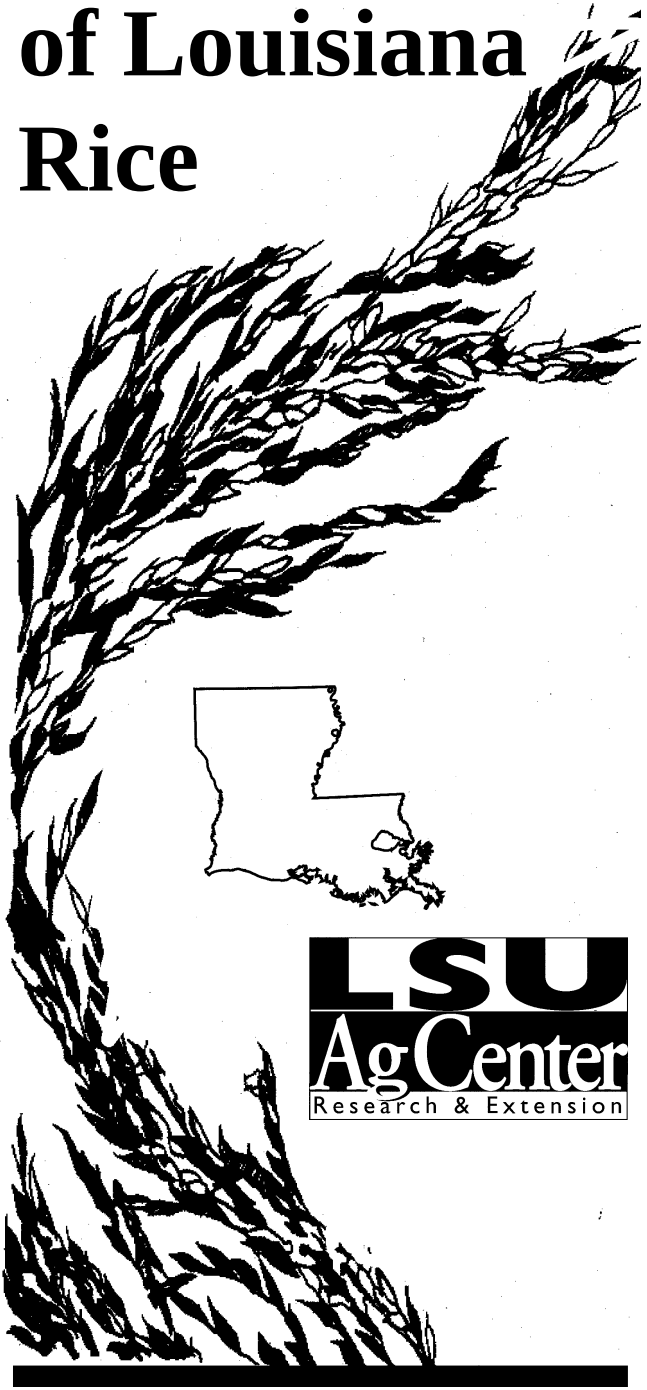
# Fertilization of Louisiana Rice



LSU AgCenter
Research & Extension

# Fertilization of Louisiana Rice

Rice in Louisiana is grown primarily on the coastal prairie soils of southwest Louisiana and on the heavy clay alluvial floodplain soils of central and northeast Louisiana. Rice fertilization requirements vary according to soil type. Nitrogen is required in almost every instance. However, phosphorus and potassium are generally not required in the alluvial clays in northeast Louisiana. Based on soil test analyses, phosphorus, potassium and zinc may be required in the coastal prairie and flatwood soils of southwest Louisiana.

## Nutrient Deficiency Symptoms in Rice

The initial symptom of nitrogen deficiency in rice is a general light green to yellow color of the plant. It is first expressed in the older leaves because nitrogen is translocated within the plant from the older leaves to the younger leaves. Prolonged nitrogen deficiency causes severe plant stunting, reduced tillering (stooling) and yield reduction.

Phosphorus deficiency initially causes yellowing of the older leaves and slow seedling growth. Severe phosphorus deficiency results in stunted plants with few tillers. Prolonged deficiency results in leaves that are grayish green, narrow, erect and brittle. Phosphorus deficiency delays plant maturity and decreases yield.

Plants lacking potassium are light green, and the leaf edges have small rust-colored spots which give them a brown appearance. Potassium deficiency may lower disease resistance of plants. Severe potassium deficiency may lower yields, but generally not as much as nitrogen or phosphorus deficiency.

The initial symptom of zinc deficiency is a yellowing of seedlings in the third to fourth leaf stage. Moderate to severe zinc deficiency results in weak plants that float on the water and die rapidly in water-seeded rice. Reddish-brown spots (bronzing) develop on leaves, and tillering may be greatly reduced. Zinc deficiency usually delays plant maturity and greatly reduces yields.

## Nitrogen

Nitrogen fertilizer recommendations are based on the variety of rice grown. Table 1 shows recommended rates of nitrogen by variety. These are general recommendations based on variety evaluations in southwest, central and northeast Louisiana. Lower rates of nitrogen may be required in newly developed land and where soil organic matter is high. Generally, the lower end of the recommendation range is needed on silt loam soils and the higher end of the range on clay soils.

Fertilizers containing the ammonium form of nitrogen should be used for rice. Ammonium sulfate, urea or other ammonium sources may be used. The rice plant is capable of using both ammonium and nitrate forms of nitrogen, but fertilizers containing nitrate nitrogen are inefficient because nitrate is lost by denitrification in flooded rice soils.

**Table 1**
**Nitrogen Recommendations by Variety**

| Variety | N Rate |
|---|---|
| Gulfmont, Lemont, Dellrose, Dixiebelle, Jefferson | 100-165 |
| Cypress, Bengal, Cocodrie, Jodon, Lafitte, Priscilla, Wells | 100-150 |
| Drew, Maybelle, Toro-2, Jackson, LaGrue, Madison | 100-140 |
| Mars, Jasmine 85 | 80-120 |
| Rico 1, Della, S102 | 70-100 |
| Saturn, Dellmati | 60-90 |

# Time and Method of Nitrogen Fertilization in Water-Seeded Rice

Most of the nitrogen fertilizer should be applied pre-flood and pre-plant in water-seeded rice if the soil is not allowed to dry during the growing season. Nitrogen fertilizer should be placed either on dry soil and flooded in immediately or shallow incorporated and flooded within 3-5 days.

If urea nitrogen is left on the soil surface without flooding within 2-3 days, some may be lost to the atmosphere as a gas in a process called volatilization. This loss will be avoided if the urea is incorporated into the soil by injection, tillage, rainfall or flooding.

If several days elapse between the period of nitrogen application and flooding, much of the nitrogen will convert to nitrate. When the soil is flooded, nitrate is broken down by bacteria and released to the atmosphere as a gas in a process called denitrification. Denitrification losses can be avoided by not using nitrate-containing fertilizers and by flooding soils within 3-5 days after nitrogen application. These losses are greatest when nitrtogen is applied into water on young rice.

When most of the nitrogen is applied pre-plant, rice fields should not be drained, or drained only temporarily. In this situation, if a field must be drained during the growing season, the field should not be allowed to dry out before re-flooding. The field should be maintained in a saturated condition to protect the pre-plant nitrogen.

If water-seeded rice will be drained and the field allowed to dry, apply nitrogen as discussed under dry-seeded rice.

From internode elongation (green ring) through the beginning of head formation, nitrogen must be available in sufficient quantity to promote the maximum number of grains. Nitrogen deficiency at this time reduces the number of potential grains (florets) and limits yield potential.

From the beginning of flowering on to maturity, the rice plant needs enough nitrogen to fill the grains properly, but this nitrogen is primarily translocated within the plant from stems and leaves. Nitrogen applications at this time may have no effect, or even a detrimental effect, on yields.

Sufficient nitrogen should be applied pre-plant or pre-flood to assure that the rice plant needs no additional nitrogen until the panicle initiation (green ring) or the panicle differentiation (2 mm panicle) stage. When additional nitrogen is required, it should be topdressed at either of these plant stages or whenever nitrogen deficiency symptoms appear. Usually only 20-45 pounds of nitrogen per acre are required if the earlier nitrogen application was sufficient. If nitrogen deficiencies are observed prior to these growth stages, apply nitrogen topdressing immediately. Early nitrogen deficiency may greatly reduce yields.

## Second Crop Fertilization

Ratoon or second crop rice should be fertilized with 45-75 pounds of nitrogen per acre when first crop harvest is before August 15. When first crop harvest is after August 15, fertilize with 30-45 pounds of nitrogen per acre. When conditions appear favorable for good second crop production (minimal field rutting, little or no red rice, healthy stubble), the higher rate of nitrogen should be applied. Apply nitrogen and establish a shallow flood within five days after harvest.

When the first crop is harvested after August 15, the potential for profitable second crop production is reduced because of the increased likelihood of unfavorable weather.

## Phosphorus and Potassium

Phosphorus and potassium fertilizer should be applied only when recommended by soil test results or when deficiency has been diagnosed. If needed, phosphorus and potassium fertilizer should be soil applied when land is prepared for planting. Apply all phosphorus and potassium before planting in both water-seeded and dry-seeded rice. If phosphorus and potassium fertilizers could not be applied pre-plant, apply them before establishing the permanent flood. Late applications are not as beneficial or economical and may add to scum problems. Make late applications only when deficiencies are observed in the current crop.

## Sulfur

Sulfur may be needed at a rate of 20-25 pounds per acre where large amounts of soil have been moved in land leveling. Sulfur deficiencies resemble nitrogen deficiencies, producing pale yellow plants which grow slowly. If these symptoms appear, applying 100 pounds of ammonium sulfate per acre will provide 21 pounds of nitrogen and 24 pounds of sulfur per acre.

## Zinc

Some soils require the addition of zinc for rice production. Zinc deficiency may be determined by soil test or by visual symptoms. Louisiana Cooperative Extension Service recommendations are to use zinc only where a known problem exists or where soil tests indicate a need. Do not apply zinc as an insurance measure.

Rice affected by zinc deficiency initially becomes chlorotic (yellow) followed by a bronzing (brown) appearance in water-seeded rice. The plants are weakened and tend to float on the water rather than grow erect. Severely zinc deficient plants may die, leaving a sparse stand with poor vigor. In dry-seeded rice, zinc deficient plants show an initial lightening of color, followed by bronzing of the leaves. These symptoms

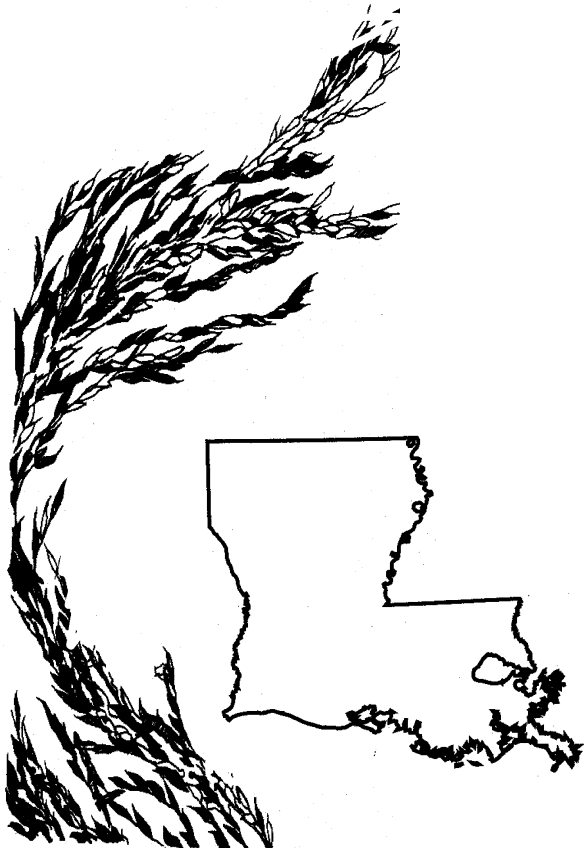
usually become visible in dry-seeded rice soon after the permanent flood is applied.

Time and method of zinc application depend on the cultural system used. If using soil-applied zinc in water-seeded rice, apply the zinc just before flooding or into the water soon after flooding with zinc sulfate. Do not incorporate zinc in water-seeded rice. Since rice roots develop near the soil surface, and seedling root growth is slow in the water-seeded system, it is important that most of the zinc be on or near the soil surface.

In the dry-seeded system, soil-applied zinc should be broadcast and shallow incorporated no more than 1-2 inches deep. Initial root development in the dry-seeded system is beneath the soil surface, and soil incorporated zinc is more available. Non-incorporated zinc will be located above the rooting zone in dry-seeded rice.

On the alluvial soils with a neutral - slightly alkaline soil reaction, particularly in central Louisiana, soil-applied zinc can be made unavailable by the soil. If zinc deficiency is a problem in these soils, either a foliar treatment or a soil plus a foliar treatment may be preferable to a soil treatment alone.

A soil application of either inorganic zinc salts or chelated forms may be used. Zinc sulfate or other acceptable inorganic forms of zinc should be applied at the rate of 7-8 pounds of actual zinc per acre. For chelated zinc applied to the soil, use 1-2 pounds of actual zinc. For foliar sprays, apply 0.5-1.0 pounds of actual zinc as a chelate. If zinc deficiencies are observed, apply foliar sprays quickly.



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Pub. 2418 (4M) 01/2000 Rev.

Issued in furtherance of Cooperative Extension work, Acts of Congress of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Louisiana Cooperative Extension Service follows a nondiscriminatory policy in programs and employment.