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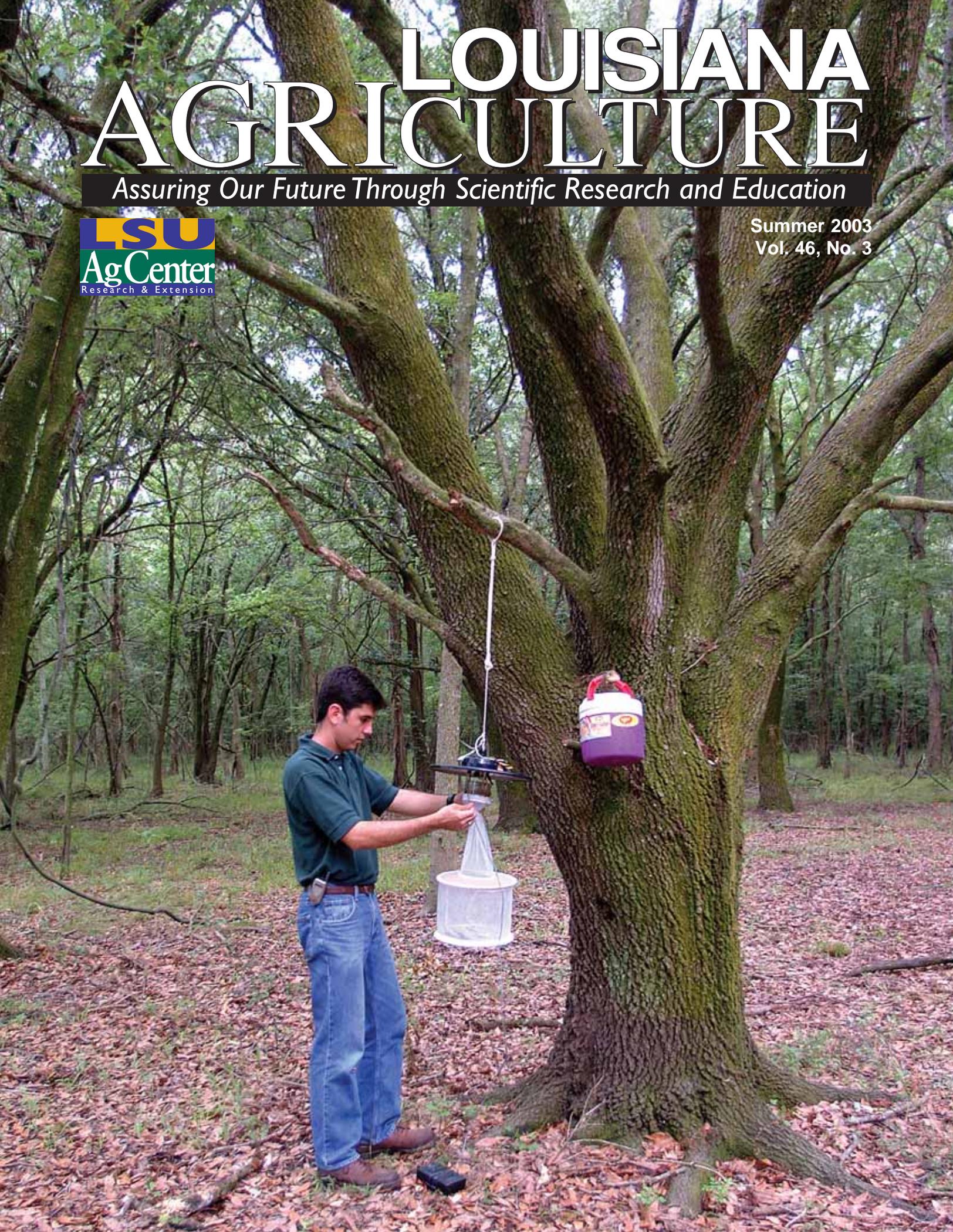
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LOUISIANA AGRICULTURE

Assuring Our Future Through Scientific Research and Education

LSU
AgCenter
Research & Extension

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Ahead of the Curve on Mosquitoes

As we headed into mosquito season in June 2002, the LSU AgCenter sponsored a one-day conference on mosquito-borne diseases. This was the first such conference ever hosted by the AgCenter and perhaps the first of its type in the country. Then, no one foresaw the severity of the West Nile virus to come.

On the agenda for the conference were the mosquito and mosquito-borne disease experts at the AgCenter and in Louisiana. Roger Nasci, an entomologist with the Centers for Disease Control and Prevention in Fort Collins, Colo., presented the national perspective.

By the fall of 2002, the West Nile virus situation had reached a crisis. But Louisiana was well-positioned to expand educational and research programs.

In September 2002, the Louisiana Department of Health and Hospitals/Office of Public Health (DHH/OPH) provided funds for AgCenter agents and others to survey the numbers and types of mosquitoes in the parishes where people had contracted West Nile but there was no mosquito abatement program. See page 15 for the story of "Operation Mosquito."

Another effort was the "Be a Skeeter Buster!" 4-H program. AgCenter educators armed 4-H'ers across the state with lesson plans and materials that they in turn presented at their schools and to their friends and families. Family and consumer sciences agents also distributed warning materials to the elderly, the group at most risk for West Nile.

In the spring of 2003, the AgCenter spearheaded a series of eight workshops to help the 44 of the 64 parishes in the state with no sustained mosquito abatement program to develop one. Thirty-six of the 39 parishes that sent participants to the workshops prepared a control plan and a proposal to fund it. Read more about the workshops on page 19.

Because of demand, the AgCenter sponsored a second one-day conference on mosquito-borne diseases on April 30, 2003. The agenda and speakers were similar to the year before, including a return visit by Nasci.

He told the group that West Nile is more threatening than other mosquito-borne diseases. He said in 1998, the first year of West Nile in this country, the virus was found in 26 of the 4,000 or so counties nationwide. But four years later, the virus was in 1,947 counties and had spread to 42 states and the District of Columbia.

Both Nasci and Raoul Ratard, the Louisiana state epidemiologist, predict further problems with this disease.

Mosquitoes are here to stay. Louisiana has 68 distinct types, and new, more ominous species have the potential to enter our country as the speed and convenience of trade and travel increase.

The best defense is knowledge, and that's where the LSU AgCenter comes in. Since 1965, our scientists have been conducting research and extension programs on mosquitoes and their control. In 2002, the AgCenter was ahead of the curve in stepping up educational efforts. ■ **Linda Foster Benedict**

Photo by Mark Claesgens



Matthew Yates, director of mosquito control for East Baton Rouge Parish in Louisiana, talks about surveillance at the LSU AgCenter's mosquito-borne disease conference in 2003.

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Volume 46, Number 3, Summer 2003

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ON THE COVER

Gerardo Boquin, research assistant in the Department of Entomology, checks a mosquito trap. The cooler hanging next to the trap contains dry ice, which helps attract the insects. Mosquito research is directed by Michael Perich. Read more beginning on page 15.

Weapons of Weed Destruction

Controlling Red Morningglory in Sugarcane

James L. Griffin, Curtis A. Jones and Jonathan D. Siebert

Red morningglory is one of the more common and problematic weed pests found in Louisiana sugarcane fields. The traditional way to control it is to apply the herbicide atrazine in April or May when sugarcane is cultivated for the last time. The intent of this application is to eliminate weed competition until the crop is harvested beginning in September.

Atrazine, however, provides weed control for only about eight weeks after application, and at least 16 weeks can occur between the application and harvest. During this period, rainfall and warm soil can cause rapid herbicide degradation, often resulting in late-season red morningglory infestations.

When control fails, morningglory, known by growers as tie-vine, climbs and entwines sugarcane stalks, causing the plants to fall over. This reduces both the number of harvestable stalks removed from the field and the efficiency of mechanical harvesters. Producers are often forced to apply the herbicide 2,4-D in late season to facilitate harvest.

Even though highly effective on red morningglory, 2,4-D is restricted in some areas of Louisiana because of problems with off-target movement and injury to sensitive crops, particularly cotton. During 2001-2002, LSU AgCenter scientists conducted research to evaluate red morningglory emergence across the growing season and the effect of the sugarcane canopy on the weed's growth. Knowledge gained in these areas will help develop effective management strategies. Additional research has evaluated alternative herbicides for atrazine and 2,4-D.

Tillage and Red Morningglory

The purpose of this study was to determine the effect of tillage on red



Photo by James L. Griffin

Research showed that tillage made little difference in the emergence of the red morningglory. Graduate student Curtis Jones is surrounded by red morningglory at four weeks' growth.

morningglory seed germination and seedling emergence. Soil samples were collected to determine red morningglory seed populations in April before the treatments began and in October when the study was terminated. Treatments included tillage to a 4-inch depth in May, June, July and August and no tillage. Weed emergence 20 to 41 days after each tillage operation was determined.

Soil samples before the study began contained between 100 and 450 red morningglory seeds per square foot. On the July sampling date, red morningglory emergence was equal whether soil was tilled or not tilled; emergence averaged 9.7 plants per square foot.

In August, weed emergence was 45 percent greater when plots had been tilled around four weeks earlier as compared with plots that had not been tilled (9.3 versus 6.4 plants per square foot). On the September sampling date, only 2.1 plants per square foot emerged in the non-tilled plots compared with eight plants per square foot where plots were tilled. The decrease in red

morningglory emergence as the season progressed is probably caused by depletion of the seed reservoir in the soil.

Soil samples taken in October clearly showed a decrease in seed from the initial sampling, but no difference in seed population was noted between tilled and nontilled treatments.

Shade and Red Morningglory

Another study looked at red morningglory tolerance to shade. Shade boxes were used to simulate zero, 30 percent, 50 percent, 70 percent and 90 percent shade. Weed emergence and growth data were collected just before each tillage operation. Red morningglory emergence decreased both years as the season progressed. But even though weed emergence decreased for some of the sampling dates in response to shading, plant growth for individual dates was equivalent regardless of shade. Results clearly showed that, unlike most weed pests, red morningglory is tolerant of shade.

James L. Griffin, Professor, and Curtis A. Jones and Jonathan D. Siebert, Research Associates, Department of Agronomy, LSU AgCenter, Baton Rouge, La.

Atrazine versus Spartan

Typically in sugarcane production, herbicide is applied at the last cultivation to keep fields clean until harvest. Herbicides are directed underneath the crop canopy to avoid contact with the young leaves in the sugarcane whorl. Atrazine applied in this manner has provided inconsistent red morningglory control.

Another herbicide, Spartan, is also recommended and provides consistent control of red morningglory. Spartan, however, has little grass activity and should be applied in conjunction with Prowl or one of the Treflan products. Prowl can be applied to the soil surface, but Treflan products must be incorporated into the soil to avoid herbicide loss.

One question often asked is if Spartan can be incorporated into the soil with Treflan rather than applied to the soil surface following incorporation of Treflan. Research has shown that at around eight weeks after treatment, Spartan applied at 8 ounces per acre and soil-incorporated controlled red morningglory 80 percent. When Treflan was soil-incorporated and Spartan was applied at 4 ounces per acre to the soil surface, however, control was 94 percent. When Spartan was applied to the soil surface and Treflan was not used, red morningglory was controlled 79 percent with 6.7 ounces per acre and 91 percent with 8 ounces per acre. Findings clearly show that to maximize red morningglory control, Spartan should not be incorporated into the soil and that Treflan followed by a surface application of Spartan is superior to that of Spartan applied alone.

Use of 2,4-D

When red morningglory growth threatens harvest, then a late-season herbicide must be used. Late-season herbicide applications are most often made by airplane or helicopter and involve use of 2,4-D products. If sugarcane is standing upright, a high clearance sprayer can be used and, if desired, herbicide can be directed underneath the crop canopy.

Because of restrictions on use of 2,4-D in sugarcane production areas, alternative herbicides for red morningglory control were evaluated. Complete control of 12- and 24-inch red morningglory was obtained 21 days after treatment with 2,4-D at 1 pint per acre, Weedmaster at 1 pint per acre,

Atrazine at 2 quarts per acre and Spartan at 6.7 ounces per acre.

Red morningglory at 6 feet tall was controlled 100 percent with 2,4-D at 1 quart per acre 28 days after treatment in 2001, but control was only 78 percent the next year. In 2002, when herbicides were applied three weeks earlier than in the previous year and when weed growth was more vigorous, red morningglory was controlled 87 percent with 2,4-D at 1.5 quarts per acre. Directed applications to the lower 18 inches of 6-foot red morningglory plants with Atrazine at 4 quarts per acre and Spartan at 6.7 ounces per acre provided at least 96 percent control the first year, but control was 23 percent to 30 percent less the second year.

Tough to Control

Results of this research show that red morningglory is not only capable of germinating throughout the growing season but is able to thrive under the sugarcane canopy. This suggests that soil-applied herbicides that provide long residual control are needed to prevent red morningglory emergence later in the growing season. Since there can be at least four months between the last cultivation and harvest, growers may choose to apply a grass herbicide at the last cultivation and delay application of Spartan or atrazine until after a rain has settled the soil. By delaying the herbicide application, the weed control period is extended.

If the grower has a high clearance sprayer, this application can be delayed even more. Spartan at the recommended rates of 6.7 to 8 ounces per acre of the dry formulation has been effective in controlling red morningglory, but long-term control can be rate dependent. In fields with heavy soil and where morningglory vines have typically been a problem of concern in sugarcane harvested early, growers should lean toward the high end of the rate range. The higher cost associated with a higher use rate of Spartan can be offset if an application of 2,4-D is avoided. Note that Spartan is not as effective on the pitted morningglory (smooth leaf species). For this weed, the higher end of the rate range should be used.

When red morningglory begins to climb and wrap sugarcane stalks, control with herbicides other than 2,4-D is more variable and difficult. 2,4-D remains the treatment of choice for late-season control of morningglory vines and other broadleaf weeds in areas where its use is not restricted. Growers should be aware that applying 2,4-D in late season to sugarcane used for seed can affect seed germination and yield of the plant cane crop. Research conducted over two growing seasons has shown that a seven-week period should be allowed between 2,4-D application and harvest of LCP 85-384 for planting material as either whole stalks or billets. ■

Acknowledgment

The American Sugar Cane League provided funds to support this research.

Photo by James L. Griffin



To test the red morningglory's shade tolerance, shade boxes were used. Graduate student Curtis Jones conducted research on the morningglory in sugarcane as part of his doctoral studies.

Pre-harvest Marketing Strategies Improve Farm Financial Performance

Lonnie Vandever, Kurt Guidry and Manuel Filipe

Changing economic variables and business conditions increase the need to manage farm income and risk. Financial performance is measured in terms of profitability, risk and the ability of the business to pay bills on time (liquidity). Farmers can increase their profits by using selected pre-harvest marketing strategies instead of selling in the cash market at harvest.

To illustrate the differences that pre-harvest marketing strategies can make, the following comparisons were made based on a representative grain farm in Central Louisiana that includes 1,000 acres where corn and soybeans are produced. An optimal marketing pre-harvest strategy estimated from an economic model is compared to a typical cash marketing situation.

The Louisiana Farm Bureau Marketing Service, along with Louisiana Cooperative Extension personnel, was used to select three pre-harvest marketing strategies. These strategies were:

- Sell in cash market at harvest—still the most popular method in Louisiana. The producer gets whatever price is offered at harvest.
- Initiate a pre-harvest forward price contract—becoming more popular in Louisiana. The producer locks in a price before harvest.
- Use a pre-harvest hedge-to-arrive price contract—also becoming more popular. The producer locks in a price based on the futures market, but there is still time before harvest to go up or down with the final, total price.

The model first estimates the optimal pre-harvest marketing strategy for each commodity. The optimal pre-harvest marketing strategy is then used to estimate the optimal crop production portfolios for the whole farm.

Marketing Strategies

Data from the marketing service were collected, and summary statistics for each of the crops for the period 1986 to 1999 are presented in Figure 1.

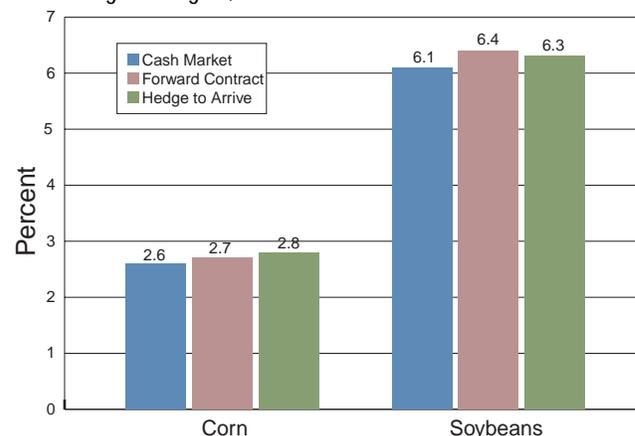
For corn, the first marketing alternative is represented by the cash price on the first Monday of August, the forward contract price is represented by the price on the first Monday of the second week of April, and the hedge-to-arrive contract is established by the price on the first Monday of the second week of April and the basis of the first Monday of the first week of July for the August futures price. Both Farm Bureau and LSU AgCenter commodity specialists were consulted in selecting these marketing dates as representative of area farm marketing activities.

For soybeans, the first marketing alternative is represented by the cash price on the first Monday of October, the forward contract price is represented by the price on the first

Monday of the second week of April, and the hedge-to-arrive contract is established by the price on the first Monday of the second week of April and the basis of the first Monday of the first week of July for the October futures price. Again, these dates are representative of typical marketing activities by area farms.

Price distribution data shown in Figure 1 reveal differences in mean prices for alternative marketing methods. The mean price for corn in the cash market is estimated at \$2.60 per bushel, while this estimate for the hedge-to-arrive contract is \$2.77. The mean price of soybeans in the cash market is estimated at \$6.14 per bushel, whereas this estimate for the forward contract is \$6.39 per bushel. These estimates generally indicate the potential of using pre-harvest marketing strategies to improve farm financial performance.

Figure 1. Unadjusted commodity prices by alternative marketing strategies, Central Louisiana 1986-1999.



Representative Farm

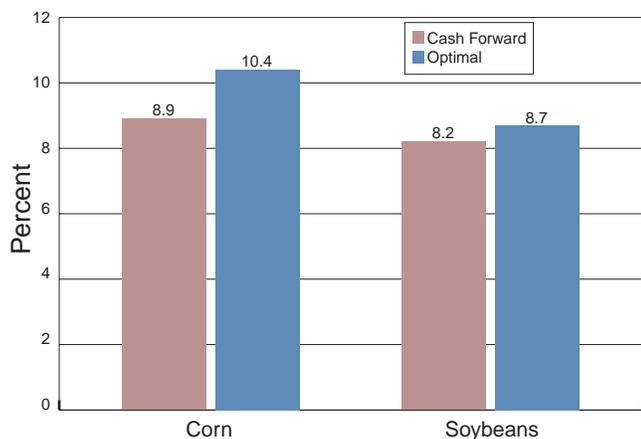
The representative farm in this study included a capital structure of \$666,841 in equity capital and \$422,159 of debt capital. Government payments were estimated at \$65,340. In addition to enterprise production expenses, which were used in estimating the rate of returns to assets, other expenses included farm overhead of \$26,900, operating interest of \$5,445 and family living costs of \$25,000. The interest rate was 9 percent, and the income tax rate 20 percent.

Optimal Marketing, Production Portfolios

A safety-first decision economic model was used to estimate an optimal marketing portfolio and optimal production portfolios. This model assumes that decisions are made to minimize the probability of economic losses. Results presented in Figure 2 indicate that the rate of return to assets for corn for the cash marketing scenario is 8.87 percent, while this amount for the optimal marketing scenario for corn is 10.39 percent. Similarly, for soybeans, the mean rate of return to assets is 8.21 percent for the cash marketing portfolio,

Lonnie Vandever, Professor, Kurt Guidry, Associate Professor, and Manuel Filipe, former Graduate Student, Department of Agricultural Economics and Agribusiness, LSU AgCenter, Baton Rouge, La.

Figure 2. Estimated rate of return gross margins for cash and optimal marketing strategies, Central Louisiana, 1999.



whereas it is at a higher amount of 8.66 percent for the optimal marketing portfolio.

The results suggest that the hedge-to-arrive contract best fits the corn enterprise, while the forward contract is estimated for soybeans. The optimal marketing portfolio for corn includes 24 percent cash and 76 percent hedge-to-arrive marketing strategies. The optimal marketing portfolio for soybeans includes 37 percent cash and 63 percent forward contract marketing strategies. Selling minimal amounts of each enterprise in the cash market for each optimal portfolio reflects modeling constraints for not contracting more of the commodity than can be produced in any given year.

The optimal enterprise production portfolio was estimated for both the cash marketing scenario and the optimal marketing strategy scenario. The optimal production portfolio with cash marketing includes 39 percent corn production and 61 percent soybean production. With the optimal marketing portfolio, corn increases to 46 percent and soybeans fall to 54 percent.

Financial Performance

Financial data along with production portfolios were used to estimate debt repayment capacity for optimal and cash marketing scenarios using the economic model. It is assumed in this analysis that the producer wishes to meet all of the farm’s financial commitments in nine of 10 years. Model results indicate that debt repayment capacity is greater for the optimal marketing scenario than for the cash marketing scenario. Assuming the representative farm must meet all of its financial commitments in nine of 10 years, maximum debt repayment capacity for the optimal marketing scenario is estimated at a debt-to-equity ratio of 0.64, whereas for the cash marketing scenario, it is estimated to be 0.51.

Other financial performance estimates for the cash marketing and optimal marketing strategy are presented in Figure 3. Profitability, risk and liquidity financial indicators shown in Figure 3 indicate that the optimal marketing plan is financially better than the cash marketing alternative. In terms of profitability, the optimal marketing scenario offers a profitability level of an 8 percent rate of return to equity, whereas this rate for the cash marketing alternative is 6.72 percent.

The optimal marketing strategy is not as risky as the cash marketing scenario. The standard deviation, which provides a measure of variability and risk, is estimated at 6.25 percent,

whereas it is estimated at 5.98 percent for the optimal marketing strategy. Moreover, the probability of meeting all cash commitments in nine of 10 years is estimated to be 0.91 for the optimal marketing scenario, whereas this same estimate for the cash marketing scenario is estimated at 0.72. This means that the representative farm meets all of its financial commitments in approximately seven of 10 years with cash marketing, and the farm is estimated to meet all of its financial commitments in approximately nine of 10 years with the optimal marketing strategy.

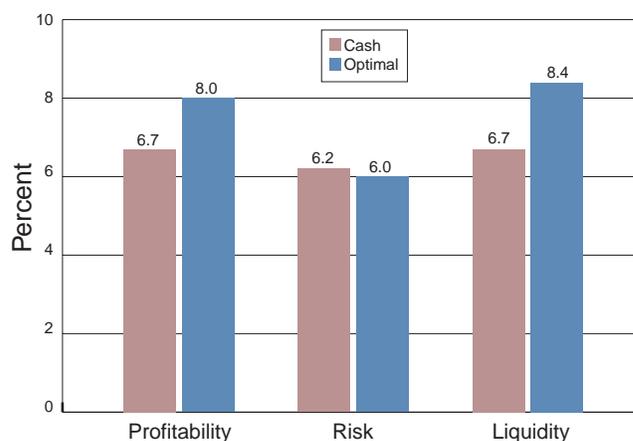
Liquidity in this article relates to the ability of the farm business to pay its bills on time. Liquidity for the representative farm is measured as the sum of the dollar returns to equity capital and the dollar amount of unused credit expressed in terms of equity. As shown in Figure 3, liquidity is estimated at 8.44 percent of equity capital (\$56,281) for the optimal marketing strategy scenario, while it is estimated at 6.72 percent of equity capital (\$44,812) for the cash marketing scenario.

Pre-harvest Strategies Boost Profitability

This article generally shows how different marketing strategies affect farm financial performance on a representative Central Louisiana corn-soybean farm. One important financial variable includes debt-carrying capacity, where the amount of debt is measured by the debt-to-equity ratio. Results of the analysis indicate that optimal pre-harvest marketing portfolios have a larger estimated debt-carrying capacity than the cash marketing strategy.

The results also indicate that different pre-harvest marketing strategies affected profitability, risk and liquidity on the representative farm. Both profitability and liquidity were higher for the optimal marketing scenario than for the cash marketing scenario. Similarly, the results indicate opportunities for improved farm risk management. Marketing the crops at harvest in the cash market has the highest level of risk. Moreover, if a portfolio of pre-harvest forward price contracts along with the cash market are used, the farm was able to meet all of its financial commitments within its desired limits of probability (nine of 10 years). These results illustrate a direct relationship between marketing strategies and financial performance. Improved marketing is expected to provide more and better opportunities for risk and financial management within the farm firm. ■

Figure 3. Financial performance measures for cash and optimal marketing strategies, Central Louisiana, 1999.



Specialty Rices for Louisiana

Xueyan Sha and Steven D. Linscombe

In the United States, all types of rice other than typical American long-, medium- and short-grain fall into the specialty category. Among these are aromatic rices, such as Jasmine and Basmati. Since these rices fit the specific needs of niche markets, they usually fetch a premium price. The demand for special purpose aromatic rice has increased dramatically in this country over the past two decades.

Most of the Jasmine and Basmati rice in the U.S. market is imported, and the volume of such imports is increasing every year. In 1990, about 137,000 tons of Jasmine and Basmati rice were imported; however, by 2001, that figure had grown to 340,000 tons, which equals about 10 percent of domestic food rice consumption. The biggest consumer group of imported aromatic rice is Asian-Americans, one of the nation's fastest growing ethnic groups. Based on the current growth rate of Asian-Americans and increased selective taste preference of other American consumers, special purpose aromatic rice markets are expected to expand.

Meanwhile, with increasing prosperity, local demand for specialty aromatic rices in India and Thailand, as well as in some economically fast-growing Asian countries such as China, has been rising dramatically. This trend is likely to continue. Because of the low yield (less than 2,000 pounds per acre), only a limited acreage can be planted to these specialty varieties. The world production of those specialty rices will not meet the increasing demand in the foreseeable future.

Jasmine aromatic rice, which originated and is largely produced in Thailand, makes up 75 percent of U.S. rice imports. It is renowned for its aroma, flavor, slender kernels and soft-cooking characteristics. Khao Hawn Dawk Mali 105 (KDML 105) is the dominant variety in Thailand. The average yield of this variety is about 1,600 pounds per acre.

KDML 105 will not grow in the climatic and environmental conditions in the United States. In 1988, the variety Jasmine 85 was released by the Texas Agricultural Experiment Station in cooperation with U.S. Department of Agriculture's Agricultural Research Service. It is the only adapted Jasmine variety available. However, consumer acceptability of this variety is low

The demand for special purpose aromatic rice has increased dramatically in this country over the past two decades.

because of the off-white grain color, aroma and flavor characteristics.

The unique kernel elongation ability of cooked Basmati rice distinguishes it from other aromatic rice. Premium Basmati rice has extremely slender grains, substantial kernel elongation after cooking (about twice), nut-like flavor and fluffy appearance. Basmati rices make up about 20 percent of total U.S. imports.

The typical U.S. long-grain aromatic varieties, such as Della, Dellmont and Dellrose, have a different market, which is composed of non-ethnic American consumers who prefer the popcorn-like aroma in an otherwise typical U.S. long-grain rice. The popcorn aroma comes from a compound known as 2-acetyl-1-pyrroline (2-AP). Indeed, rice aroma, as well as its inheritance, is complicated. Scientists are only beginning to learn the genetic basis for such characteristics as aroma and kernel elongation.

Development of improved specialty rice varieties adapted to Louisiana environmental conditions will help the Louisiana rice industry obtain a sizable portion of this fast-growing, high-value rice market, both domestically and internationally. These varieties must have competitive grain and milling yields and superior specialty characteristics that match those of imported rice.

To grow successfully in Louisiana, they must also be pest-resistant.

Since the initiation of the specialty rice breeding program at the Rice Research Station in 1992, major emphasis has been placed on the development of Jasmine-, Basmati- and Della-type aromatic varieties. Initial crosses were made between KDML 105 or Basmati 370 and commercial U.S. long-grain varieties. A few lines with improved agronomic characteristics and high-yield potential were selected from those crosses. These lines had poor milling yield, inferior plant types and weak specialty attributes. Intercrosses among these selected lines and between these lines and conventional advanced lines or varieties have been made over the years to combine all the specialty attributes.

After several cycles of hybridization and recurrent selection, a number of advanced breeding lines have been developed that possess cooking quality attributes approaching those of imported Thai Jasmine or Indian Basmati. These lines have been tested in both the Uniform Regional Nursery and the Commercial Advanced tests across Louisiana since 1998. Some of these lines have good yield potential and acceptable milling yield. One example is LA2140, a Jasmine-type advanced breeding line. The average yield of this line over five Louisiana locations in 2002 was 7,421 pounds per acre compared with 7,709 pounds per acre for Cocodrie, currently Louisiana's most widely grown rice. The head rice yield for LA2140 was 59.9 percent compared with 63.5 percent for Cocodrie. Detailed evaluation of these lines for their cooking quality is being conducted.

The other example is the newly released Basmati-type variety Dellmati by the Rice Research Station, which shows excellent cooking quality and kernel elongation characteristics that are close to those of imported India Basmati rice. Most important, this variety is well adapted to Louisiana and the other southern states. Efforts to enhance quality attributes and to incorporate disease resistance into these lines or varieties will be addressed in future research. ■

Xueyan Sha, Assistant Professor, and Steven D. Linscombe, Professor and Southwest Regional Director, Rice Research Station, LSU AgCenter, Crowley, La.

Scientists Ready Thai Jasmine Rice Competitor

The industry leader is high-priced, perfumed and soft. It comes to America's shores from Thailand with a name that hints of its marketing advantage.

Khao Dawk Mali rice is the premium Thai Jasmine variety in the United States. So far, no American variety has matched its delicate taste, appearance or cooking characteristics.

Its Thai name translated into English illustrates why Khao Dawk Mali trumps specialty rice competitors bred in research labs from Louisiana to California over the past 20 years.

Khao means white in English. Asians, including the millions who have immigrated to the United States over the past three decades from Thailand, Vietnam and Cambodia, prize Thai Jasmine's intense, white kernels. U.S.-bred Jasmine alternatives—up to now—have looked almost brown by comparison, a turn-off for most Asian consumers.

Dawk means flower and Mali means Jasmine, both of which describe the sweet aroma also valued by Asians who have brought their love of premium Thai Jasmine rice to America's shores.

Khao Dawk Mali and other Thai Jasmine varieties are generally soft and sticky. Their long, thin kernels don't harden much as they cool after cooking, another characteristic that Asian consumers like.

The quest to conquer Khao Dawk Mali and other Thai Jasmine varieties with a Louisiana-grown rice has heated up in recent years as Asian immigrant numbers have swelled. So far, researchers have come up mostly empty-handed, but that may be about to change.

LSU AgCenter scientists believe a new specialty rice, known now as LA 2140, being grown in test plots at the Rice Research Station in Crowley, has potential.

Steve Linscombe, rice breeder and the LSU AgCenter's Southwest Region director, insists LA 2140 is a big leap forward over Jasmine 85, an older rice variety released in 1988 by the Texas Agricultural Experiment Station. Jasmine 85 has never caught on with the Asian market (or with U.S. rice growers) in large part because of its off-white color after milling.

"With rice prices so low, it would be great if we could give rice farmers an option with a new aromatic rice that could sell at a premium price," said Xueyan Sha, assistant professor and rice specialist at the station.

"LA 2140 is a promising advanced experimental that will be a strong candidate for release in the near future," Linscombe said.

Taste tests give LA 2140 relatively high marks in appearance, flavor, aroma, tenderness and whiteness. It is a cross between Jasmine 85 and an older aromatic rice variety grown in the United States called Della.

Breeding of specialty rice varieties at the LSU AgCenter is funded in part by the Louisiana Rice Research Board's check-off funds.

LA 2140's kernels are not quite as long as premium Thai Jasmine after cooking, and they're not quite as slender. But the differences are measured in tenths of a millimeter.

Up to now, the demand for Jasmine rice has been met by huge imports from overseas.

In 1990, 130,000 tons of Thai Jasmine rice and Basmati (another aromatic rice from India and Pakistan) were imported. By 2001, that figure had grown to 340,000 tons, with Jasmine rice making up about 75 percent of all U.S. rice imports.

Dennis Hensgens, who owns Eunice Rice Mill in Eunice, is pulling for LSU AgCenter researchers.

"When you're selling rice to the Oriental market, appearance is one of the most important things," Hensgens said. "We can't give up because the Asian market is so huge. So far, we haven't had the quality to compete. But if we can come close to the (Thai Jasmine's) quality with a high-enough yielding variety, maybe we can compete."

Linscombe says LA 2140 is much closer in appearance, aroma and grain quality to Khao Dawk Mali than past mimics.

But, he added, "We're dealing with a discriminating consumer skeptical of U.S.-grown rice." ■ **Randy McClain**

Photo by Mark Claesgens



Xueyan Sha, a researcher at the LSU AgCenter's Rice Research Station, predicts that if he can develop an aromatic rice that appeals to the Asian-American population, it will sell well and provide an economic opportunity for Louisiana rice growers.

Valor

A New Herbicide for Managing Winter Vegetation in Louisiana Crops

Bill J. Williams, Donnie K. Miller and Steven T. Kelly

Conservation tillage systems, including no-till and stale seedbed, require successful control of native winter vegetation or planted cover crops before planting. Some winter vegetation is easy to control, such as annual bluegrass and common chickweed, while others are difficult, including curly dock and ryegrass.

Glyphosate or paraquat form the backbone of most burndown programs in Louisiana. Few residual herbicides can be mixed with glyphosate or paraquat and applied in multiple crops. Goal and Direx are the main residual herbicides used in Louisiana, but they are limited to selected crops.

Valor can improve burndown programs for cotton, soybean, grain sorghum, rice, sugarcane and wheat.

Valor (flumioxazin), a herbicide marketed by Valent, is one of just a few residual herbicides that can be tank-mixed with glyphosate or paraquat to improve burndown programs for cotton, soybean, corn, grain sorghum, rice, sugarcane and wheat. Valor efficacy and crop tolerance were evaluated in 2001 and 2002 at the Northeast Research Station near St. Joseph, La., on Commerce silt loam and Sharkey clay soils.

Selecting the optimum Valor rate depends on weed size and the level of soil residual needed:

- Valor at 0.5 to 1 ounce per acre applied with glyphosate or paraquat in February improved cutleaf eveningprimrose, henbit, chickweed, curly dock, swinecress and smartweed control 10 percent to 40 percent compared to either applied alone.

- Valor at 0.5 ounce per acre provided limited residual benefit but was adequate for enhancing burndown of small weeds (less than 2 inches), including cutleaf eveningprimrose.

- Primrose 2 to 4 inches was controlled by 1 ounce per acre of Valor; 2 ounces per acre was required to control 4- to 8-inch primrose. Primrose taller than 8 inches has not been consistently controlled with Valor.

- Valor at 2 ounces per acre has resulted in soil residual control of smartweed for up to six weeks. Smartweed is extremely sensitive to Valor, and other weeds may not be controlled for that length of time. Valor at 1 ounce per acre typically provided three to four weeks of residual control.

Overall, Valor in combination with glyphosate or paraquat applied in February had the broadest spectrum and best residual control of winter vegetation when compared to mixtures with Linex, Direx, Aim, Clarity, Harmony Xtra or Goal. Research indicated that Valor is an excellent tool when burning down early and residual control are desired; however, 2,4-D, Clarity or Harmony Xtra may be better options on larger weeds where residual control is not an issue.

Soybeans and rice demonstrated the most Valor tolerance. Valor applied at 1 to 2 ounces per acre 30, 21, 14 and seven days before planting did not injure soybeans or rice.

Corn injury from Valor was strongly influenced by rainfall following emergence. In 2001, rain occurred four weeks after the corn emerged. Valor at 2 ounces per acre caused 10 percent injury when applied 30 days before planting and 35 percent injury when seven days before planting. However, within 10 days most of the visual corn injury had decreased to negligible levels and did not affect yield.

In 2002, visual corn injury was similar to that observed in 2001, but corn yield was reduced 22 and 52 bushels per acre when 2 ounces of Valor

per acre was applied 14 and seven days before planting, respectively. Corn injury from Valor was generally higher (up to 40 percent) on the Sharkey clay than on the Commerce silt loam.

Rain occurred in grain sorghum in 2001 right after emergence. Valor at 2 ounces per acre caused 20 percent injury 30 days before planting up to 70 percent injury seven days before planting. As with corn, however, grain sorghum injury from Valor was short-lived.

In 2002, only 2 ounces per acre of Valor applied seven days before planting resulted in visual injury to grain sorghum. Valor did not affect grain sorghum heights, stands or yields in any trial.

In 2001, 2 ounces per acre of Valor injured cotton up to 63 percent when applied seven days before planting. Cotton yield was not influenced by Valor. In 2002, weather prevented the establishment of cotton tolerance trials.

Valor is labeled for preemergence use in soybean at 1 to 3 ounces per acre and can be applied anytime before planting. In cotton, corn, grain sorghum, sugarcane and rice, no more than 2 ounces per acre of Valor can be applied within 30 days of planting. Valor at 1 and 2 ounces per acre tank-mixed with paraquat or glyphosate improved the control of most winter weeds.

Some trials indicated that less than 1 ounce per acre of Valor could be used for weed control, but this rate did not produce consistent results. Some trials indicated that Valor could be applied as close as 21 days before planting cotton and corn, and possibly maybe even as close as 14 days before planting grain sorghum and rice. The severe injury in corn supports the 30 days before planting restriction on most crops.

Additional, research is under way to refine Valor rates and timings for improved crop tolerance. When applied as recommended, Valor is an excellent tank mix partner for glyphosate and paraquat and can be used safely on most row crops grown in Louisiana. ■

Bill J. Williams and Donnie K. Miller, Associate Professors, Northeast Research Station, St. Joseph, La., and Steven T. Kelly, Assistant Professor, Scott Research and Extension Center, Winnsboro, La.

Particleboard from Sugarcane Bagasse for Value-added Applications

Qinglin Wu

Finding a better way to use bagasse, a byproduct of sugarcane production in Louisiana, is a key research interest of the LSU AgCenter. Disposal of this byproduct is so far inefficient. About 85 percent is used in-house as fuel in mill processes and for other low-value applications such as mulch and inexpensive ceiling tiles. The remaining 15 percent is waste that is allowed to decay or is landfilled.

Transforming bagasse into high-quality panel products provides a prospective solution.

Bagasse-based composites offer potential as the core material for laminated floors, replacing high-density and expensive wood fiberboard. Dimensional stability of the panel is critical for this use. Otherwise, internal stresses and out-of-plane distortion to a floor will develop when the panels are exposed to high humidity.

LSU AgCenter researchers conducted studies to develop technical information for manufacturing bagasse particleboard with desired properties as a potential raw material for laminated floor applications. The objective was to investigate effects of panel density, resin content and wax level on dimensional stability and mechanical properties of the bagasse particleboard.

Producing Bagasse Panel

Bagasse was collected from a sugar mill in New Iberia, La. The fibers had been open-field stored and naturally dried for several months. Before panel manufacturing, bagasse was hammermilled to pass through a 6-mm screen. The particles were further screened to separate most pith material and then dried to about 3 percent moisture content before use. During panel manufacturing, dry bagasse particles were blended with various levels of polymeric Methylene Diphenyl diisocyanate (pMDI) resin and wax emulsion with a laboratory blending system. The mats were then manually formed and hot-pressed into solid panels with target density levels. All boards were conditioned at 68 degrees F and 65 percent relative humidity for two weeks before cutting test samples. Tests including basic mechanical and physical properties were conducted according to the American Society for Testing and Materials standard. Test results were analyzed and compared with the corresponding values of wood-based particleboards.

Panel Properties

Panel density and resin content levels were important in controlling the strength properties of the particleboard. Bending modulus, bending strength, internal bond strength and surface hardness values all increased with increases in

panel density and resin level. The strength values well exceeded the minimum specifications for wood-based particleboard at the target manufacturing conditions. The use of wax had no significantly negative effects on the mechanical properties of pMDI-bonded bagasse particleboards. All bagasse particleboards showed decreased tendency of in-plane swelling (linear expansion) and out-plane swelling (thickness swelling) with increase

of wax contents. All linear expansion values from wax-sized panels were successfully controlled under the maximum allowed values for wood particleboard. Wax-sizing also showed its positive effect on the long-term thickness swelling properties of the particleboard. Water adsorption and thickness swelling increased as water soaking time increased for all boards. However, boards treated with high levels of wax showed significantly less water absorption, thickness swelling and thickness swelling rates compared with the control panels. The long-term water-soaking test also showed that

boards made of pure rind particles (after removing pith from the bagasse) further improved the dimensional stability of the bagasse particleboard with reduced resin content and panel density levels.

This study shows that it is technically possible to make bagasse particleboard with pMDI resin as a bonding agent and wax as dimensional stabilizer for targeted laminated floor and furniture applications. The particleboard developed in this study had mechanical properties that well exceeded the standard requirements for wood particleboards. Panel linear expansion and thickness swelling values from water soaking tests were also in the range of the values for wood particleboards. The study demonstrated an efficient way of transforming bagasse into high quality industrial panel products, providing a prospective solution for value-added bagasse use. Further development of the technology includes rind-based structural composite for building construction.

Successful commercialization of bagasse-based panel products depends on development of a cost-effective manufacturing process on a commercial scale and establishment of a market base for the products. Panel product manufacturers are considering adding handling facilities for materials, such as bagasse fibers, to the existing wood-based composite plants. This would allow them to produce pure and mixed wood-bagasse panel products and to market them together. ■

Bagasse-based composites offer potential as the core material for laminated floors, replacing the expensive material used now.

Qinglin Wu, Associate Professor, School of Renewable Natural Resources, LSU AgCenter, Baton Rouge, La.

Cattlemen Pleased with Cloned Calf, Thanks to LSU AgCenter Research

Though Dolly the famous Scottish sheep is no longer with us, the promise of cloning as another tool in the quest to produce perfect livestock animals remains strong. The LSU AgCenter just had a successful experience in cloning a genetically valuable cow. And the owner, Louisiana rancher David Pattridge, is pleased.

In 1997, Dolly was the world's first clone produced from the cells of an adult animal. She was euthanized in February 2003 because of a progressive lung disease.

"There are a lot of unknowns with animal cloning," said Richard Denniston, director of the LSU AgCenter's Embryo Biotechnology Laboratory. "This is still a developing science with no guarantees."

In the livestock industry, cloning is looked upon as the next step in reproducing profitable animals. Pattridge of Benton, La., wanted a clone of one of his best and most expensive Charolais cows.

"She's a high-yielding, milk-producing beef cow," Pattridge said of the 11-year-old animal, whose initial purchase price was \$20,000, which is top dollar in the world of specialty breed cattle. Her registered name is GS "Lacey" 2201 ET. The ET stands for embryo transfer, which means she started out as an embryo transplanted into a surrogate mother. This would make the calf a clone of an ET-produced cow, a double technological accomplishment.

"This cloning was his idea," David said of his son and business partner, Paul, who in the fall of 1999 was a student in an LSU animal science class where he first heard specifics about cloning. Denniston was a guest speaker in the class.

"I brought my dad to Baton Rouge to talk about the possibilities of trying this in our business," Paul said. "He had no hesitation."

The Pattridges have a 200-acre ranch in Louisiana and a 1,600-acre spread in Mansfield, Mo., where they maintain about 200 head of Charolais and 150 head of commercial cattle, not counting calves. The business is called Oakwater Ranch. Paul now resides in Missouri where both "Lacey" and her clone are too.

The ranchers and the researchers had to work out an arrangement mutually agreeable, considering all the risks.

"We were interested in working with the private producers of our state," Denniston said. "But this was still part of our ongoing research and not a service we were selling."

The few companies in the world that offer a cloning service charge high fees—something in the neighborhood of \$25,000 for a cow, for example.

"This new technology is being developed primarily at university laboratories," Denniston said. "It's still inefficient, and its success depends on many factors still unknown."

After the final agreement on ownership of the offspring was made, the cloning process began. The first step was for a local veterinarian to take skin cells from the animal to be cloned, following strict procedures, and ship them to Lazon BioTechnologies, a company in Baton Rouge with the capability of cryo-preserving the cells. This means storing the cells at an extremely low temperature where, in theory, they can be preserved forever.

Then comes the tedious process of trying to create embryos with micro-instruments under a high-power microscope. Sometimes it takes hundreds of tries to get one to work.

Embryos are then transplanted into surrogate mothers, and everyone waits to see if it's a successful pregnancy. In this case, the project was undertaken by an animal scientist from Japan, Masao Murakami, who was doing post-doctoral research under the direction of Robert Godke, Boyd Professor and project leader on this research. A successful conception occurred after eight months. Murakami has since returned to Japan.

"He worked on the project during his two years of study with us," Denniston said.

Then, on February 8, 2002, Lacey's clone was born, weighing a little over 100 pounds. Murakami nicknamed her "Yuki," which is Japanese for snow. And so far, so good. David came to pick her up from the LSU AgCenter facility on March 27, 2003, and transported her to Benton, where Paul saw her for the first time.

"I've known her donor since she was about five years old. The calf looks a lot like her and seems to have the same characteristics. We're very impressed with the whole procedure," Paul said.

Part of the agreement is that LSU AgCenter researchers can further evaluate the clone and her offspring.

"We're glad to be part of this emerging technology," David said. "We see significant application for the future."

Helping farm animals have babies efficiently and at the least cost to livestock producers is the focus of the AgCenter's reproductive physiology research program.

"We're grateful to people like the Pattridges who are willing to help us with our research," Denniston said. "The cloning process is by no means perfected yet. An animal's genetic makeup is enormously complicated." ■ **Linda Foster Benedict**



Photo by Robert Godke

"Yuki" is a cloned calf produced at the LSU AgCenter's Embryo Biotechnology Laboratory as part of the reproductive physiology research program. She is a Charolais and looks exactly like her donor, according to owner David Pattridge, a rancher in Benton, La. Yuki, which is Japanese for snow, is about 2 months old in this photo. She was produced by Masao Murakami, postdoctoral researcher under the direction of Robert Godke, Boyd Professor and project leader on this research.

Graduate Student Produces First Cloned Cow From Frozen Egg

Soon the portrait of another farm animal first will hang on the wall of the narrow hallway at the LSU AgCenter's Embryo Biotechnology Laboratory, located near St. Gabriel, La.

This will be of a big-eyed, lop-eared blonde Brahman named "Gracie," born this year on Elvis Presley's birthday, January 8.

She is the first clone of a cow to be produced from a new type of freezing procedure for an egg, or oocyte, called vitrification.

"This vitrification procedure adds a new dimension to our embryo research," said Robert Godke, LSU AgCenter project leader for reproductive physiology research. He started the tradition of hanging pictures of firsts for the laboratory back when the new facility opened in the mid 1980s.

Some of the pictured animals are firsts for the AgCenter, such as the first calves produced by splitting embryos. But others are also firsts for the world, including the first horse born through a test tube fertilization procedure that used oocytes from a pregnant mare in 1998 and the first cloned goats to produce a heart medication in their milk in 1999.

"The oocyte is one of the largest cells of the female's body and contains a lot of water," said Sabrina Luster, Godke's graduate student responsible for the research project that brought Gracie into the world. "When a cell freezes and then thaws, this creates ice crystals that can disrupt the cell membrane, causing a cell to die."

Because of this, scientists have been somewhat limited in their embryo research to fresh oocytes near at hand. Some female animals, such as goats, produce oocytes only during the fall breeding season. To increase their production, such as in cloned goats that synthesize a pharmaceutical product in their milk, it would be valuable to freeze and store oocytes for future use and also for transporting to other parts of the country for embryo production.

As part of her graduate study, Luster developed a procedure to preserve an oocyte in a super cold gel. This is what vitrification is. It prevents crystals from forming. Through vitrification, the egg can stay intact long enough for cloning.

"Cloning involves removing the female genetic material from an oocyte and replacing it with an adult cell from the animal to be cloned," Godke said.

Gracie started as a vitrified oocyte after coming to the biotech laboratory from Wisconsin

via an overnight mail delivery service. The nuclear material was removed from this oocyte and replaced with a cell taken from a big, beautiful Brahman cow who

resides at the LSU AgCenter's Ben Hur Research Farm, which is about halfway between the campus and the biotechnology laboratory.

Photo by Mark Claesgens



Gracie, a Brahman born on Elvis Presley's birthday, January 8, is the first clone to be produced from a new procedure for freezing cow eggs, called vitrification. Her "producer" is Sabrina Luster, a graduate student working under the direction of Robert Godke, LSU AgCenter project leader for reproductive physiology research. Gracie, at 4 months in this picture, is about 200 pounds, roughly twice her birth weight.

Luster used a cow in her research rather than a goat because of the economic importance of cattle production to the state of Louisiana.

Multiple cloned embryos were prepared for nonsurgical transfer to recipient cows. Of three pregnancies, one went to term.

"She looks exactly like the cell donor cow," Luster said of Gracie, who was born via Caesarean section weighing in at 105 pounds, a normal birth weight for that breed. Because of all the human handling she underwent, her surrogate mother did not accept her to nurse. Luster and fellow animal science graduate student Kyle Hebert became her caregivers.

Luster is scheduled to graduate in December, but Gracie will remain under the watchful eye of LSU AgCenter scientists studying the long-term effects of cloning on cattle.

"There are still unknowns with the animal cloning process," Godke said. "Some day it could be another tool in assisted reproduction for farm animals. At present, efficiency needs to be improved and it's still too costly."

The main reason Gracie's portrait has not been added yet to the wall of fame is that the 7,000-square-foot lab is being expanded to nearly double in size. Renovations are to be complete by the first of the year. ■ **Linda Foster Benedict**

News Briefs



Embryo Biotech Lab to Expand

The LSU AgCenter's Embryo Biotechnology Laboratory, located at the St. Gabriel Research Station, is set for a facelift and some more space in 2003. The renovated facility should be ready for a ribbon-cutting ceremony by the first of 2004. Richard Denniston, who is the director of the facility and an assistant professor in animal science, said two new labs, a conference room, a student work room and a small animal prep area will be added. These additions and renovations are necessary for the facility to obtain the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) accreditation, which will enhance opportunities for more grant money. The existing

building includes about 6,500 square feet. About 2,300 square feet of space will be added and about 1,000 square feet will be renovated. The cost is approximately \$300,000.

■ **Linda Foster Benedict**

Photo by Mark Claesgens



Three administrators took part in the ground-breaking ceremony in June at the Embryo Biotechnology Laboratory. Left to right are Bill Brown, vice chancellor for research; Bill Richardson, chancellor; and Robert Godke, professor and program leader.

Which Came First? Egg or Insulin

The LSU AgCenter has licensed technology to a start-up biotechnology company to produce a precursor for the drug insulin in chicken eggs. This technology was developed by Richard Cooper, a professor in the Department of Veterinary Science.

The company is TransGenRes and is in the process of moving into office and laboratory space on the Baton Rouge campus and at the Ben Hur Research Farm, where the chickens will be housed.

The technology involves a patented process of moving genes into a chicken so that a specific protein, in this case proinsulin, can be produced in the egg white. The proinsulin

will then be used by drug manufacturers to produce insulin at a fraction of the current cost. Not only do the chickens produce a specific protein in their eggs but they pass on the traits to subsequent generations.

TransGenRes expects to hire hundreds of employees in high-paying jobs, which will be a boost to the Baton Rouge economy.

Proinsulin is just the beginning. It may be possible to create other expensive protein products more inexpensively in egg whites. Chickens work "cheep."

■ **Linda Foster Benedict**

'Operation Mosquito' Fights Bites

Michael J. Perich and Raquel M. Gleiser

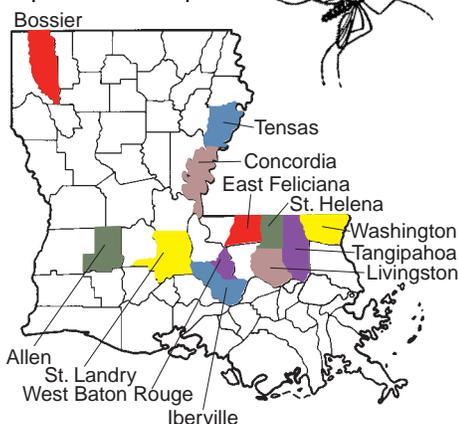


The tropical and subtropical climate in Louisiana creates conditions that support mosquitoes year-round. Mosquitoes are not only a nuisance but, more important, can transmit several diseases to people and domestic animals when biting for a blood meal. Louisiana is historically host to several viral mosquito-borne diseases such as St. Louis encephalitis, eastern equine encephalitis and LaCrosse-California encephalitis. As recently as 2001, West Nile virus was first reported in the state. In 2002, Louisiana ranked among the top five states in the nation in number of West Nile encephalitis cases, and first when cases per inhabitants were taken into account.

The outbreak of West Nile virus in Louisiana in 2002 led to a cooperative venture between the LSU AgCenter and the Louisiana Department of Health and Hospitals Office of Public Health (DHH/OPH).

In the summer of 2002, DHH/OPH funded a team of LSU AgCenter entomologists and other personnel to conduct Operation Mosquito, the mosquito surveillance component of the AgCenter's West Nile Virus Mosquito Program. Team members, led by entomologist Michael Perich, collected mosquitoes in 12 parishes that had reported a human case of West Nile but were without organized mosquito abatement programs. The purpose was to determine what potential vectors of West Nile were present and to gather information on the mosquito abundance in these parishes.

Figure 1: Parishes surveyed in Operation Mosquito.



For each of the parishes, 10 sites in proximity to reported West Nile cases and also representing the various ecological habitats within that parish were selected for samples. Sampling was initiated on Sept. 3, 2002, for eight parishes (Allen, East Feliciana, Iberville, Livingston, St. Helena, Tangipahoa, Washington and West

Baton Rouge) and the other three parishes on Sept. 10, 2002 (Bossier, St. Landry and Tensas). See Figure 1.

Mosquitoes were collected three times a week for nine consecutive

Michael J. Perich, Assistant Professor, and Raquel M. Gleiser, Postdoctoral Researcher, Department of Entomology, LSU AgCenter, Baton Rouge, La.

Figure 2: The gravid trap is used primarily to collect southern house mosquitoes, which are carriers of St. Louis encephalitis and West Nile virus, and the Asian tiger mosquito, also a carrier of West Nile virus. The trap includes a pan filled with water and organic matter to attract the mosquitoes. A fan inside the net trap draws in the mosquitoes.

Photo by John Wozniak



Figure 3: The CDC (for Centers for Disease Control) miniature light trap is typically hung from a tree and includes a light to attract flying mosquitoes and a fan to suck them into the white net tube. The cooler hanging next to the trap contains dry ice, which is carbon dioxide (CO₂) in a solid state. CO₂ attracts mosquitoes.



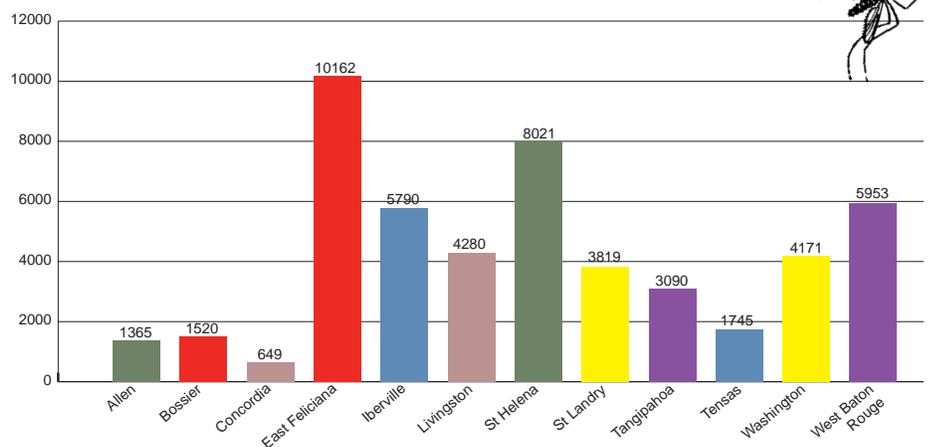
weeks, using gravid traps (Figure 2) and miniature light traps (Figure 3), both in urban and rural areas near confirmed human West Nile cases. Gravid traps were used to assess the presence, distribution and abundance of the southern house mosquito (*Culex quinquefasciatus*), the principal vector, which means carrier, of St. Louis encephalitis and West Nile virus, and the Asian tiger mosquito (*Aedes albopictus*), also a vector of West Nile. Light traps were used to determine what other potential mosquito vectors were in each parish. In addition, ovitraps were deployed to sample for the Asian tiger mosquito. The collaboration of the county agents, who operated the traps, sorted and delivered the mosquitoes to the AgCenter medical entomology laboratory for identification, was essential for the success of the project.

More than 160,000 mosquitoes were collected in the combined CDC light traps and gravid traps, representing the 10 genera of mosquitoes known to occur in Louisiana, and 43 of the approximately 64 species reported for the state. Not all species were present in every parish, and their relative importance in terms of number of mosquitoes collected varied as well (Figure 4).



Student worker Lana Gallego holds a trap full of mosquitoes.

Figure 4: Total number of southern house mosquitoes (*Culex quinquefasciatus*) in each parish surveyed during Operation Mosquito.





The Asian tiger mosquito likes to lay eggs in standing water. Gerardo Boquin, research assistant, inspects likely breeding areas for mosquitoes.



Because of this variation in the mosquito populations, the approaches to mosquito control will be different for each parish. For example, in more urban areas with higher populations of container-breeding mosquitoes (such as the Asian tiger mosquito), parish officials will have to invest more time and resources in sanitation and public education campaigns. In more rural areas, they need to target natural mosquito habitats such as rice fields and poorly drained areas.

Some factors affected the total number of mosquitoes collected, such as spraying for mosquito control in five parishes (East Feliciana, Livingston, St. Landry, Tangipahoa and Washington) by the Louisiana Department of Agriculture and Forestry. Collections had to be interrupted on a few occasions because of tropical storm Isidore and Hurricane Lili. The number of mosquitoes, specifically floodwater mosquitoes, increased dramatically in weeks following the tropical storm and hurricane (Figure 5).

The information gathered during Operation Mosquito provides a starting point for the organization of mosquito



The ovitrap is placed in areas where there is standing water. It includes a black plastic cup half filled with water, with a wooden paddle or paper strip resting inside. The mosquito lays eggs on this strip.

abatement programs. We know what mosquito vectors and nuisance species are present in each parish. Besides the survey, a series of recommendations for arbovirus vector surveillance were provided as part of Operation Mosquito (Table 1).

A further project developed by the AgCenter and funded by DHH/OHP, with input from the Louisiana Mosquito Control Association and its technical advisory committee and the Louisiana Office of Agricultural and Environmental Sciences of the Louisiana Department of Agriculture and Forestry, has resulted in a template for organizing and instituting mosquito abatement districts, known as the Louisiana Mosquito Abatement Plan or LaMap. The LSU AgCenter is working closely with parishes involved in Operation Mosquito to adapt LaMap to specific needs and budgets and to help officials apply for special funding. ■

Acknowledgments

County Agents: Randall Bellon (Allen Parish), Marion Farris (Red River), Glen Daniels (Concordia), Brian Chandler (East Feliciana), Harry Laws (Iberville and West Baton Rouge), Kenneth Sharpe (Livingston), Gerald Roberts (St. Landry), James Devillier (East Feliciana), Stefen Givens (St. Helena), Sandra Benjamin (Tangipahoa), Robert Goodson (Tensas), Audrey Posey (Washington)

Mosquito identification: Jack Baldwin, Gerardo Boquin, Chris Carlton, Brett Collier, Mary Claire Delony, Stephanie Gil, Andrew MacKay, Victoria Moseley, Lisa Peri, Michael Perich, Laura Rodriguez, Raiza Rodriguez, Ana Maria Sanchez.

Figure 5. Total number of mosquitoes collected by CDC light traps and gravid traps for Livingston Parish. Floodwater mosquito numbers increased following tropical storm Isidore and Hurricane Lili. Red arrows indicate the weeks when LDAF sprayed the parish.

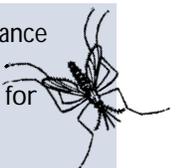
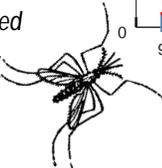
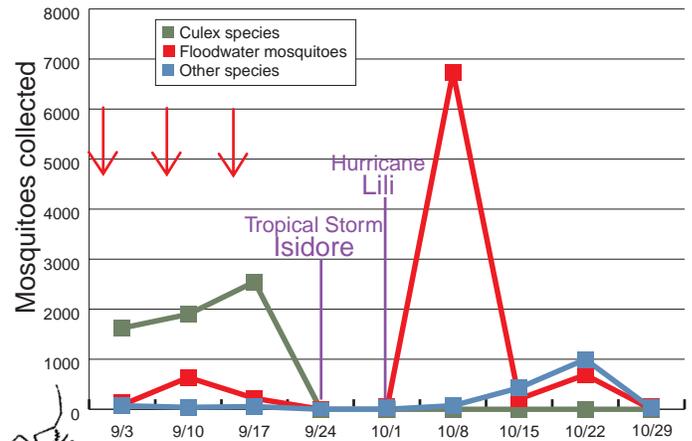


Table 1. Recommendations for Mosquito Surveillance

- Use personnel trained in mosquito taxonomy for mosquito identification.
- Use more than one adult mosquito sampling technique (gravid and CO₂ light trapping).
- Include larval mosquito sampling as well as adult.
- Map mosquito (adult and larvae) collection sites.
- Have maps GIS/GPS-referenced, if possible.
- Sample at least weekly.
- Maintain accuracy of records.
- Base adult mosquito trap locations on historical arbovirus cases; also include all ecological habitats within the surveillance area.
- Regularly assess and modify as needed vector sampling techniques, equipment and personnel.

Mosquito Facts

Mosquitoes don't need blood to live. Their main energy source is nectar from plants. But females must consume blood before they can lay eggs, so only the females bite.

Females live only about a week to 10 days and need a three-day cycle from the time of a blood meal to the time of laying eggs. A female will lay eggs only two or three times during a lifetime.

Most mosquitoes don't travel far from their birthplaces, especially those that breed in urban habitats. However, marshland mosquitoes can travel 10 to 12 miles looking for water and blood meals in dry weather.

Mosquitoes are attracted to blue lights and dark clothing, but not to reds and yellows. They are especially attracted to carbon dioxide.

They also are attracted by heat and aromas. Some people attract mosquitoes because of the way they smell or because of a slightly higher body temperature. So, stay cool and scents-less!



If the mosquitoes are to be tested for viruses, they must be frozen for transport back to the lab.



Raquel Gleiser, postdoctoral researcher, examines mosquitoes under a microscope.

Workshops Arm Parishes for Mosquito Battle

Byrel Book, a Beauregard Parish police juror, started out as a skeptic at a West Nile virus/mosquito control workshop in Crowley—one of eight sessions held around the state sponsored by the LSU AgCenter this past April and May.

When the session ended, though, Book said he was convinced of the need to seek funds to help fight the threat of the mosquito-borne virus. The virus first appeared in Louisiana just two years ago. But no one expects it to disappear any time soon.

In 2002, Louisiana had 329 confirmed cases of West Nile virus in humans, and health officials expected the disease to be a serious threat again in 2003. Nationally, more than 4,000 people were infected in 2002, with the most serious cases affecting the elderly and people with other health problems.

“I’m sure we’re not the only parish government considering it,” said Book, when asked about the possibility of applying for a share of \$500,000 in state and federal money available through Louisiana’s Department of Health and Hospitals/Office of Public Health.

The funds were made available to parishes that don’t yet have a mosquito control district. Book represents one of the 44

parishes in Louisiana without a district, an alarming statistic that led the LSU AgCenter to hold the workshop series.

The goal of the workshops was to show local officials how to set up affordable mosquito control programs to fight the Asian tiger and southern house mosquitoes, the two types considered the biggest threats to infecting humans with West Nile, a mosquito-borne virus that can cause meningitis and encephalitis.

AgCenter economist Kurt Guidry outlined how mosquito budgets can be adjusted to fit the money available. “One size budget does not fit all communities,” Guidry said.

Mosquito Control Blueprint

The all-day sessions gave parish officials across Louisiana a blueprint for starting a mosquito control district, an endeavor that could cost each locale \$500,000 to \$1 million a year, depending on personnel costs and equipment.

But the message was this: Get started with a program you can afford and then build from there.

“When I worked in mosquito control in East Texas, we had

a small crew of four or five people, but we covered a large area and everyone did what they could to get the job done. Sometimes I drove the spray truck," said Lucas Terracina, who today oversees mosquito control in Calcasieu Parish.

Terracina's parish has a model mosquito control program. Work crews check rural traps for the presence of mosquitoes, and other staff members evaluate when and where to spray to stop adults in mid-flight or kill mosquito larvae.

AgCenter specialists and other mosquito fighters around the state say mosquito control is more than just spraying. It's knowing when, where and what to spray.

"Spray only when you need to," said Matthew Yates, head of East Baton Rouge Parish's mosquito and rodent control program. Yates appeared at several of the workshops.

Yates recommends teaching adults and children how to clear standing water from around their homes to eliminate mosquito breeding grounds and reduce the threat of disease.

Get Message Out

"Take advantage of every media opportunity. Put your message in subdivision newsletters. People read those more than the daily newspaper sometimes. Set up mosquito control booths at festivals and fairs. Get involved in school science fairs and ask teachers to include lesson plans on fighting mosquitoes in their classroom instruction," Yates said.

AgCenter officials and other experts said some state and federal funds should be available for start-up costs, but the bottom line is that a full-fledged attack on mosquitoes will require local tax revenue to help finance any meaningful control efforts.

"These sessions are stimulating some interest," added Terracina. "It's a question of how much you can afford locally."

"Our experience with disease outbreaks the past few years makes it clear that we need to do something to address the potential threat of even more serious mosquito-borne diseases," said David Boethel, the LSU AgCenter's associate vice chancellor who is coordinating research and educational efforts aimed at mosquito control. "That's why we have worked to develop strategies and plans for mosquito abatement.

Series Reaches 39 Parishes

There were 324 attendants at the West Nile virus/mosquito control workshops sponsored by the LSU AgCenter, including police jury members and other governmental officials, from 39 parishes. Representatives from a few parishes attended more than two workshops. The mayors of six municipalities also attended the workshops.

Following the workshops, 36 parishes submitted letters of intent to the state for a share of mosquito abatement funds. Al Mancuso, Department of Health and Hospitals Office of Public Health, said that amounted to 82 percent of the 44 parishes without organized mosquito abatement districts. Mancuso credited the AgCenter's educational efforts for the big response. ■ **Randy McClain**

"We're not here to say you have to do this," Boethel told officials at the workshops. "We're here to work with you in case you have an interest."

The West Nile virus is transmitted from birds to humans and other animals by a number of species of mosquitoes, but primarily by the southern house and Asian tiger mosquitoes. Both species live near homes. The southern house mosquito commonly breeds in water high in organic matter such as drainage ditches and oxidation ponds. Asian tiger mosquitoes deposit eggs in fresh water commonly trapped in flower pots, gutters, trash dumps, abandoned tires along the roadside and other containers.

\$1.4 Million on Average

The average abatement district in Louisiana spends \$1.4 million a year on mosquito control today, said Guidry, but that figure includes some of the more populated areas with well-established programs. East Baton Rouge Parish, for example, spends \$2 million a year.

Some local officials who attended the all-day seminar in Crowley in mid-May said at the time that they were a bit confused by the state paperwork and fast-approaching deadlines to qualify for a share of federal funds funneled through the state Office of Public Health. But several planned to rush through applications for the money anyway, and then fine-tune their budgets before signing a final contract with the state in June.

John Quebodeaux, Acadia Parish's emergency preparedness director, said the state money could help local officials convince voters to pass additional mosquito control taxes locally.

"We're trying everything we can. Last year, we spent \$200,000 in one-time (public health) money on spraying (in Acadia). But to do more, it's going to take more parish support," Quebodeaux said.

Acadia Parish had a one-quarter-cent sales tax proposition on its election ballot in July to pay for mosquito control outside the city limits of Crowley and Rayne. A parishwide half-cent sales tax failed last year. The quarter-cent tax would raise an estimated \$400,000 to \$600,000 a year, Quebodeaux said.

"If we could start with \$400,000 to \$600,000, it would be something. That would give us a start, and if the people were satisfied, we could consider expanding from there in another two years."

The LSU AgCenter conferences also featured detailed scientific advice on how to control mosquitoes.

"Louisiana has a subtropical climate, the preferred climate for mosquitoes," AgCenter medical entomologist Michael Perich said. "And we even have some mosquito species that are more active during the period from October through April than they are during the summer months."

It is important to protect yourself from mosquito bites at all times of the year, he said. "West Nile is not going away," Perich added.

Others warned that West Nile isn't the only threat. "West Nile probably won't be our last epidemic," said Yates of East Baton Rouge Parish. "The next threat is just a plane ride away. New mosquito varieties are easily transported into the United States, and mosquitoes don't recognize political boundaries."

■ **Randy McClain**

Improving Cucumber Yields Following Nematode-resistant Tomatoes

Root-knot nematode can cause significant losses in cucumber yield if not treated with nematicides. Considerable effort has been made to breed for nematode resistance in vegetable crops and was successful in tomatoes but not in cucumbers. Tomato cultivars resistant to root-knot nematodes have been developed and are an effective means of reducing tomato losses from this pest. Additional benefits include a residual effect that remains in the soil and protects following crops from nematode damage.

The spring tomato crop in most southern states is transplanted in late March or early April on polyethylene-mulched and drip-irrigated beds and terminated in late June or early July. Producing a second short-season crop such as cucumbers following tomatoes on these beds is feasible and may help tomato growers increase their profits by using the irrigation and mulch system already in place.

It is not known how long the residual beneficial effect of tomatoes will remain in the soil after terminating a nematode-resistant tomato crop. LSU AgCenter researchers conducted a study to evaluate cucumber yield planted at three dates, separated by one month each, following the termination of nematode-resistant and susceptible tomato cultivars.

Celebrity (nematode-resistant) and Heatwave (nematode-susceptible) tomato cultivars were transplanted on polyethylene-mulched and drip-irrigated beds in early April 1995 and 1996. Following the last harvest of tomatoes in late June, plots were sprayed with glyphosate to kill tomato plants and other existing vegetation. Beds were cleared of plant debris and remained fallow for zero, one and two months before planting cucumbers as a second crop.

Results of this study indicated that cucumbers planted after the nematode-resistant tomato cultivar Celebrity produced significantly higher plant fresh weight, lower percentage of galled roots and higher yields per acre than did those planted after the nematode-susceptible tomato cultivar Heatwave. Yields of cucumbers decreased and percentage of galled roots increased significantly as time of planting was delayed one or two months following the termination of the tomato crop. Cucumbers planted immediately after the termination of the tomato crop yielded more than cucumbers planted one month later. Cucumbers planted two months later produced the lowest yields, the least fresh weight and the highest percentage of galled roots.

The increased percentage of galled roots as the time of planting cucumbers was delayed beyond July was a good

indication that cucumber protection offered by the previous nematode-resistant tomato crop was weakening. The increase in galled roots may have reduced cucumber growth and yield. Also, late planting may have subjected cucumbers to undesirable lower night temperatures that contributed to lower yields.

The results of this study indicate that double-cropping cucumbers with a nematode-resistant tomato variety can be an effective method to improve cucumber yields in soils that have a history of root-knot nematode infestation. Tomato growers are encouraged to consider the numerous benefits of planting cucumbers as a second crop following nematode-

Photo by John Wozniak



Double-cropping cucumbers with a nematicide-resistant tomato variety can improve cucumber yields.

resistant tomatoes in soils susceptible to nematode infestation. Benefits include improving cucumber yield without chemical control and reduced overhead costs by using the polyethylene mulch, drip irrigation and trellising system for both crops. Residual fertilizer left in the soil after the termination of tomato harvest can be used by the cucumber crop and reduces the need for additional application. Cucumber growers should make every effort to plant cucumbers following nematode-resistant tomatoes as early as possible in July to maximize cucumber yields. ■

H.Y. Hanna, Professor, Red River Research Station, Bossier City, La.

Poultry Litter Fertilizer on Pasture, Silvopasture and Forest Soils

Lewis Gaston, Terry Clason and Darren Cooper

Poultry is the leading animal agricultural industry in Louisiana. The industry is concentrated in the hilly, northern Coastal Plain area where land is used mostly for pasture and timber production. The grains used for poultry feed create a large influx of plant nutrients that accumulate in poultry litter. The litter is generally applied to nearby pastures and provides nutrients and organic matter to the soils, the two soil components that have historically limited crop production in Coastal Plain soils.

The commercial pine plantations in Louisiana generally have not been fertilized, but high prices for timber and recent research demonstrating growth responses to added nutrients have made fertilization of pine plantations a viable management option. The abundant supply of poultry litter would provide an economical source of nutrients for this purpose. It is important in using poultry litter, however, to minimize nutrient losses to surface waters. Nutrient enrichment may degrade water quality, limit its intended use and offset benefits of poultry litter as a soil amendment. Loss of phosphorus to surface water is a particular concern because elevated levels may cause excess algae growth in freshwater systems.

Studies on the benefits of poultry litter fertilizer on pasture and forest soils (Ruston fine sandy loam) were initiated at the LSU AgCenter's Calhoun Research Station in 1995. Litter was applied to test plots of bermudagrass or loblolly pine from 1996 to 2001. See Table 1. This research was expanded in 1997 to test plots of bahiagrass on pine silvopasture soil (Wolfpen fine sandy loam) at the LSU AgCenter's Hill Farm Research Station. See Table 2.

Yield of Forage Grasses, Growth of Pine

In the Calhoun study, the high litter rate treatment has given significantly higher yields than the low rate and check

Table 1. Average yields per harvest of bermudagrass (1997 to 2002) for pasture plots at the Calhoun Research Station.

check	Litter treatment		
	2.25 tons/acre	4.50 tons/acre	9.00 tons/acre
Yield per harvest (tons/acre)			
1.04	1.24	1.42	1.71

Lewis Gaston, Assistant Professor, Department of Agronomy, LSU AgCenter, Baton Rouge, La.; Terry Clason, former Professor, Hill Farm Research Station, Homer, La.; and Darren Cooper, Research Associate, Calhoun Research Station, Calhoun, La.

treatments in most years. Similarly, yields from the medium rate plots have generally been higher than from check plots. Effects of fertilization and increasing rate of litter on bahiagrass yields from the silvopasture plots have been similar.

Average relative increase in basal area of loblolly pine from 1995 to 2002 (Calhoun plots) increased with increasing

Table 2. Average yields per harvest of bahiagrass (1997) for silvopasture plots at the Hill Farm Research Station.

check	Litter treatment		
	commercial fertilizer	2 tons litter /acre	4 tons litter /acre
Yield per harvest (tons/acre)			
1.11	1.32	1.37	1.76

Figure 1. Effect of poultry litter fertilizer rate on loblolly pine growth.

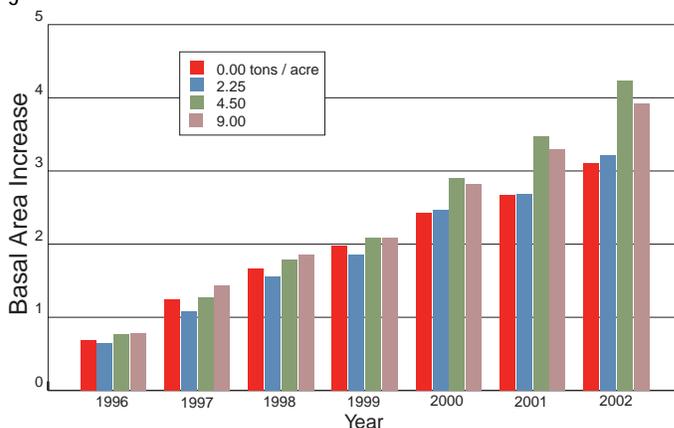
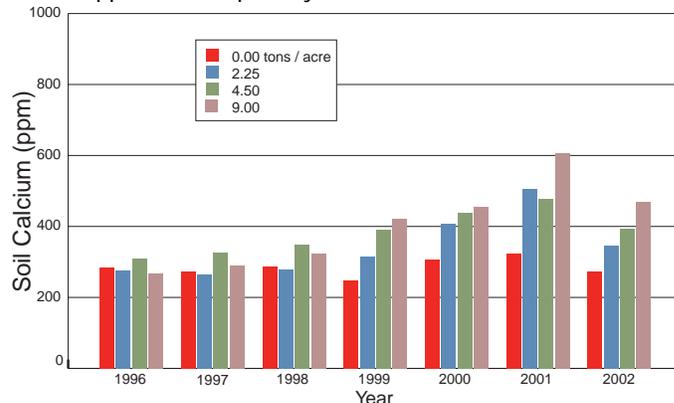


Figure 2. Calcium accumulation in surface pasture soil from annual application of poultry litter.



litter rate, but this trend was not statistically significant until the most recent measurement (Figure 1). In part, this may reflect the expected lag between application of nutrients to established pine and growth response. Also, ice storm damage to trees on several occasions probably affected results. The trend of increasing growth with fertilization is less clear and nonsignificant with the older pine used in the silvopasture study.

Table 3. Measures of soil quality in pasture and pine soil after six annual applications of poultry litter.

	Litter Rate (tons/acre)	Soil Organic Matter (%)	Relative Microbial Activity	Earthworms and Arthropods (#/square foot)
Pasture	0.00	2.7	1.0	20
	2.25	2.7	1.0	17
	4.50	2.7	1.1	9
	9.00	3.7	1.0	11
Pine	0.00	1.9	1.0	6
	2.25	2.4	1.2	2
	4.50	2.4	1.3	6
	9.00	3.3	1.5	7

Figure 3. Phosphorus accumulation in surface pine soil from annual applications of poultry litter.

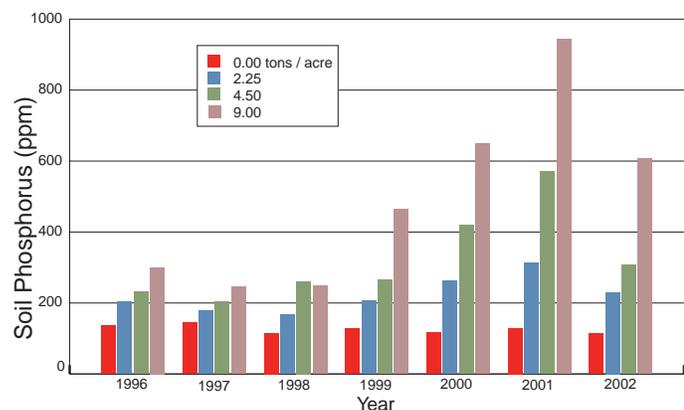
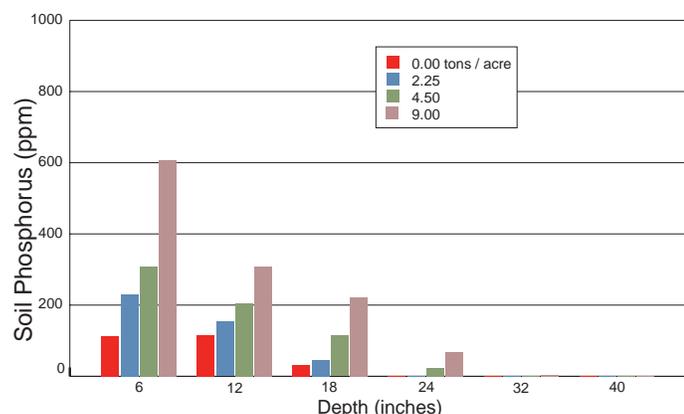


Figure 4. Downward movement of phosphorus from poultry litter in pine soil.



Soil Quality

Recently, soil scientists have begun to examine the overall fitness of a soil to function in its surroundings. Besides the capacity of a soil to support plant and animal productivity, its capacity to maintain or improve water and air quality and support human health and habitation are included in the concept of soil quality. Many soils in the Louisiana Coastal Plain were degraded by erosion and nutrient depletion when these were row-cropped years ago. Therefore, amending such soils with a nutrient-rich, organic material like poultry litter may improve their quality.

The best evidence for this is seen in the accumulation of nutrients like calcium. See Figure 2. Addition of litter to pasture and forest soils increased the level of soil organic matter, particularly in the forest soil. See Table 3. However, the long-term effect of litter application on biological measures of soil quality such as earthworm populations and microbial activity is not as clear.

Buildup, Movement of Phosphorus

Six annual applications of litter at the high and medium rates greatly increased the concentration of phosphorus in the surface (zero to 6 inches) of pasture and pine soils. See Figure 3. Phosphorus buildup caused by five annual applications of litter to the silvopasture soil is similar, but there is no evidence of appreciable leaching of phosphorus in any of these soils. Even at application rates of 9 tons per acre, the level of soil phosphorus below 2 feet is not higher than in check plots. See Figure 4.

Runoff Water Quality

Elevated concentrations of phosphorus in surface runoff and subsurface seepage may degrade surface water quality. Both poultry litter and soil are sources of phosphorus loading into surface water. Clearly, the higher the rate of litter application and the higher the level of soil phosphorus, the greater is the potential for phosphorus loss.

Limited mobility of phosphorus in the pasture and pine soils, despite high rates of application, suggests that lateral subsurface loss of phosphorus to surface water may be minimal except where a shallow, impervious clay horizon exists. Whenever runoff occurs, however, dissolved and particle-bound phosphorus from soil or freshly applied litter will be transported downstream.

Results for phosphorus in edge-of-field runoff from the pasture and pine plots show highest concentrations following litter application and positive correlation with soil phosphorus level. After a few rains, the effect of freshly applied litter is gone, and subsequent loss of phosphorus is controlled by the level of soil phosphorus.

The total amount of phosphorus lost in runoff (loading) depends on runoff volume as well as concentration of phosphorus in the runoff. Although the concentrations of dissolved phosphorus in runoff from pasture and pine plots amended at the same rate with poultry litter are similar, total runoff volume from the pasture plots has consistently been greater. Thus, edge-of-field phosphorus loading from the pasture plots is greater than from the pine plots. However, within a soil type and land use, pasture or forest, there can be substantial variability in infiltration rate and runoff amount. Consequently, soil management objectives for minimizing nutrient losses in runoff should include improving rainfall infiltration rate. ■

New '540' Sugarcane Variety Reduces Reliance on '384'

Photo by Kenneth Gravois

The sugarcane industry has been playing a risky game in recent years because of its over reliance on the 10-year-old cane variety, LCP 85-384, which accounted for roughly 85 percent of Louisiana's total sugarcane acreage last year.

Now, sugarcane farmers have something new to use—a high-yielding, more disease-resistant cane variety developed by U.S. Department of Agriculture research scientists in cooperation with the LSU AgCenter and the American Sugar Cane League.

Seed for the new variety, HoCP 96-540, will be available through the American Sugar Cane League in the fall of 2003.

"When you have all your eggs in one basket, there are a lot of risks, including susceptibility to disease," said LSU AgCenter sugarcane breeder Kenneth Gravois, who was involved with the project. "It's good to have a Plan B."

HoCP 96-540 is a cross developed by matching LCP 85-384 with another sugarcane variety known as LCP 86-454. The new "540" variety gives farmers an even better-yielding option, Gravois said. Several years of tests have shown that HoCP 96-540 produced cane and sugar yields 5 percent to 10 percent higher than the popular LCP 85-384.

Outfield testing, the final stage of the Louisiana sugarcane variety development program, has been conducted through second stubble crops. The new variety's third and fourth stubble yield potential will be evaluated in future years, Gravois said.

"The new 540 variety is more resistant to rust—a typical sugarcane disease—and grows more erect with fewer lodging problems than LCP 85-384," Gravois added. That means less mud will be harvested by combines under soggy harvesting conditions like those that plagued the sugarcane industry during a wet 2002.

Too much mud can affect milling quality adversely, Gravois said.



The LSU AgCenter has released its latest sugarcane variety, HoCP 96-540. It is a high-yielding cane more disease-resistant than the popular LCP 85-384.

In addition, the leaves of the new "540" variety don't cling to the cane's stalks as tightly as with LCP 85-384. That means the green leaves are more likely to fall off or get blown off when heavy combines harvest the cane each fall. Getting rid of the leaves means farmers don't have to haul that "dead weight" to the mill, and the leaves won't clog up the milling process. Less waste material at the mill means it is easier to process the cane and extract a higher percentage of its sugar, he said.

Being able to harvest the cane while it is "green" also should reduce the need for burning in the fields, Gravois said, acknowledging that has long been a goal of sugarcane researchers.

The new "540" doesn't fall over (lodge) in the field as easily as LCP 85-384 under heavy rains or wind. "Of course, nothing could withstand two hurricanes like we had last year," Gravois said. ■ **Randy McClain**

Inside:

■ The LSU AgCenter was ahead of the curve on stepping up educational efforts on mosquito control and mosquito-borne diseases. Page 2

■ Red morningglory is a particularly troublesome weed for sugarcane farmers. But there is a way to control it somewhat efficiently. Page 4

■ It's not enough just to sell crops at harvest for the going price. AgCenter economists recommend pre-harvest strategies. Page 6

■ New, aromatic rices are growing in Louisiana. Page 8

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