

# Rice Research News

Rice Research and Extension Center • University of Arkansas Division of Agriculture

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**Save the date!**

**Field Day  
August 12, 2009**

Visit the RREC Web site.  
Click here:  
<http://aaes.uark.edu/rice.html>

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*From the Director*

## Our reservoirs are full

Well, our reservoirs are full. So are the ditches, the bayou and the river. Even so, it's pretty certain that by mid-July we'll be wanting a rain, but right now we've had enough. Fortunately, much of the rice at the Center has been planted, and though it is a little behind in growth, most looks like it is in good shape. We're fortunate compared to so many areas of the state.

I just walked the Foundation and Breeder Seed fields, and the plentiful moisture has kept

the herbicide activated, so fields are weed free.

### Field Day Wednesday, August 12

During the growing season at RREC we have three main periods: planting, Field Day, and harvest. We always enjoy visiting with producers and showing and telling about the important research our Division of Agriculture scientists are conducting. We hope to see you here for our Field Day on Wednesday, Aug. 12.

The Field Day program is still developing, but likely topics are listed in another article. Construction of our new facilities is progressing well. The office section will be mostly done by the time of the Field Day. Others will be far enough along to provide a good idea of the final product.



Christopher W. Deren

## Debra Ahrent joins rice breeding program

Debra Ahrent has recently taken on new duties in the Division of Agriculture rice breeding program coordinated by Drs. James Gibbons and Karen Moldenhauer.



Debra Ahrent

Ahrent was most recently assigned to the Rice Research and Extension Center in 2004 to work in Foundation Seed production and distribution. Her duties with Foundatrion Seed were closely linked with the breeders, helping in seed purification of head-row and breeder seed.

With an M.S. degree in plant breeding from the University of Arkansas, Ahrent is well trained to take on additional duties in the rice breeding program. These will include a wide range of activities, including data processing and analysis, field plot observations, crossing, report writing and specific breeding or genetics studies.

Though her favorite crop is soybeans, Ahrent's experience with rice will provide valuable assistance to the RREC rice breeding program, and we look forward to her contributions.

## RREC Field Day

**Wednesday, August 12  
8 a.m. to Noon,  
with complimentary lunch**

**Field Tours, 8:00–10:30 a.m.**

Rice breeding, weed control and fertility, soybean research and corn research

**Inside Program:** Farm economy issues, commodity board reports, research project posters, and a guest speaker (tba)

**On the Grounds:** Consumer display with recipes and food samples, children's activities, and outdoor activities such as ATVs, safety and wildlife

(Program topics are preliminary)

## No-Till Rice Economics for Landlords and Tenants: Who Benefits?

Rice is a major cash crop in eastern Arkansas, and most rice is grown using intensive cultivation. Sediment is the primary pollutant identified for most eastern Arkansas waterways, and no-till is commonly recommended to better control sediment transport.

Savings in fuel, labor and fixed machinery expenses also make no-till more attractive relative to conventional till. However, these economic benefits accrue primarily to the producer, who in most instances rents the land from someone else. What about the landlord? Would the landlord benefit economically from no-till management? More specifically, will no-till improve the landlord's expected (average) returns and reduce the landlord's return variability?

A study was conducted in 2008 to evaluate the profitability and return variability of no-till rice from the perspective of both the landlord and the tenant. Crop yields and prices were simulated 500 times for a typical two-year rice-soybean rotation under conventional till and no-till management, and tenant and landlord net returns were calculated for popular rice rental arrangements used in eastern Arkansas.

The results imply that tenants gain greatly from no-till rice through higher expected returns and lower return variability. However, landlords gain less from no-till in that their returns are only slightly less variable and their expected returns remain virtually equal under both tillage treatments. Thus landlords would be largely indifferent as to whether no-till or conventional till were used on rented cropland based on these results.

If landlord returns are no different under either tillage treatment, what might entice a landlord to favor no-till on rented land? One possibility is carbon credits. No-till is an effective means of sequestering soil carbon and reducing greenhouse gas emissions, and economic incentives currently exist for no-till in the form of carbon credits through the Chicago Climate Exchange (CCX).

Current U.S. carbon prices give little economic incentive to adopt no-till for the purpose of carbon sequestration, but carbon prices would increase if the U.S. were to adopt policies to regulate carbon emissions in the future. Therefore some potential may exist for targeting carbon credits towards landlords as a means of inducing adoption of no-till rice on rented land.

Brad Watkins, Research Assistant Professor  
of Agricultural Economics, RREC



Carbon credits could encourage landlords to support no-till rice on rented acreage.

## Japanese Film Crew Visits

A film crew with Japanese Public Television, NHK Enterprises, came to the Rice Research and Extension Center to film activities at the Center and to visit farms, mills and suppliers in Arkansas. The filming in Arkansas is for a five-part series that also includes rice production in Italy, Phillipines, China and India.

During their visit to RREC, the visitors were particularly interested in the linkage between the Center and farms. After a general description of how research and extension works in Arkansas, a very detailed and informative explanation of the DD50 program was provided by Chuck Wilson, rice agronomist. Wilson also showed his skills and experience with cameras and film crews as he handled all the questions and the confusion with cool patience. The visitors were very pleased with their visit. And we are very pleased to have had the opportunity to host them.

## Arkansas breeders incorporate 'Miracle Rice' genes in semi-dwarf varieties for Arkansas conditions

About 50 years ago, Dr. Peter R. Jennings was walking his rice breeding plots at the newly created International Rice Research Institute in the Philippines when he observed that an  $F_2$  population had tall and short rice plants in it. A quick count of individual plants in the population revealed a ratio of 3 tall plants to 1 short plant and indicated a single recessive gene for short or semidwarf rice. The population was composed of individual plants from the eighth cross made by Jennings at IRRI, and a semidwarf selection from that cross became IR8, the 'miracle rice' of the Green Revolution.

Seed of IR8 was sent from IRRI to rice researchers and farmers in several Asian and Latin American countries that were facing malnutrition and famine. Rice yields dramatically increased when farmers planted this high yielding variety because the semidwarf plant type produced abundant grain without falling on the ground, wasting grain and making harvest very difficult, like their traditional rice varieties did. Also, IR8 was able to



Dr. Peter R. Jennings in Colombia, 1982

convert newly available applied nitrogen fertilizer into grain at an economically favorable rate so that farmers could afford to buy fertilizer every year for their crop and make a profit.

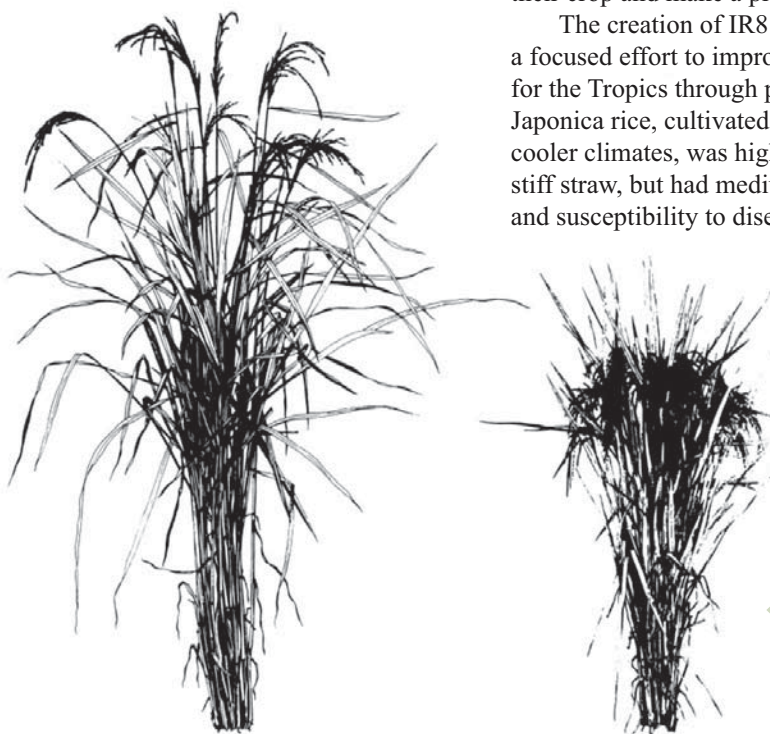
The creation of IR8 resulted from a focused effort to improve indica rices for the Tropics through plant breeding. Japonica rice, cultivated in temperate or cooler climates, was high yielding with stiff straw, but had medium or short grain and susceptibility to diseases that are

common in tropical rice culture. Indica rice had the consumer preferred long grain and good disease resistance, but

was tall and unresponsive to added nutrients. With the single recessive gene (*sd1*) for semidwarfism bred into the indicas, both farmers and consumers were happy with the resulting rice. Although the *sd1* gene was the major facilitator for the green revolution, disease resistance and grain quality were critical to the success of the new high yielding rice varieties.

Today over 99 percent of rice varieties grown in the Tropics are semidwarf. In the United States, well known semidwarf varieties include Lemont, Calrose 76, Cypress and Bengal. In 2004, Cybonnet and Medark were the first semidwarf rice varieties released from Arkansas. Each of these U.S. varieties are japonica, however, and our recent effort has been to incorporate indica semidwarf varieties into the Arkansas rice breeding program.

(Continued on page 4)



Traditional tall and semidwarf rice plants, drawn to same scale. On left is Syntha from Indonesia. On right is IR8. Source: International Rice Research Institute.

From: Dana G. Dalrymple, 'Development and spread of high-yielding rice varieties in developing countries'. 1986. USAID.

**Arkansas breeders incorporate 'Miracle Rice' genes...** (Continued from page 3)

Although the 'green revolution' indicas were much improved for yield with the addition of the *sdl* gene, traits such as grain quality and late maturity are not acceptable to Arkansas markets or growing conditions.

Our program to develop indicas for Arkansas began by intensive testing of indica varieties from the USDA germplasm bank, introductions from Latin America and Asia, and improved indicas developed by geneticists from our Stuttgart neighbor the USDA DBNRRC. We identified high yielding lines with good plant types and vigor that were earlier maturing, with good grain quality, and began crossing among them and intercrossing with the locally adapted japonicas such as Drew, Wells, Cybonnet and Medark. Our selection program focuses on disease resistance, especially blast, and grain cooking quality in addition

to high grain yield and whole grain milling recovery.

Since indicas are generally heat loving tropical plants, another goal has been to identify varieties with cold tolerance

at the seedling stage to use as parents with the indicas for adaptation to early planting under Arkansas conditions (see winter 2009 RREC Newsletter). After hundreds of crosses and intense selection here at Stuttgart and at our winter nursery in Puerto Rico, our efforts are resulting in experimental varieties with high yield, good milling ability, correct cereal chemistry and early maturity. A very early maturing semidwarf long grain indica by japonica experimental line, RU0701124, is expected to be released next year. Its ancestry can be traced to IR8, the 'miracle rice' of the green revolution.

James Gibbons  
Assistant Professor of Crop, Soil,  
and Environmental Sciences  
Rice Breeder, RREC



Semidwarf breeding line at harvest, Stuttgart, 2008.



Seed purification of semidwarf experimental line STG05F5-02-091 in Puerto Rico, 2008.



Plot of RU0701124 third stake from left, Stuttgart.



Seed purification of semidwarf experimental line STG05AC-02-103 in Puerto Rico, 2008.

## Bioenergy production from rice straw and hulls

A few months ago, the price of crude oil was about \$147/barrel, which resulted in high prices of gasoline and diesel at the pump. This high price affected Arkansas citizens because they consume about two billion gallons of gasoline and diesel annually.

Arkansas, the natural state, is biomass rich and can produce bioenergy and biofuel locally. Bioenergy is the renewable energy made from biomass (plant-derived organic matter) to generate electricity and produce gaseous and liquid fuels. Arkansas annually produces about 3 million tons of head rice, nearly 11 million tons of rice straw and 1.1 million tons of rice hulls. Rice straw and rice hull are attractive feedstock for bioenergy production.

Researchers at the Bioenergy and Biofuel Laboratory at the Rice Research and Extension Center conduct research on bioenergy production from a variety of biomass feedstocks, including rice straw and rice hulls via gasification technology.



Rice hulls

Gasification involves turning biomass into gaseous compounds (producer gas or syngas) by supplying less oxygen than is needed for complete combustion while heating the biomass at a very high temperature (between 1100 and 2800 F). A gasification reactor is being tested with various types of biomass including rice straw and rice hull. The resulting producer gas from the gasification process has a Btu value in the range of 125–200 Btu per cubic foot. It has been found that rice straw production is about 2.75 tons per acre with energy content of about 6000 Btu/lb.

High cost of baling and transporting rice straw from the field to gasification sites is certainly a significant consideration. If we can overcome the difficulties of harvesting and transporting the straw, we can convert rice straw and rice hull to producer gas, which could help our state in reducing our dependency on foreign oil and provide extra cash to rice growers.

Samy Sadaka  
Assistant Professor – Extension Engineer



The office section of the new RREC facilities will be mostly completed by the time of the Aug. 12 Field Day. Other sections will be far enough along to provide a good idea of how the entire complex will look.

**Save the date!**

**Field Day  
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