Managing nitrogen fertilization in rice fields can be challenging for producers. Because ammonium nitrate is subject to denitrification on flooded soils, urea is the main N source for rice. In drill-seeded rice, urea fertilizer is broadcast immediately before flooding. Depending on irrigation well pump capacity, field size, and weather conditions, urea can be lost by volatilization while a field is being flooded. Optimum N rates vary by rice variety, soil texture (loam vs. clay), and rotations (continuous rice vs. rice rotated with soybeans).

Excessive N promotes lodging and diseases. Applying too much N will often reduce rice yields as much as applying too little N. The current recommended program in Missouri is to split N applications [75 to 120 lb N/acre preflood, 30 lb N/acre at internode elongation (IE), and 30 lb N/acre at IE +1 week]. Mid-season applications must be applied by airplane. To save aerial application costs, farmers would prefer making one application for the season with ground equipment before flooding.

Rice production is steadily increasing in Southeast Missouri. Cash receipts for rice in 1998-2001 averaged $ 51.7 million per year. If rice acreage increases continue at the current rate, rice could surpass the economic impacts of cotton in the Bootheel within a decade. In the last decade, the amount of water-seeded rice production has increased. Hybrid rice production is also rapidly increasing. Rice fertility research is needed to help Missouri farmers adapt in these changing production systems.

Objective: To improve rice N timing and rate recommendations for silt loam and clay soils for continuous rice and rice rotated with soybeans.

Procedures: Each experiment will have four replications for each treatment. Tissue N samples collected during the season and analyzed at the Delta Center Soil Lab. At maturity, plots will be mechanically harvested for yield and grain milled for quality properties.

Variety X N test will evaluate response of rice varieties to preplant and mid-season nitrogen on Crowley silt loam soil at Quin, Missouri and Sharkey clay soil at Portageville, Missouri. Plots will be planted with Francis, Wells, Cheniere, and Ricetec hybrid XL8 varieties. At first tiller, five urea-N rates will be applied before flooding- 0, 45, 90, 135, and 180 lb N/acre. For each variety, three plots in each replication will receive the same preflood N rates. One plot will receive no mid-season N, the second will receive 45 N at IE, and third will receive 30 lb N at IE + 30 lb N a week after IE. Before applying mid-season N applications, leaf area and plant height will be measured by a new in-field N monitoring system called the “Yardstick Method”.

Urea volatilization test will determine the effectiveness of Agrotain in reducing volatilization of urea in fields that require up 2 to 5 days to completely flood with irrigation wells. Francis variety rice will be planted on a Sharkey clay soil at Portageville and flooded at first tiller growth stage. Urea (90 lb N/acre) will be applied with and
without Agrotain in plots prior to flooding. Urea treatments will be applied the same day as flood (0), 24 hrs before flood (-1 day), 48 hrs before flooding (-2 day), 72 hrs before flooding (-3 day), 96 hrs before flooding (-4 day), and 120 hrs before flooding (-5 day). Soil moisture conditions at time of applications will be measured and rice leaf N content at internode elongation will be tested at the Delta Center Soil Lab.

Continuous Rice N test will measure N response in fields 1) that had rice planted the previous year and soybeans two years before, 2) rice planted for last five years 3) planted in soybeans the previous year (check). Because of the poor efficiency of N in continuous rice, we will evaluate N rates and new methods to improve plant recovery of N. Treatments will include multiple split applications and slow release N applied at planting.

Timetable for proposed research: This will be a three-year project (2005-2007).

<table>
<thead>
<tr>
<th>March-April</th>
<th>Develop field plans, weigh out fertilizer for individual plots, and prepare fields for planting.</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-October</td>
<td>Plant rice, apply fertilizer treatments, collect soil and tissue samples, and harvest research plots.</td>
</tr>
</tbody>
</table>

Strategy for application/transfer of knowledge:

Results will be presented at Missouri Rice Farm and Delta Center field days and Missouri Rice Conference in Dexter. Articles will be written for the annual Missouri Rice Update booklet and posted on the Missouri Rice Webpage. N recommendations will be modified as needed in the Missouri Rice Degree Day 50 and MU soil test recommendation programs. When the study is completed a final report will be written and a manuscript submitted to scientific journal such as the Journal of Plant Nutrition.

Proposed budget:

<table>
<thead>
<tr>
<th>Expenses</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
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<tbody>
<tr>
<td>Res. Specialist salary (0.4)</td>
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<td>$12,114</td>
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<td>Fringe benefits</td>
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<td>Supplies</td>
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<td>Total</td>
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</table>
WILLIAM E. (GENE) STEVENS

Associate Professor
Department of Agronomy
University of Missouri-Delta Research Center
Portageville, MO 63873
Phone: (573) 379-5431
Fax: (573) 379-5875
Email: stevensw@missouri.edu

EDUCATION

Degree: Ph.D., Agronomy, 1992
Institution: Mississippi State University
Professor: Dr. Jac J. Varco

Degree: M.S., Plant and Soil Science, 1982
Institution: University of Tennessee-Knoxville
Professor: Dr. Donald D. Tyler

Degree: B.S., Biology, 1979
Institution: Union University

EMPLOYMENT

1994 – Present University of Missouri-Delta Research Center, Portageville, MO
Crop Production Specialist

1990- 1994 Mississippi State Univ./USDA Crop Simulation Lab, Starkville, MS
Soil Scientist

1984- 1990 North Mississippi Branch Experiment Station, Holly Springs, MS
Research Associate

RECENT PUBLICATIONS:

Stevens, G. and D. Dunn. 2004. Fly ash as a liming material on cotton. J.
Environmental Quality 33: 343-348.

Stevens, W.E., S.A. Berberich, P.A. Sheckell, C.C. Wiltse, M.E. Halsey, M.J.
Horak, and D.J. Dunn. 2004. Optimizing pollen confinement in corn grown for

fungicide effects on Phomopsis sp. seed infection. Plant Disease. 721-723.


