

# Bio-Fuels Units, Cost-Saving Measures Featured At Rice Field Day

STUTT GART, ARK.

Small-scale units for making bio-fuel were shown during the Rice Field Day recently, at the Rice Research and Extension Center of the University of Arkansas System's Division of Agriculture near here.

A turnout of about 600 was the most in recent years for the annual event, said RREC Director Chris Deren. Visitors toured research plots and family-oriented booths and heard reports from chairmen of the boards that oversee check-off

the current system leads to over-fertilization in many rice fields, Ph.D. student Trent Roberts said. His doctoral research is to develop a system to measure actual soil-nitrogen in a field as the basis for field-by-field nitrogen recommendations.

Systems agronomist Merle Anders said some rice growers have reduced water use and fuel costs for pumping water by converting to a furrow-irrigated system rather than conventional flood irrigation. He said the system works best



Samy Sadaka demonstrates bio-fuel processes used in the Division of Agriculture's Bioenergy, Biofuel and Bioproducts Laboratory at the Rice Research and Extension Center during the Rice Field Day.

programs by which farmers help fund research in rice, soybeans, wheat and feed grains.

Samy Sadaka of the Division of Agriculture's Bioenergy, Biofuel and Bioproducts Laboratory at RREC demonstrated bio-fuel processes. They included a 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 fuel oil and can be further refined.

Sadaka 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.

Gasification turns solid biomass into a gas, called syn-gas, through partial combustion. Various types of solid biomass are fed to a processing unit that prepares the fuel by chipping, grinding or shredding. Then, at controlled temperatures and pressures, the gasifier heats the feedstock to produce a low-Btu gas. This gas can be used as a substitute for natural gas.

Pyrolysis is similar to gasification except that instead of producing a low-Btu gas, the process produces bio-oil, a liquid similar to crude oil. By subjecting the biomass to varying temperatures and pressures in the absence of oxygen, oils with different characteristics can be produced.

Sadaka said he is conducting research to determine if pyrolysis and gasification plants could be strategically located for delivery of crop residue or other biomass from farms for conversion to bio-oil or syn-gas. The oil could be stored and transported to a centrally located refinery at lower cost than the biomass.

Several presentations focused on ways to reduce crop input costs.

Soil scientist Nathan Slaton said, "On a nutrient basis, poultry litter is an excellent buy, but it's hard to get." He said less than recommended rates of fertilizer can be applied with minimal reduction of crop yields, but nutrients extracted from the soil will eventually have to be replaced for future crops.

At current prices, farmers should consult extension agents on the yield increase they can expect from incrementally higher fertilizer rates, Slaton said. "The highest yield usually does not give you the highest net return, when you consider the cost of the additional fertilizer required," he said.

Current nitrogen fertilizer recommendations for rice are based on the mean nitrogen rate required to achieve maximum yields at several locations around the state. Research shows that

in fields where water moves down the rows at an even speed for uniform soil saturation.

Weed control is a challenge, but the system allows use of ground equipment for more control over herbicide applications compared to relying on aerial application, Anders said.

Two new long-grain rice varieties are on track for release to seed growers in 2009 from the Division of Agriculture's rice breeding program.

Soil scientist Nathan Slaton shows a chart that illustrates that higher yields from higher rates of potassium fertilizer can reduce net returns. His was one of several presentations on ways to reduce crop input costs.



Soil K	Planting Rate	Yield	Net Return
80	30	750	74.40
70	30	700	24.80
60	42	700	5.20
50	48	600	-22.20
40	48	600	-22.20
30	50	600	-42.60

Trent Roberts shows results of tests at 14 Arkansas locations that all had excess nitrogen applied based on the conventional system of rate recommendations, for an average excess cost of \$82 per acre. He is helping to develop a more accurate method that will allow recommendations to be based on actual soil nitrogen in a field.



Site No.	Rate of N over applied* (lb N/acre)	Cost of Excess N† (\$/acre)
1	81	81.00
2	25	25.00
3	105	105.00
4	109	109.00
5	119	119.00
6	150	150.00
7	43	43.00
8	24	24.00
9	30	30.00
10	55	55.00
11	71	71.00
12	121	121.00
13	90	90.00
14	91	91.00
Average	82.43	82.43

\* Difference between current (assumed) rate and the rate obtained from the calibration curve with soil test results.  
† Cost based on fertilizer price of \$1.00 lb<sup>-1</sup> N or \$200.00 ton<sup>-1</sup> urea.

Rice breeders Karen Moldenhauer and James Gibbons direct the program, which has been a major factor in yield increases that have averaged two bushels per acre per year in Arkansas over the past 20 years.

Moldenhauer said the RU1182 breeding line, which will be available in 2009 to seed growers, has the high yield potential of Wells and Francis and enhanced blast disease resistance. It has the major gene, Pi-ta, which confers resistance to the common races of rice blast disease in Arkansas, and minor genes for moderate resistance to the race IE-1k, which was isolated from fields of Banks rice in 2004 and 2005 and has the potential to be a problem for growers.

The RU1188 line, also being considered for release to seed growers in 2009, has high yield potential and the longer and larger kernel size desired by the industry, Gibbons said.

CL 171-AR, which was available as certified seed for the first time in 2008, has performed well in the Clearfield system for red rice control. Gibbons said two Clearfield lines with very good yield potential in preliminary tests advanced to the head row stage for further evaluation for potential increase as breeders seed. Δ