IPNI Plant Nutrition TODAY
Better Crops, Better Environment...through Science

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# THE RIGHT WAY TO GROW RICE…4R NUTRIENT STEWARDSHIP

**Rice is life … for about three billion people in the world today.** And, with the world's population growing every day, improved fertilizer management is now more critical than ever in order to achieve the necessary increases in rice yield and quality. 4R Nutrient Stewardship can help growers apply the right fertilizer source, at the right rate, at the right time, and in the right place needed to meet their rice production goals. The practices resulting from a *combination* of these factors are site-specific, of course, but the scientific principles are universal.

**Choosing the right fertilizer source for any crop requires an understanding of soil and environmental conditions.** In rice, this means recognizing how plant nutrients behave under flooded, anaerobic conditions. For example, elemental S must be oxidized into the sulfate form to become plant available; this reaction can't happen in a flooded field. So, S requirements in rice are best met using a sulfate fertilizer source like ammonium sulfate.

**Nutrient requirements for rice, particularly N, are dependent on variety or hybrid.** Yield potential, growth duration, susceptibility to lodging, whether the rice is first crop or ratoon; all of these things affect the nutrient requirement. Now some of this nutrient requirement for rice will be provided by the soil; the rest must be added using fertilizer. In the US and other developed rice-producing nations, soil testing is the predominate method used for determining soil nutrient supply and fertilizer application rates. However, throughout much of Asia, where 90% of the world's rice is produced, soil testing is not available. For these regions, there are science-based, decision support tools like Nutrient Manager™ or the Nutrient Expert™ software that are available to help growers choose the right fertilizer rate for their fields.

**The right timing choice for rice depends on production system, but whether the rice is water-seeded, drill-seeded, or transplanted, early season N is critical for tiller development.** However, applying too much N early is not advised because of the risk of losing the flood and much, if not all, of the early-applied N. So to address this, most rice production systems around the world recommend splitting the N into multiple applications during the growing season. On coarse-textured, low CEC soils, splitting K between pre-flood and panicle initiation has also proven beneficial; however, P and other nutrients are not typically utilized more efficiently when applied in multiple doses.

**In many situations, the right place for immobile nutrients like P is banded near the plant to increase uptake efficiency.** This practice is especially effective in soils with low pH where much of the applied P gets tied up by iron or aluminum. In rice however, banding is not as much of an issue because once the field is flooded, the soil pH moves toward neutral, which increases the availability of soil P. It is important to remember, however, that even though no P deficiencies may have been observed in a rice crop, once the field is drained, pH will return to near its original level and P deficiencies can appear in subsequent crops.

**4R Nutrient Stewardship provides the framework needed to increase productivity and profitability of rice production in both the highly intensive agricultural systems of the developed world and the smallholder systems in developing nations.** It is this increase in productivity aligning with the environmental and social goals of sustainable agricultural systems that will be critical to help feed the growing population and ultimately provide global food security.

To learn more about how the 4Rs can be applied to rice production, visit the IPNI website www.ipni.net in early 2013 to view the video "The Right Way to Grow Rice…4R Nutrient Stewardship." If you want to simply know more about 4R Nutrient Stewardship, check out the currently available DVD "The Right Way to Grow…4R Nutrient Stewardship".

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Abbreviations: N = nitrogen; P = phosphorus; K = potassium; S = sulfur; CEC = cation exchange capacity.

Note: ***Plant Nutrition TODAY*** articles are available online at the IPNI website: www.ipni.net/pnt