New complex will enhance RREC research capabilities

The University of Arkansas System’s Division of Agriculture is making progress toward construction of a 35,000-square-foot complex that will greatly enhance research capabilities at the Rice Research and Extension Center.

The complex will include new headquarters offices, an auditorium, laboratories and sample processing areas to assure that materials collected from research plots are efficiently and properly handled to maintain the integrity of research data.

The new facility will significantly expand laboratory space. It will include modern facilities for research in plant breeding, molecular genetics, physiology, pathology, entomology, agronomy and bio-energy engineering.

Architects are Witsell, Evans and Rasco, Little Rock. General contractor is May Construction, Little Rock.

From the Director

RREC begins publication of newsletter

This is the first issue of a new newsletter from the Rice Research and Extension Center of the University of Arkansas System’s Division of Agriculture. We hope to make this newsletter informative and easily accessible to all who have an interest in rice.

Arkansas continues to be the nation’s leader in rice production. Since opening as the Rice Branch Station in December 1926, RREC has had a major role in providing support to rice farmers and millers through a wide range of research and extension programs. The list of field research in this issue indicates the scope of that work and the many scientists from all over the state who depend on RREC facilities. A future article will feature the Rice Verification Program, one of the many extension programs that deliver information to the farm.
RREC begins publication… (Continued from page 1)

In addition to field-oriented research and extension, a portion of our 1,000 acres is dedicated to production of foundation seed. Rice, soybean and wheat seed are grown, conditioned, bagged and sold at the center. The Foundation Seed Program will be featured in the future.

The big news is that the Division of Agriculture is closing in on completing arrangements for construction of our new facility. This $11.5 million project will provide new offices, laboratories, an auditorium and an area for efficient processing of plot samples for analysis. We hope to complete all construction in about a year. We’ll keep you posted on our progress in subsequent issues of the RREC Research News.

RREC is largest U.S. location for rice research

Scientists from the University of Arkansas System’s Division of Agriculture and the USDA–ARS Dale Bumpers National Rice Research Center conduct laboratory and greenhouse studies and field experiments on 360 acres of research plots at the Rice Research and Extension Center.

In combination with the USDA center located next door, RREC is the largest rice research location in the U.S. and is well known worldwide. Students, interns, and research and industry professionals visit frequently, staying from a day to a few years. Research is also conducted on companion crops, including soybeans, corn and wheat.

Research is applied and production-oriented. There are projects in plant breeding and genetics, pathology, entomology, agronomy, physiology and economics. Extension faculty disseminate research results and demonstrate research applications. Many projects integrate several disciplines. For example, the rice breeding program includes not only the breeders, but pathology, entomology and agronomy as well. All projects have very close working relationships with the greater rice industry. The Arkansas Rice Research and Promotion Board funds most research.

Production of Foundation Seed is another major function of RREC. Each year, the seed produced on several hundred acres of intensively managed rice, soybean and wheat is processed at the Center’s seed drying, cleaning and bagging facility. This seed is of the highest quality and is the basis for the success of Arkansas’s seed industry.

RREC escapes major tornado damage

A Quonset building and the equipment inside it at the Rice Research and Extension Center were destroyed or severely damaged by a tornado May 10, but no other buildings at the center or the two neighboring USDA research centers were damaged, RREC Director Chris Deren said.

The National Weather Service said the tornado passed through the south part of town almost directly from west to east. The twister severely damaged residential and commercial property in the vicinity of 22 Street. Several employees of RREC and the Dale Bumpers USDA Rice Research Center suffered damage to their property. Luckily, there were few injuries and no deaths. About 3,800 people lost power.

The tornado traveled east almost directly along Hwy 130 for 9 miles, hitting every residence and farm between town and RREC. Just before it reached the center it veered south, missing the main complex and destroying the only RREC property affected — a Quonset building a mile away. Several threshers and small combines were destroyed along with the building.

We were lucky.
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New breeding lines in the pipeline

The Division of Agriculture rice breeding program based at RREC always has new breeding lines at various stages of development. We grew foundation seed this year of breeding line 41182, which originated from a cross made in 1998. And we have just finished making hundreds of crosses that will produce improved breeding lines over the next decade.

Lines 41182 and 61188 were both grown this year to produce foundation seed for potential release to seed growers in 2009. They both have had yield potential similar to that of Wells and Francis in the Arkansas Performance Trials (ARPT) for the last 2 to 3 years.

In addition to high yield potential, 41182 has the major gene, Pi-ta, which confers resistance to the common blast races in Arkansas, and the minor genes necessary to be “moderately resistant” to “resistant” to the race IE-1k.

Rice blast (Pyricularia grisea) can be a devastating disease in Arkansas. Races IB-49 and IC-17 are currently the major races in Arkansas, but as demonstrated in 2004 and 2005, race IE-1k may become more of a problem. Race IE-1k has been isolated from Banks fields in both years.

The parentage of line 41182 includes several varieties that are familiar to rice producers: Drew, Newbonnet, Dawn, CI9695, Starbonnet and Katy. This line had an average yield of 197 bu/acre in the ARPT 2005–2007, which is similar to Francis and Wells at 202 and 199 bu/acre, respectively. Milling yields of this line are better than Wells.

Line 61188 has the longer and larger kernel size desired by the industry. It was also grown as foundation seed in 2008 as a potential release to Arkansas seed growers in 2009. It has high yield potential, testing at 198 bu/acre, which compares favorably with Wells and Francis, for the two years 2006-2007. Even with the larger kernel, 61188 had a better milling yield for the two years than Wells.

For those who appreciate the technical genealogy of rice cultivars, line 61188 originated from the cross Lagrue//Katy/Starbonnet/5/Lagruce//Lemont//Radiated Bonnet 73/3/Lagruce/4/Lagruce (cross no. 20001657).

An aromatic line is being considered as a potential future release. It is a semidwarf and non-photoperiod-sensitive line, and it can produce seed during the normal growing season in Arkansas.

Many other lines in the program have improved characteristics, and several were in head rows this season.


Line 81076 yielded 215 bushel/acre in the 2007 ARPT compared to Wells and Francis, which each yielded 185 bu/acre. Milling yield averaged better than both Wells and Francis.

Another potential future release is line 71124. It is a very early semidwarf similar to Spring in maturity. It has good blast resistance and milling yield potential.

Three Clearfield lines were grown as head rows in 2008 and will be considered for potential release to BASF this fall. One line, IMI113, had very good yield potential in the 2007 ARPT. It is a little taller and has the larger kernel size, but its milling yield is not as good.

The other two, IMI091 and IMI055, are semi-dwarf lines with better milling and acceptable grain yield. Lines IMI091 and IMI055 yielded 182 and 164 by/acre, respectively, in a Clearfield test at two locations, compared to CL161 and CL171-AR at 100 and 153 by/acre respectively in the same test. These and several other Clearfield lines will be evaluated further.


IN THE PIPELINE — Rice breeders Karen Moldenhauer and James Gibbons briefed Rice Field Day visitors on prospects for new varieties from the Division of Agriculture’s rice breeding program.
Fleet N. Lee, professor of plant pathology based at the Rice Research and Extension Center, was presented the Distinguished Service Award recently by scientists from rice-growing regions of the world at the 4th International Rice Blast Conference (IRBC) in Changsha, China.

The award recognizes Lee’s leadership in research on rice blast disease, which is a major problem for growers worldwide. He was one of 10 researchers from five countries honored at the conference. The IRBC is held every five years, with the 5th IRBC tentatively scheduled to be held in Little Rock.

Lee joined the Division of Agriculture faculty in 1977 as an assistant professor of plant pathology based at RREC. He conducts research on all plant diseases that affect rice in Arkansas.

Lee’s research made significant progress on understanding and controlling sheath blight using improved rice varieties. While strong, single-gene resistance has not been found in rice to sheath blight, the gradual improvements determined by Lee are evident in current varieties, which suffer only 15-25% yield loss in research plots now compared to 80% in earlier years.

Lee fostered a working relationship with breeders and molecular biologists throughout his career. “A lot of progress has been made in learning about rice blast disease, especially by developing resistant varieties. Early on, we discovered there were a number of varieties that were very susceptible to blast while others were not badly damaged,” Lee said.

The ‘Newbonnet’ rice variety was released in 1983 with high yield potential and was resistant to the common races of the blast fungus at the time. ‘Newbonnet’ became widely popular within only a couple of years and was planted on about 65% of the state rice acreage by 1986. However, everyone was caught off guard when the blast fungus, encouraged by very favorable weather conditions, quickly spread through the new variety in 1986 and 1987. “The epidemic in that variety was highly educational,” he said.

It was during that time that Lee’s research objectives shifted to put more emphasis on rice blast disease. He focused on using durable field resistance and major resistant genes in conjunction with effective cultural practices and fungicides.

Lee discovered that the rice root zone environment in flooded fields was a key to the development of rice blast disease. A deep and consistent flood was shown to greatly reduce the severity of rice blast. Recent research has shown a connection between the anaerobic conditions established by low oxygen in the root zone and the plant hormones that mediate resistance to rice blast. Lee said, “It’s amazing that growers can actually make the plants blast resistant in the field simply by growing them in a deeper flood.”

This has reduced the need for Arkansas farmers to use highly resistant but lower yielding varieties, and allowed them to grow higher yielding rice varieties that vary in blast susceptibility. Today, about 80% of the state acreage is planted to “somewhat” blast-susceptible rice varieties.

Another major part of Lee’s program has been to find and define major sources of resistance genes for many diseases. This is critical in the development of improved rice varieties. The most successful to date is the Pi-ta blast resistance gene, which was widely used from about 1994 to 2004. In 2004, the ‘Banks’ cultivar, which utilizes the Pi-ta gene, was released with great promise. Unfortunately, a rare race of the blast fungus combined with drought stress and the absence of other minor genes caused the disease to develop on ‘Banks’ as severely as it had on ‘Newbonnet’ over 20 years ago. “We just don’t really know what will happen with a new rice variety until growers get it into their fields, under the many conditions that we cannot duplicate experimentally,” Lee said.

With over 30 years in the profession, Lee would like to see more research on field resistance. “We’re really just now learning about field resistance to rice blast. And I want to pursue it a little longer so we can better work with it on a molecular basis to create better tools for selecting and using field resistance in improved cultivars. We also need to learn from the many disease and environmental interactions under field conditions. This is very complex, but possibly understandable using the technology of today.”

Dr. Yulin Jia, research plant molecular pathologist at the USDA-ARS Dale Bumpers National Rice Research Center, and a research colleague, nominated Lee for the Distinguished Research Award. Jia also serves on the International Organizing Committee for the IRBC.”

— by Debby Monfort
Factors to consider before trying row rice production

Furrow irrigated rice, also called row rice, has the potential to reduce input costs and increase net returns under some conditions. A number of Arkansas farmers have tried row rice production, but only a few have been successful. A number of factors should be considered before attempting row rice production, as discussed during a presentation at the 2008 Rice Field Day at RREC.

1. Do you have a water recovery system? Row rice watering is the same as watering bedded soybeans in that water flows down the field and out at the bottom of the field. Row rice production will result in more water being applied than is the case with soybeans; being able to capture water at the bottom of the field and reuse that water would be beneficial.

2. What is the field slope? Fields with a greater slope and thus fields with many levees are best suited for row-rice provided the slope is not too short. A short slope would mean that the water would reach the bottom of the field quickly and there would be a tendency to shut it off before beds at the top of the field were adequately wetted. If the center of the beds is not wet, plants in that area will suffer water stress.

3. Seeding rates used by farmers growing row rice are similar to levee-watered rice, but producers will need to make sure that grain drills are set so that planting depths are acceptable both on the bed and in the furrow.

4. Varieties must have good blast disease resistance and be able to withstand intermittent dry periods. If such varieties are not available the producer should scout fields and spray when necessary.

5. Poor weed control is the primary reason for crop failures in row rice production. It is essential that an aggressive approach be taken on weed control. Residual herbicides such as Facet must be applied at maximum rate and early, preferably with a ground applicator. Row rice cannot be flooded, thus herbicides that require a flooded field for best results may not work.

6. Fertilizer rates might need adjusting because of nitrogen losses via volatilization. Strategies that reduce volatilization losses, such as Agrotain coated urea and multiple applications, might be useful.

7. Grain yield might be reduced when compared to flooded rice, but input costs are much less because there will be no levees and harvest times will be reduced.

— by Dr. Merle Anders

The Rice Research and Extension Center has been part of Arkansas rice country since 1926.
Biosystems engineer develops technologies to produce biofuel and bioenergy at the RREC

Dr. Samy Sadaka, assistant professor and extension engineer, Department of Biological and Agricultural Engineering, has established two biofuel and bioenergy research and extension laboratories at the Rice Research and Extension Center. He has obtained internal and external funding for six research and extension projects totaling more than $325,000.

Prior to joining the Division of Agriculture in February 2007, Sadaka was an associate scientist at the Biomass Energy Conversion Facility at Iowa State University, where he conducted research in the biofuel and bioenergy areas. He also taught graduate-level courses in engineering thermodynamics and thermochemical conversion of biomass.

Sadaka has a Ph.D. degree from Dalhousie University, Nova Scotia, Canada, and Alexandria University, Egypt. He is a licensed professional engineer in the United States and Canada.

In his lab at RREC, Sadaka has been the lead scientist in designing, manufacturing and testing a mobile fluidized-bed biomass gasifier/pyrolysis unit, an animal manure biodrying unit and a batch biomass pyrolysis unit. He also demonstrates biodiesel production processes from various types of vegetable oil.

Sadaka conducts demonstrations of biofuel and bioenergy production for a variety of audiences, including high school classes and 4-H clubs. At the RREC field day Aug. 13, he showed a small-scale unit for making biodiesel, a gasification unit that transforms solid biomass into a gas that can be substituted for natural gas and a pyrolysis unit that converts biomass into bio-oil, which is similar to crude oil and can be further refined.

He said a farm-scale bio-diesel conversion unit could produce fuel for use in diesel engines at a cost of about $1 per gallon for 40 gallons in about 14 hours, plus the cost of the oil feedstock, such as used cooking oil from restaurants.

Currently, Sadaka is investigating biodrying and gasification/pyrolysis of animal manures mixed with crop residues. In addition, he is investigating the conversion of glycerin, a byproduct of biodiesel production process, to syngas and converting cotton gin waste to bio-oil.

Sadaka may be contacted by e-mail at ssadaka@uaex.edu or by phone at 501-303-0522.

Large crowd on hand for Rice Field Day

Approximately 600 visitors were on hand for the Rice Field Day on an unseasonably cool Wednesday, Aug. 13, the day after a nice rain at the Rice Research and Extension Center. It was the largest crowd we have had in recent years.

Family-oriented booths staffed by extension personnel were well received. We had the usual field tours from 8 a.m. to about 11 a.m., followed by an indoor program leading up to a catfish lunch.

Chairmen of the checkoff program boards that allocate funds for research in rice, soybeans, wheat and feed grains provided brief overviews of those programs, which are vital to the support or our efforts. Vice President for Agriculture Milo Shult and Anna McClung, director of the USDA Dale Bumpers National Rice Research Center, welcomed everyone. Dr. Andrew McKenzie, an agricultural economist based in Fayetteville, gave a presentation on futures markets and basis.

There was a lot of interest in the bio-fuels demonstrations by Dr. Samy Sadaka. More about his program is provided in a separate article (above). Articles about the breeding program and row rice (furrow irrigation) are also in this issue.

Field tour topics included:
- Breeding program for Clearfield and conventional rice lines
- Soybean plots for lespedeza worm and soybean rust
- Fertility research for minimum nitrogen and other fertilizers
- Agronomics of row rice
- Disease research for smut
- Weeds research for levees
- Soybean herbicides

A tour in the USDA Center included research on rice-weed interactions and rice diseases.

The field day provides a small sample of the work at RREC. We welcome your comments about the format and content of future field days.
Rust Review — Plant pathologist Scott Monfort reviewed the Asian Soybean Rust monitoring program at the RREC Field Day Aug. 13.

Diminishing Returns — Soil scientist Nathan Slaton shows a chart that illustrates that higher yields from higher rates of potassium fertilizer at current prices can result in lower net returns. His was one of several presentations at the RREC field day Aug. 13 on ways to reduce crop input costs.

Rice Field Day
August 13, 2008

A Rice Day — About 600 visitors attended the Rice Field Day Aug. 13, which included an indoor program, field tours, posters and exhibits of interest to families and youth. (Photo by Maurice Blocker)

Weed Tour — Weed scientist Bob Scott leads a field day tour of several research plots for rice and soybean weed control experiments.