approach for feeding rice with nutrients as and when needed.

(b) Increase Profitability:

The major benefit for formers from improved nutrients management strategy is an increase in the profitability or rice cropping. SSNM eliminates wastage of fertilizer by preventing excessive rates of fertilizer and by avoiding fertilizer application when the crop does not require nutrient inputs. It also ensures that N, P, K are applied in the ratio required by the rice crop.

When to use SSNM:

Suitable target areas for the introduction of improved nutrient management strategy is likely to have one or more of the following characteristics. Insufficient or imbalanced use of fertilizer, resulting in the low attainable yield despite high yield potential find out about local fertilizer use from farmers' fertilizer suppliers and extension worker.

Occurrence of nutrient deficiency symptoms:

Occurrence of pest problems link to nutrient imbalance or over use of fertilizer (N) (e.g. sheatt blight and rice blast) Inefficient fertilizer (N) we because of high total (H) rates or inadequate splitting and timing of application fertilizers. Evidence of strong mining of soil indigenous park.

Implementing SSNM

Once we have determined that implementing Site Specific Nutrient Management (SSNM) will be beneficial in a particular area, we should follow three main steps to carry out a successful extension campaign.

Step -1

Select an economic yield target. This is essential to determine the required application rate of N, P and K nutrients only it we know that yield increases we are targeting. We can determine appropriate nutrient application rate. Select an economic yield target base on the following criteria. As a general rule, select our yield target i.e. based on the average yield of the pest 3-5 crops (same season) pulls to 20% achievement as visible yield increase.

Select an yield target of not more than 75-80% of the potential yield determined at experimental stations. If such information is not available, use the highest yields reported from farmers' fields. Yield target that are too close to the potential yield may require excessive amount...
of fertilizer inputs and increase the risk of crop failure.

Select a high yield target in the high yield season favourable climate conditions and a moderate yield target in lower yield seasons less favourable climate conditions and greater risk of the crop failure because of pest and disease.

**Step - 2**

Estimate soil nutrient supplies using nutrient omission plots only if we know that nutrients are deficient, as evidenced by given yield. Appropriate nutrient application rate will be calculated by subtracting the yield attained is nutrient deficient plot from the target yield for a crop identified in step-1, omission plots visually demonstrate to farmers the nutrient deficit in their fields. The required rate of 'P' & 'K' fertilizer can be calculated in area with no nutrients limitation. The use of omission plots consequently helps ensure that 'P' & 'K' are applied in the ratio required by the rice crop. Farmers themselves establish small omission plots embedded within their fields. In 'P' omission plots, in 'K' omission plots no K fertilizer is applied. But other nutrients are adequately supplied. The supply of soil nutrient can be estimated from yield in omission plots. Because the deficiency nutrient not supplemented with fertilizer limits plant growth and yield.

At crop maturity, major grain yield from a central 2m x 2.5m are in each omission plot. Cut all panicles and place them in a plastic sheet to prevent yield loss. Strip all the spikelet carefully, remove unfilled spikelets and spread the grass on the plastic sheet, dry the grain in the full sun light for one whole day to reach grain moisture content of about 12.6%. It may take 2-3 days to sundry the grain fully in a rainy season express grain yield (GY) in t/ha.

Average the yield estimates obtained from 10-20 farmers' fields for each omission plot type to obtained the average 'N' - limited yield (yield in F - plots) the average 'P' limited yield (yield in O P plots) and the average 'K' limited yield (yield in O K Plots).

94 yield mesurements in the omission plots indicate large differences in soil nutrient supply within particular area of your recommendation domain, consider dividing the domain into two or more areas as a rule of thumb. The average rule of omission plots should differ consistently by at least t/ha to justify two separate domains.

**Step-3**

Manage N, P and K nutrient inputs based on fertilizer rates calculated from date gathered in steps-1 and 2. Once we have selected any yield target (Step-1) and estimate soil nutrient supply (Step-2) you can begin to manage N, P and K nutrient inputs. The management of N uses visual indicators of deficiency while the management of P and K primary involves preventing deficiency in the soil rather than treating observable deficiency symptoms in the crop.

**Advantages of SSNM :**

Site specific nutrient management is a concept that can be applied to any field or any crop, while most often use of computer and satellite technology in the site specific nutrient management does not require special equipment and does not require a large farming operation. The technology tools certainly expand the capabilities for using site specific management.

---

Sushanta Kumar Jata is working at SRF, NAIP, RC of CTCRI, Dumuduma Housing Board Colony, Bhubaneswar-751019.

Dr. M. Nedunchezhiyan is working as Senior Scientist (Agronomy) at RC of CTCRI, Dumuduma Housing Board Colony, Bhubaneswar-751019.

Dr. K. Laxminarayana is working as Senior Scientist (Soil Science) at RC of CTCRI, Dumuduma Housing Board Colony, Bhubaneswar-751019.