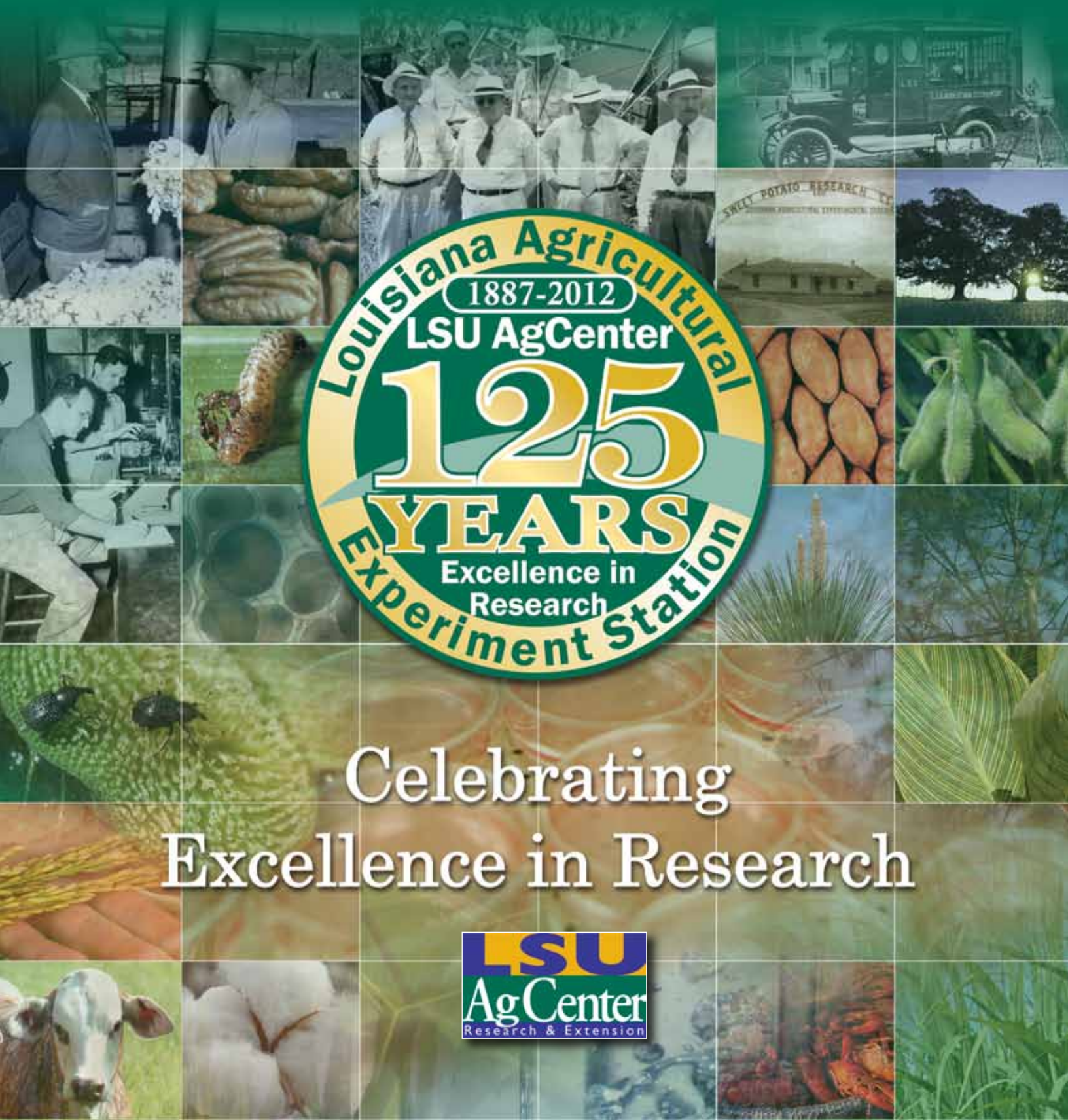
Louisiana Agricultural Experiment Station

Research Milestones



Louisiana Agricultural Experiment Station Research Milestones

- Agricultural research in Louisiana officially began with the establishment of the Louisiana Sugar Experiment Station in 1885. This station evolved into the Louisiana Agricultural Experiment Station with the passage of the Hatch Act in 1887.
- The Audubon Sugar School began in 1891 as part of the Louisiana Sugar Experiment Station. The school was closed in 1896 and reopened by LSU in 1897, under the direction of Charles Coates, who served as its director until 1937. The school grew into the present-day Audubon Sugar Institute. Coates taught what is believed to be the first chemical engineering class. The world's greatest sugar technology leaders emerged from his school.

- One hindrance to sugarcane breeding in Louisiana was the plant's lack of flowering because of low fall temperatures. St. John P. Chilton, plant pathologist and sugarcane breeder, established artificial photoperiod schedules that would allow sugarcane to flower in Louisiana. This groundbreaking research in the late 1940s and 1950s was carried out in photoperiod facilities on the LSU campus. This meant sugarcane crossing could be conducted locally instead of relying on facilities in Canal Point, Fla.
- In the late 1940s, a 50-year forestry project was begun at the Hill Farm Research Station in Homer. It would have major implications on how pine plantations would be managed. Management techniques such as the number of trees planted per acre, fertilization timing, pruning techniques, thinning practices, spacing recommendations between trees and the herbicides used to manage competing vegetation would be altered because of this longitudinal study.

- In 1948, Julian C. Miller brought to fruition his idea of a separate research station just for sweet potato research. The 308-acre Sweet Potato Research Station in Chase is the only station devoted solely to the sweet potato in the United States.
- In 1949, the first foundation seed was planted at the Sweet Potato Research Station. Sprouts from these roots formed the nucleus of the foundation seed program, which to this day supplies producers with healthy seed.
- In the late 1940s and 1950s, Wes Martin advanced the understanding of sweet potato diseases. He was the first to discover the causal organisms associated with soil rot – a disease that almost decimated the U.S. sweet potato industry – and circular spot. In addition, he was a key member of the team of plant pathologists who identified the cause of bacterial soft rot. Martin actively cooperated with the sweet potato breeding program and developed methods to screen for disease resistance still used today.
- Contrary to the conventional forestry practice in the 1950s to "plant 'em thick" at greater than 700 trees per acre, researchers found that planting 400 to 500 trees per acre promoted better early growth in loblolly pine plantations by reducing tree-to-tree competition.
- In the mid-1950s, entomologists discovered boll weevil resistance to the insecticide DDT. This research documented the first large-scale problem of pesticide resistance shown in a major U.S. crop pest.
- Discovery by L.D. Newsom and graduate student J.R. Brazzel of a winter hibernation state of the boll weevil, known as diapause, helped lead to eradication of the boll weevil.
- In trying to help cotton farmers use less pesticide, L.D. Newsom did some of the pioneering work in integrated pest management, which is the term used to describe a system of moderating the use of chemicals in agriculture by taking into consideration all aspects of production and the control of insect pests, weeds and disease.
- Milk production in Louisiana doubled between 1950 and 1975, and many of the dairy management practices that led to this increase were due to the work of H. Dewitt Ellzey and Ernest Morgan at the Southeast Research Station. Their work included identification of improved forage varieties, especially ryegrass. This was instrumental in development of the Florida Parishes dairy industry. Their contributions include the use of improved Holstein sires and the development of outdoor hutches (individual housing) for dairy calf rearing.

- Dairy farms were thriving in northwest Louisiana in 1960, but problems with mastitis threatened to destroy the industry. A mastitis laboratory was established at the Hill Farm Research Station. Scientists there tackled the problem and were able to get it under control, which saved the industry in the state.
- The practice of land-leveling was perfected at the Rice Research Station in the 1960s. This increased rice production efficiency.
- Bill Herke, a fisheries researcher, studied fish passage through human-made water control structures such as weirs and locks in the 1960s and 1970s. His work was the basis for federal policy in the Gulf of Mexico region, and aspects of his work remain in effect today.
- Milton "Chuck" Rush, plant pathologist, initiated a comprehensive fungicide testing program for rice in the 1970s and 1980s, demonstrating the potential for economically controlling fungal rice diseases. He identified and reported new rice diseases in Louisiana and the United States, including the causal agents of rice panicle blight.

- For nearly three decades beginning in the 1980s, Don Franke conducted crossbreeding research with the Brahman breed. More recently, he studied the meat quality of purebred Brahman steers and found that genetic markers can be used to identify those that will produce very acceptable carcasses based on quality grade and tenderness.
- Entomologist Lane Foil worked with scientists at eight research stations for more than 20 years studying horn fly control and resistance management strategies. Estimated annual U.S. losses from horn flies exceed $1 billion. The most critical factor that affects chemical treatment is insecticide resistance, and Foil has developed bioassays and molecular tools to aid in diagnosing resistance.
- The Northeast Research Station in St. Joseph was one of a handful of sites across the United States selected by Monsanto to test the effectiveness of a genetically modified cotton variety called Bt cotton. This cotton contains the gene of a common soil bacterium toxic to certain insects, including the tobacco budworm and the boll worm, which were hurting cotton production. The work of these researchers helped launch Bt crops.
- A product manufactured and marketed by a Louisiana company is the only "killed" vaccine available to prevent anaplasmosis, a disease that costs U.S. cattle and dairy producers an estimated $300 million a year. Developed in the early 1990s by Gene Luther, Lewis T. Hart and William Todd, the vaccine is a "killed vaccine," which means it uses the dead organism to create immunity in cattle. When the vaccine is injected, the animal's body creates antibodies and immunity. A disease caused by an intracellular microorganism, anaplasmosis destroys red blood cells in cattle. Although it occurs primarily in warm tropical and subtropical areas and was once confined to the Gulf and West coasts, the disease has spread to other parts of the country.

- Animal scientists conducted the first testing of the successful vaccine for brucellosis, a disease that causes a pregnant cow to abort her fetus, during the 1990s. Louisiana was declared brucellosis-free in 2000 and continues with that status.
- Food science research has revealed that boiling shrimp and crab until they float will significantly reduce foodborne pathogens, and color change must not be used as an indicator to ensure the elimination of foodborne pathogens.
- Food scientists published the first U.S. study examining the prevalence of methicillin-resistant *Staphylococcus aureus* in retail meats.
- Food scientists have patented ways to extract collagen from seafood and alligator waste for use in cosmetic and health products.
- In the 1990s, food scientists developed a heat and cold shock treatment to significantly reduce *Vibrio vulnificus* and *Vibrio parahaemolyticus* in Gulf Coast oysters to a nondetectable level safe for raw consumption. This treatment also reduced naturally occurring *Vibrio* present in shellstock oysters to a nondetectable level. Oysters treated with this process have comparable flavor, aroma and texture to untreated samples, but need to be refrigerated to ensure continued safety and quality. This treatment is known as the AmeriPure Process. In 1997, Louisiana dropped its mandatory retail warnings for raw oysters that underwent this treatment.
- The ability to control weeds before planting the crop – without negatively affecting crop stand or yield – led to the adoption of reduced tillage programs and conservation tillage practices that contributed to less soil erosion. Much of this pioneering research was conducted at the Northeast Research Station. Adoption of reduced tillage, "stale seedbed" programs contributed to greater profitability of cotton and soybeans, particularly when grown on heavy clay soils. Conservation tillage minimizes the use of equipment in farming and thus saves on fuel costs and minimizes disruption of the soil, which prevents erosion.
- Pecan researchers discovered that zinc is a critical nutrient for pecan growth and nut production, which was the single most important cultural improvement for the pecan industry in its history.

- Initiated in 1998, with cooperators from the LSU AgCenter, the U.S. Department of Agriculture and the New Orleans Mosquito and Termite Control Board, a program called Operation Full Stop began in a 16-block section of the New Orleans French Quarter and, subsequently, expanded into a wider area before it was curtailed because of a loss of funding in 2011. The results of the research project showed a 50 percent reduction in winged termite counts in the treated zone compared with untreated areas.
- The world's first cloned transgenic goats were born as part of a research program conducted by the LSU AgCenter and Genzyme Transgenic, now GTC Biotherapeutics. Although the goats made their appearance in 1998 at the Genzyme farm in Massachusetts, much of the research was done by Louisiana Agricultural Experiment Station scientists under the direction of Robert Godke, Boyd Professor in the School of Animal Sciences, now retired, and internationally known for his research in assisted reproductive technologies in animals. The transgenic goats produce a human anti-clotting protein in their milk.

- In 1999, the sweet potato foundation seed program was converted to a virus-tested program because of the efforts of Christopher Clark, plant pathologist. He demonstrated that viruses reduce sweet potato yields by 25 percent to 40 percent.
- Aquaculture researchers developed and patented vaccines to protect channel catfish and hybrid striped bass from the economically devastating diseases enteric septicemia catfish and pasteurellosis.
- Aquaculture researchers developed and commercialized formulated crawfish baits. Today a producer-mandated checkoff on formulated bait funds crawfish promotion and research activities. The efficiency of commercial fish diets, particularly catfish diets, was improved by identifying less costly feed ingredients and more efficient feed additives.
- Aquaculture researchers developed technologies for improving crawfish aquaculture, including double-cropping with rice, advances in forage management, improved harvest efficiency to reduce production cost, and identification of basic biological, ecological and environmental factors affecting production. Many of these advances have allowed crawfish farming to grow from only token acreage in the 1960s to nearly 200,000 acres today, making it the largest aquaculture industry, in terms of area, in the United States.

- Research demonstrated that up to six tons of channel catfish could be produced with continuous aeration of the culture waters. Continuous aeration today is a common management practices in southern U.S. catfish farming.
- The Aquaculture Research Station is a world leader in aquatic animal germplasm cryopreservation research and in the uses of this germplasm in selective breeding, protection of endangered fish species and maintenance of biomedical fishes used to advance human health research.
- Richard Cooper incorporated a disease-resistance gene into channel catfish, creating transgenic fish at rates previously not obtained in any species and demonstrating disease resistance and heritability. In 2000, he applied the technology to chickens to make human pharmaceutical proteins in the egg whites. Early success with transgenic chickens led to the formation of a biopharmaceutical manufacturing company. Research with chickens then led to a discovery in cell culture that has led to increased rates of protein expression that has produced growth factor proteins intended for use in new human biopharmaceuticals.
- Researchers have developed the protocols for successful artificial insemination of white-tailed deer. This process increases the ability to extract valued genetic material from wild populations of white-tailed deer for improved animal development programs and to determine if poor genetics are responsible for undesirable characteristics in wild herds.

- A biological control of giant salvinia, which is clogging Louisiana's waterways, involves the use of a weevil native to South America. The tiny weevil is capable of slaying the giant plant and clearing waterways. The method for doing this was developed by Dearl Sanders, a weed scientist, and Seth Johnson, an entomologist. Nearly 3 million weevils have been released in more than 40 locations statewide.
- The first demonstration of an aerially applied prescription pesticide treatment on a crop in the United States was done on cotton in Tensas Parish in 2002. This technology means farmers need only apply the amount of pesticide necessary to solve production problems, which saves them money and helps the environment.
- Mycoplasma mastitis, a highly contagious form of the disease, was first detected in Louisiana in 2002. But through the diligent work of Bill Owens at the Hill Farm Research Station, a testing system was put into place, and the disease was controlled.
- More than a third of the dairy producers in Louisiana and Mississippi have adopted the bale silage system, which was evaluated and adapted by Mike McCormick, dairy scientist. Bale silage has a higher nutritive value than hay because of seasonal poor hay drying conditions.

- Development of dairy waste lagoon systems by Jim Beatty and Vinicius Moreira greatly reduced dairy industry contribution to point-source pollution and assisted in vastly improving water quality of waterways in the Florida Parishes, which ultimately assisted in returning Lake Pontchartrain to a body of water suitable for recreation and commercial fishing as well as swimming.
- Because of the alertness of plant pathologist Ray Schneider, Asian soybean rust was found in a soybean field at an AgCenter research station in 2004. This was the first discovery of this disease in North America – a disease that had caused devastation to soybean fields in other parts of the world, including South America and Asia. Since the discovery, research has been conducted to monitor and minimize damage from the disease. In addition, LSU AgCenter scientists also cooperate in an aggressive nationwide monitoring program for Asian soybean rust.
- Scientists have developed a pop-up device that can indicate the presence of subterranean termites. The LSU AgCenter has a patent on the indicator, which presents a clear visual signal when termites consume a food "trigger" that trips a signal to show they have been active.
- Researchers have developed a potential Formosan subterranean termite bait using genetically modified yeast that specifically kills the protozoa in the termite gut and causes termites to starve. The time required for the yeast to kill the termites is long enough to allow transfer of the yeast among colony mates.
- Food scientists have developed processes to increase resistant starch in rice and sweet potatoes, which adds value to these two commodities. Resistant starch is a type of starch that resists digestion and, thus, functions like fiber in the diet and can help prevent cancer and weight gain.
- The development of wood composites has led to the use of wood in nontraditional applications. One such application commercialized in 2010 is called TigerBullets. The "bullets" are primarily made of recycled plastic material and wood fibers and are used in oil drilling to plug cracks and fissures to reduce the loss of drilling fluids.
- In 2010, scientists produced calves from Angus bull semen that had been frozen for more than 40 years, some of the longest-stored frozen semen ever reported in the scientific literature. Earlier achievements include the first calf produced from an in vitro fertilized embryo, where the egg was harvested from a live pregnant cow.
- In 2010, ConAgra's Lamb Weston division built a state-of-the-art sweet potato processing plant in Delhi, La. The company made the decision to locate in Louisiana to be close to the research and extension work of the LSU AgCenter.
- Herry Utomo, molecular geneticist, has developed lines of smooth cordgrass for coastal restoration projects. Native smooth cordgrass produces low numbers of seeds, but Utomo has crossed 15 genetically diverse lines of the plant to develop higher seed production. Smooth cordgrass has traditionally been transplanted in the marsh, and Utomo's work has shown it can be planted by dropping the seed from aircraft.
- Food scientists have identified a bitterness blocking compound that can be used to improve the flavor and enhance the nutritional content of foods and drinks. For instance, it can be used to improve flavor of sport rehydration drinks, to remove the "beany" flavor of soy beverages without having to add a high level of sugar, and to spray on vegetables such as broccoli, Swiss chard and collard greens to mask the bitterness.

Crop Variety Development

Crop variety development has historically been one of the principal research activities of the Louisiana Agricultural Experiment Station. In 1888, William Carter Stubbs, the first director of the Louisiana Sugar Experiment

Station, began testing more than 70 sugarcane varieties obtained from overseas. In 1893, Stubbs brought to Louisiana 500 sugarcane seedling varieties from overseas to try to increase sugar yield, which he did. This was the beginning of the concept of continual variety development through crossing to sustain the agricultural industry in Louisiana.

The Rice Research Station was established in 1909 to develop rice varieties that would grow successfully in Louisiana. The Clearfield technology, developed at the Rice Research Station in the late 1990s, resulted in rice varieties that enabled farmers to make considerable progress against the weed red rice. Clearfield rice is herbicide-resistant, so farmers can use herbicides to kill the red rice without harming the commercial rice. This technology allowed farmers to drill-seed rice into dry soil instead of water-seeding from the air, which is more expensive and can lead to more soil loss from fields. Jazzman rice was developed by rice breeder Xueyan Sha using genetic markers that identified which genes

are responsible for aromatic flavoring of rice. It was released in 2008 after 12 years of research. This was the first U.S.-adapted rice variety that is competitive with Thai jasmine aromatic rice. Jazzman 2, which has superior aromatic and quality characteristics, was released in 2010.

The Beauregard sweet potato released in 1987 had a beautiful shape and color and sweet taste unlike any other sweet potato before. Developed by Larry Rolston, an entomologist, for its insect resistance, the Beauregard went on to reinvigorate Louisiana's sweet potato industry. It was widely adopted throughout the U.S. industry. Because of its resistance to Streptomyces soil rot, this disease has diminished to a minor problem.

When the high-yielding, cold-tolerant LCP 85-384 variety was released in 1993, it revolutionized the sugarcane industry. Because of its size and weight, it required a different harvester – one that cut the stalks into billets rather than leaving them whole. By 2004, it was growing on 91 percent of the sugarcane acreage. Because it was so widely grown, it became vulnerable to disease. But it has proved to be an excellent parent, and new and better varieties have been developed from it.

Agronomist Steve Harrison established breeding programs for wheat and oats during the 1980s. Since then, five oat and five wheat varieties have been developed for Louisiana producers.

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Louisiana State University Agricultural Center
William B. Richardson, Chancellor

Louisiana Agricultural Experiment Station,
John S. Russin, Vice Chancellor and Director

Louisiana Cooperative Extension Service,
Paul D. Coreil, Vice Chancellor and Director

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