From the Director

Blast disease screening area added to research plots

One new area of research was opened up this year to provide pathology a site with severe blast disease pressure. This will be used to screen breeding lines and accessions for blast response under field conditions. The area will be featured on the tour of the International Rice Blast Conference, which will be held in Little Rock in mid-August.

Spring 2010 was excellent for planting research plots and seed production fields at RREC. With about 25 project leaders and dozens of individual tests, planting can be particularly challenging, and more than a little competitive, when weather doesn’t cooperate. Favorable weather and a cooperative spirit helped make it a smooth process this year.

New RREC facilities ‘keep the Land-Grant spirit alive’

Rice producers took time off from planting to attend the April 15 ribbon cutting for the new 34,000-square-foot, $12.4 million Rice Research and Extension Center facilities, along with officials from the University of Arkansas System and agricultural groups and agencies.

University of Arkansas Vice President for Agriculture Milo J. Shult said, “While some campuses across the nation have strayed from their land grant mission of serving their states by educating their citizens, discovering new knowledge and putting that knowledge to work to improve their quality of life, the Division of Agriculture is keeping the land-grant spirit alive in Arkansas.”

The Division has updated research and extension facilities and located faculty all across the state to achieve that goal. Virtually every facility in the state has had new construction or renovation over the last 15 years.

Rich Hillman of Carlisle, a member of the Arkansas Rice Research and Promotion Board, which contributed $2.3 million to the project, said the new facilities “advance Dr. Shult’s vision that the University of Arkansas be home to the premier center for public rice research in the nation.”

John Ed Anthony, chairman of the U of A System Board of Trustees, said, “the Division of Agriculture is a key part of the university system” and makes important contributions to the state’s economy.

U of A System President B. Alan Sugg said agriculture is “an economic cornerstone in Arkansas” and that its continued success depends on cooperative efforts by farmers, agribusiness, the U.S. Department of Agriculture and the U of A Division of Agriculture.

State Secretary of Agriculture Richard Bell said Arkansas is number one in rice production by a large margin and that the state’s rice industry needs a strong research program. “Farmers believe in research,” he said, as illustrated by the Rice Research and Promotion Board contribution to the building project.

The board, which is made up of farmers,

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New RREC facilities ... (Continued from page 1)

manages a check-off fund paid by rice farmers and processors for research, promotion and market development. The contribution for the building project was from part of a European Tariff Rate Quota payment received in 1999 from an international trade case settlement, Hillman said.

Hillman read a letter from the board, which praised the leadership of Shult, who has announced that he will retire July 1. Shult’s 18 years as U of A vice president for agriculture have brought “significant advancements in university research and the subsequent benefits that farmers receive from those gains in knowledge,” the letter says.

Funding in addition to that provided by farmers themselves included $6 million from the Arkansas Higher Education Technology and Facility Improvement Act, and the balance was from Division of Agriculture reserve funds, Shult said. Gov. Mike Beebe was instrumental in obtaining federal funding from the American Recovery and Reinvestment Act for adding two greenhouses and upgrading the waste treatment plant serving the RREC and the USDA Agricultural Research Service’s Dale Bumpers National Rice Research Center, which is next door.

RREC Director Chris Deren said the two centers often collaborate, with USDA researchers focusing mainly on molecular biology research, and the UA center on more conventional research to solve crop management problems, with an emphasis on plant breeding to develop improved rice varieties.

The new RREC facilities include an auditorium named the Arkansas Rice Farmers Conference Center, an office wing, laboratory wing and an adjacent field lab building. Deren said the conference center was named to affirm that the RREC and its personnel are dedicated to meeting the needs of rice producers and their communities.

The RREC has 10 resident faculty members and hosts others who conduct field research on some 750 acres of the 1,021-acre campus.

Laboratories are equipped for molecular biology of rice, biofuels research and other areas such as plant breeding, plant pathology, tissue culture, hybrid breeding, agronomy, soil fertility, entomology, plant physiology and cropping systems. Field labs were designed for handling and preparation of samples from field plots, Deren said.

The biomass/biofuels program, which had no laboratory, now has a custom-designed laboratory, and the new molecular genetics laboratory will enhance the use of advanced technology

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to support the conventional rice breeding program, Deren said.

New laboratories will provide for the addition of a hybrid rice breeding program and expansion of medium-grain and aromatic rice variety development. Deren said an assistant rice breeder will be added to conduct the hybrid rice breeding pro-
gram in cooperation with other rice-growing states.

“Hybrid rice technology has tremendous potential benefits for our producers,” Deren said. “Developing hybrids is a very expensive process, and we will be collaborating with other states to enhance the efficiency of this new effort,” he added.

Deren cited other benefits of the new facilities, including a design that will enhance faculty and staff interaction, adequate and dependable environmental control, modern storage facilities for seed and other material, and efficient and secure processing and movement of research materials.

Architects for the RREC facilities construction were Witsell, Evans and Rasco of Little Rock. General contractor was May Construction Company of Little Rock.
Zongbu Yan, a rice breeder specializing in development of hybrid breeding lines, has joined the research staff at the Rice Research and Extension Center as a program associate in the University of Arkansas Division of Agriculture rice breeding program.

Yan brings 30 years of experience to the Division of Agriculture rice breeding program, said Christopher Deren, RREC director. “His mission will be to develop breeding lines that can be used in a hybrid breeding program,” Deren said.

Deren said the Division of Agriculture is working to set up a consortium of public breeding programs with scientists at Louisiana State University, Texas A&M University, Mississippi State University and Southeast Missouri State University. The purpose will be to combine resources and breeding materials in a focus on hybrids that will improve rice production in Arkansas and its neighboring states.

“Zongbu has a lot of experience in China working with hybrids and developing new hybrid breeding lines,” Deren said. “He’ll be working on bringing male sterile systems to breeding material that has traits, such as high yield and disease resistance, that we want.”

Rice is self-pollinating, Deren said, and has both male and female parts. The male parts have to be removed during conventional breeding. Sterile breeding lines will simplify crossbreeding and help assure the addition of only desirable traits to lines with the potential to become improved varieties.

Yan was a professor and rice breeder at the Rice Research Institute of Guizhou Province in China. He retired in 2008 and came to the United States and worked at the University of Arkansas at Pine Bluff. While there, he collaborated with Deren and rice researchers at the USDA’s Dale Bumpers National Rice Research Center at Stuttgart.

“We used USDA germplasm to create new sterile breeding lines and develop new hybrid combinations,” Yan said.

Yan said some of those lines will be on display during the annual research field day at the Rice Research and Extension Center Aug. 11.

Rice Field Day
Rice Research and Extension Center
Aug. 11
The 5th International Rice Blast Conference (IRBC) will be held at the Peabody Hotel in Little Rock Aug. 12-14. The 5th IRBC organizing committee has extended a worldwide invitation requesting rice scientists to attend and present their research on the rice blast disease.

The IRBC is the premier international conference on rice blast disease and is typically held once every four to five years. The 4th IRBC met in Changsha, China in 2007. The local organizing committee includes Chairman Yulin Jia, USDA/ARS; Co-Chairman James Correll, University of Arkansas Department of Plant Pathology (PLPA); Fleet Lee (PLPA); Rick Cartwright (PLPA); Chris Deren, RREC director; Anna McClung, USDA-ARS Dale Bumpers National Rice Research Center director; and Bob Fjellstrom, plant molecular geneticist, USDA-ARS.

Rice blast disease, caused by the fungus *Magnaporthe oryzae* (originally named *Pyricularia oryzae* or *P. grisea*) was first described in 1637. Now recognized as one of the most destructive diseases worldwide, rice blast can cause widespread epidemics that devastate rice production fields and subsequently result in local famines. Although rice blast disease has been studied intensively worldwide, unanticipated epidemics of this highly adaptive disease still occur when least expected. (Rick Cartwright and Fleet Lee. Neck blast a major problem in wet 2009 growing season. Rice Research News, Spring 2010, Vol.2, No.3, pg 1-4.)

The 5th IRBC attendees will present contemporary research on rice blast disease, pathogen virulence and host resistance along with novel disease management strategies. Topics include:

- Pathogen genomics and functional genomics
- Pathogenesis and interaction with host-pathogen effectors
- Host signaling and defense responses
- Structural and functional analysis of resistance genes
- Molecular and cellular biology of the pathogen
- Genetic diversity of the pathogen, evolution and adaptation
- Breeding for resistance using marker assisted selection
- Breeding for durable resistance
- Disease management strategies
- Epidemiology and disease evaluation and monitoring programs

One highlight of the conference is a field day to observe rice production and rice blast disease in Arkansas. Attendees will travel by tour bus from the Little Rock Peabody Hotel to the University of Arkansas Division of Agriculture and USDA/ARS research facilities near Stuttgart, where they will visit rice blast research plots, our new research laboratory facilities and local grower rice fields.

Additional meeting information and various deadlines are posted on the 5th IRBC website at www.ars.usda.gov/irbc2010.
Managing blast susceptible rice varieties

An estimated 61 percent of the state’s rice acreage was planted in varieties that range from “susceptible (S)” — Wells and Jupiter — to “very susceptible (VS)” — CL 251 — to rice blast disease. In one sense, the acreage information is not unusual or alarming because Arkansas rice growers have increased per acre production to record highs while annually planting a high percentage of the rice acres (80 percent plus in some years) with high-yielding, blast-susceptible varieties. However, our experience is that varieties with VS blast susceptibility ratings are very difficult to grow and require special attention and close monitoring during the growing season.


How does one manage VS rice varieties? The answer is “very carefully.” The first step is to fully understand the disease and/or consult someone knowledgeable about the disease process. A brief account of the blast disease is found in “Rice Research News,” Spring 2010, Vol. 2 No. 3, Pgs. 7-12. Additional detailed information can be obtained through the University of Arkansas Division of Agriculture’s Cooperative Extension Service.

Briefly, rice is infected by small airborne spores of the blast fungus, which grow on all joint tissue on the plant (leaf veins, leaf collar, stem and panicle nodes, panicle spikelets and at the base of individual grain hulls). Blast fungal growth in plant tissue is directly and/or indirectly controlled by the root zone environment where high oxygen levels (aerated soils) favor rice blast while low oxygen levels (water saturated soils) slow or inhibit rice blast development to induce blast field resistance.

Rice growers had used field resistance to control rice blast long before we learned how to manipulate and use flood-induced field resistance as a primary blast control strategy. Induction of blast field resistance by establishing water saturated soils using careful flood management will produce blast free crops in many susceptible varieties. The trick is to maintain a continuous, two-to-three-inch-deep flood at the high-point of individual levees throughout the growing season beginning with the first application of the permanent flood. Blast field resistance decreases during intermittent flooding. One common mistake is to neglect rice flood management while watering soybeans. Flood-induced resistance enhances efficacy of other rice blast control measures such as fungicide application.

Despite all efforts, we do not have a simple assay for blast resistance in the plant, nor do we fully understand the genetics and related mechanisms involved. We do know that root-produced hormones and plant adaption to continuous flood are involved. In our research, we work with gross extremes of continuously flooded rice, upland rice plots where plants are grown under variable levels of soil moisture stress and greenhouse tests to determine variety reaction to common rice blast races. Blast severity is visually rated in these tests and extrapolated to production fields.

We initially used inclined plots with a variable depth flood to study blast field resistance. We have returned to the inclined plot technique to better understand and hopefully quantify flood-induced field resistance for use in rice breeding and as an aid for rice growers and extension agents in managing this disease.

Our inclined plots look like a young upland rice crop growing on a hill side. Flood management practices will duplicate, within a single 60-ft. plot, cultural conditions that vary from true upland, through intermittent flooding, to a continuous flood that increases in depth until terminating at approximately five inches.

Fleet Lee
Professor of Plant Pathology
Rice Research and Extension Center

Figure 1. Inclined Plots for Blast Flood Management Test
One of the most important decisions made by rice producers is when to begin planting. Undesirable consequences can occur for both early and late planted rice. Early planted rice can suffer from slow emergence and poor growth, potential damage from seedling diseases and reduced herbicidal activity, all related to cool, wet ground conditions. Production costs may also be higher for early planted rice due to greater herbicide costs required for weed control, greater seed treatment costs and the potential need for additional flushing due to the extended time between planting and flooding required for plants to achieve the 5-leaf growth stage. On the other hand, late planted rice can experience lower field yields and reduced grain quality due to increased disease incidence from diseases like panicle blight, blast, or false smut, increased insect pressures and high temperatures.

How early or late can rice planting occur for yields to ultimately suffer? A study was conducted in 2009 to help provide some insight about yield potential based on planting date. The study used rice yield and planting date data for the period 1983–2009 from fields enrolled in the University of Arkansas Division of Agriculture’s Rice Research Verification Program (RRVP).

A total of 318 RRVP fields in 33 Arkansas rice-producing counties were included in the analysis.

Figure 1 presents the frequency of fields planted by week of year throughout the 27-year period. Week 17 had the largest number of RRVP fields planted, followed by weeks 16 and 18. These weeks roughly comprise the second full week of April through the first day of May.

Figure 2 shows the average yields by week of year planted across the 27-year period. Casual observation of the average yields per week planted in the RRVP would suggest optimal yields occurred when planting during week 13 with a linear decline in yields for following weeks. However, normalizing the data across weeks and years provides a more accurate picture of the impact of planting date on yields.

The three most frequent weeks planted (16, 17 and 18) were defined as the “base period” in this analysis, and a base yield was determined for the base period by taking an average of rice yields (Continued on page 8).
across the three weeks. All RRVP yields were then normalized by dividing each of the 318 yield observations by the base period yield.

Figure 3 presents a scatter plot of the normalized yield potential by week of year planted. The line through the center of the plots represents the average yield potential for each week of year planted and indicates that yield potential is relatively stable between Weeks 13 through 20, which roughly corresponds to the last full week of March through the second full week of May.

Figure 4 presents yield potential by week of year planted on a relative scale. The data are normalized by setting Week 14, the week of year planted with the highest normalized yield, equal to 100 percent. All other weeks of year planted are thus compared relative to Week 14. The data in Figure 4 indicate that yield potential is maximized by planting rice in Weeks 13 through 20 (roughly the last full week of March through the second full week of May).

Planting after Week 20 will result in yield penalties, as relative yields begin to drop off. These results suggest that rice producers have roughly an eight-week planting window without yield penalties and thus should have sufficient time in most years to complete rice planting operations. The analysis also suggests that planting as early as Week 13 (roughly the last full week of March) results in no yield penalty, although planting this early may subject rice producers to greater yield and revenue risk due to cold or wet conditions as described above.

Bradley Watkins
Associate Professor of Agricultural Economics
Rice Research and Extension Center
Growers in Jackson and Randolph Counties are trying their hand at producing a peanut crop this season. In mid-April, peanut company representatives from Oklahoma and Texas met with several growers and county agents to discuss the potential of growing high oleic peanuts in Northeast Arkansas. Chris Elkins, regional buying point manager for Clint Williams Peanut Company, commented on the continual decline of peanut acreage in West Texas and Oklahoma due to water shortages. In response, Clint Williams is looking for potential production acreage in neighboring states so they can fill their peanut manufacturing quota.

"Peanuts have the potential to increase a grower’s profit margin, however, the crop must be monitored and managed for maximum yields," said Extension Plant Pathologist Scott Monfort. Monfort says resistant weeds and diseases are the two major economic and yield limiting issues Arkansas growers will face when growing peanuts. To aid growers in this pilot year, Extension personnel have established several peanut variety and fungicide trials at the Newport Research Station to determine the most effective strategy for managing diseases and maximizing yields.

In 1997, Arkansas had about 29 peanut farms. That number has steadily declined over the years with only one farm reported in the 2007 Agricultural Census. A lack of market and the phase out of the quota system initiated by the 2002 Farm Bill can explain some of this decline.

Monfort is a native of Georgia, growing up in rural South Georgia and working 11 years in the Peanut Belt. His previous research, industry experience and service as a Worth County Extension Agent made the perfect fit for the partnership with Clint Williams and these growers, helping them get started in this charter year.