



# Texas Rice

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## Rice Multilines and Mixtures

Rice varieties released in the U.S. are either inbreds or hybrids and are grown as monocultures. The resistance genes they possess are part of several tactics integratively applied to prevent or manage disease outbreaks. However, there is concern that monocultures provide a high selection pressure on disease pathogens to evolve and overcome the plant's resistance genes. The longevity of rice varieties with various blast resistance genes is less than three years in Japan [6]. Resistance gene-based strategies to reduce high selection pressures and extend the usefulness of resistant varieties include rotating varieties that have different resistance genes, gene pyramiding, planting multiline varieties, and planting mixtures of varieties. Gene rotation deploys new varieties with different resistance genes to replace current varieties before new pathogenic races increase to damaging levels [7]. Based on experience, gene pyramiding is most likely to be effective in controlling bacterial blight than rice blast due to the high level of pathogen variation exhibited by *M. grisea* (causal organism of blast) [7].

The concept of the multiline variety is not a new one, with Jensen [5] describing it in 1952 as a blend of seeds from multiple purelines based on a ratio established by the plant breeder. The purelines that compose the multiline variety would be uniform in appearance (height and maturity), have resistance against diseases, and have other characteristics essential for a desirable agronomic type. Each pureline must be able to contribute additional desirable genetic qualities without reducing the phenotypic uniformity of the multiline. Resistant lines of the multiline provide the genetic barrier against the spread of disease pathogens. A multiline that yields similar

to or better than the average of its component lines grown singly is considered successful.

In 1981, the multiline was described by Browning and Frey [2] as a mixture of isogenic lines, which differ in the disease or pest resistance gene that they possess. Variety mixtures, on the other hand, refer to mixtures of cultivated varieties growing simultaneously on the same tract of land with no attempt to breed for phenotypic uniformity [8]. Between multilines and variety mixtures, the latter is more practical and requires less investment because it can be applied even without the breeding of new varieties, that is, existing varieties with favorable agronomic traits and performance can be mixed together [3]. However, choosing varieties or lines for the mixture that have similar number of days to harvest and similar plant heights would facilitate management practices such as fertilization and harvesting.

Leung et al. [7] summarized the prevalence (whether in tropical or temperate regions) and management strategies (whether based on the use of resistance genes or chemical-based control) of major diseases of rice. In the summary, variety mixtures are considered as one of the resistance gene-based management strategies for rice blast, bacterial blight, rice tungro, and brown spot, while the multiline is a strategy for rice blast.

There have been successful uses of multilines and variety mixtures. In 1998 and 1999, four mixtures were tested on 2,006 and 8,258 acres of rice, respectively, at Yunnan, China [9]. Each mixture was applied as one row of a susceptible glutinous (waxy or sticky) variety being grown after every four rows of a resistant nonglutinous hybrid variety. Their results showed that

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# From the Editor ...



## Controlling Plant Disease Using Varietal Mixes

Welcome to the September issue of *Texas Rice*. The cover story in this issue focuses on rice varietal mixtures as an alternative tactic in managing disease outbreaks and was written by Omar Samonte, the Center's Associate Breeder and Technical Editor of *Texas Rice*. Rice varieties released in the U.S. are either inbred or hybrid varieties and they are grown in farms as monocultures. Most rice varieties grown in Texas contain genes that either tolerate low to moderate levels of disease or they are resistant to infection by specific plant diseases. Disease resistance is an integral part of several tactics applied to prevent or manage disease outbreaks. As Dr. Samonte indicates, there is concern that monocultures, which in this context refers to the production of a single variety across an entire field or in some cases across several adjoining fields, presents pathogens with massive selection pressure to evolve and overcome the plant's resistance genes. Resistance gene-based strategies to reduce high selection pressures have included crop rotation, gene pyramiding, and the planting of multilines and mixtures of varieties. Dr. Samonte discusses the three methods, but emphasizes variety mixtures. As he indicates in his article, he and Dr. Rodante Tabien currently have a yield trial to evaluate the yield potential of several mixtures of high-yielding resistant and susceptible lines.

The second article, also written by Dr. Samonte, focuses on rice and aquaculture. While aquaculture is practiced in rice to only a limited degree in the U.S., as with crayfish production, it is very common in parts of the world where labor is less expensive. This article provides an interesting contrast with how other areas produce rice.

Texas rice acreage increased significantly in 2008. The Farm Service Agency (FSA) reports acreage increasing from 143,299 acres in 2007 to

168,039 acres in 2008, representing a healthy 17.3% increase. The greatest increase, on a percentage basis, was reported for Bowie, Cameron, Galveston, Harris, Lamar, and Red River counties, which are six of our smallest rice producing counties. Collectively, these counties experienced a 400% average increase in acreage, going from 776 to 3,102 acres. Only Fort Bend (-11.5%) and Jackson (-5.9%) counties reported a decrease in rice acreage. The greatest increase, on an acreage basis, was for Chambers (+4,868 acres), Colorado (+4,259 acres), Wharton (+3,771 acres), and Liberty (+3,192 acres) counties, with almost an equal increase both east and west of Houston.

The Texas rice crop statistics are estimated by a weekly survey of 29 rice producers, seedsmen, and millers, representing ca. 35,000 to 50,000 acres of production each year. While this is a fairly large sample size, given the size of the Texas rice industry, surveys can introduce a bias due to samples not always being representative of the entire population of Texas rice growers. We can think of this type of error as being analogous to surveys of voters preferences for political candidates. Normally, a well produced survey provides a close estimate, but occasionally it will not. Estimates for the 2008 Texas rice acreage, as well as earlier years, for different parts of the Texas rice belt can be obtained by going to our website at <http://beaumont.tamu.edu/CropSurvey/CropSurveyReport.aspx>. If you are a rice producer, seedsmen, or miller and would like to be added to our survey for 2009, please send an email to Brandy Morace at "bmorace@aesrg.tamu.edu".

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# Farming Rice

## A monthly guide for Texas growers

*Providing useful and timely information to Texas rice growers, so they may increase productivity and profitability on their farms.*

## Rice-Fish Culture

Rice is primarily cultivated as a monoculture and it is considered to have originated with the seeding of annual types of wild rice in the subtropics, tropics, or in the Yangtze River. Another hypothesis is that primitive rice cultivation and fishing may have shared the same environment [6]. Relic clay models unearthed from the Shanxi and Sichuan provinces of China suggest that the rice-fish culture was practiced about 2,000 years ago, while the earliest written record of rice-fish culture is from *Recipes for Four Seasons*, which was written during the Wei Dynasty (220 to 265 AD) [9].

Currently, about 4% of China's total rice growing areas practice rice-fish culture [4], with 849,055 tons of fish produced in 2001 [10]. Countries that practice rice-fish cultures include Egypt, India, Indonesia, Thailand, Vietnam, Philippines, Bangladesh, and Malaysia [4]. In a review by Frei and Becker [4], rice-fish culture field experiments yields around 1,607 to 6,519 lb/acre rice and 260 to 423 lb/acre fish (common carp, silver barb, and Nile tilapia) in Vietnam, 1,340 to 3,304 lb/acre rice and 202 to 242 lb/acre fish (silver barb and Nile tilapia) in Bangladesh, and 2,679 to 3,215 lb/acre rice and 809 to 1,145 lb/acre fish (native carp species and common carp) in India.

### Rice-Fish Culture Systems

There are two major types of rice-fish culture systems - the concurrent and the rotational [4]. In the concurrent culture, the rice and fish are grown simultaneously, that is, the fish are grown in the flooded field of growing rice plants. This culture has a fish refuge, which is about 10% of the total rice field area and can be a trench or pond. The fish refuge serves as a place where the fish go when the rice field is drained for harvesting, and it is where the fish that have grown to marketable size are harvested. On the

other hand, the rotational rice-fish culture involves raising the fish before planting the rice. Between the two cultures, the concurrent rice-fish culture is more efficient. In Indonesia, Dwiwana and Mendoza [2] compared monocultures of rice, fish, and different rice-fish cultures: rice-with-fish (carp, Java carp, and tilapia were grown concurrently with rice in the field), rotational fish (carp, Java carp, tilapia and catfish were grown after harvesting rice), sequential fish (carp, Java carp, and tilapia were grown in the paddy field during the seedling period and harvested before rice seedlings were transplanted onto the field), sequential fish and rice-with-fish, and rice-with-fish (carp) with two times of fish stocking. Although the average of the different rice-fish culture systems for total costs was 77% more expensive than a rice monoculture, the net revenue increased by 66%.

### Rice-Fish Culture Effects on Rice

In a study in China that compared a rice monoculture and a rice-fish (Chinese mitten crab, shrimp, chub and silver crucian) culture [11], the latter extended the growth period of rice, increased dry matter and LAI, increased the leaf area of the top three leaves, deterred the degeneration of leaves function, increased stem diameter, and promoted the growth of roots and the formation of roots in the extended stem. It also extended the length of basal internodes, increased the number of nodes, raised the plant's center of gravity, and decreased root thickness. The rice-fish culture decreased the panicle-to-tiller ratio, number of spikelets per panicle, and seed set percentage, but increased total grain weight. Rice grain yield was higher in the monoculture when the variety Suxiangjing 1 was grown, but it was higher in the rice-fish culture when the variety Changyou

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1 was grown. In a greenhouse study in Germany that compared rice mono- and rice-fish cultures [3], although grain yields were not significantly different, rice grain yield was higher in the rice-carp culture (1,768 lb/acre) than in the rice monoculture (1,616 lb/acre), but lower in the rice-carp-tilapia culture (1,545 lb/acre). Frei and Becker showed that a rice-fish culture's species composition was crucial to its productivity. They also observed that the species composition affected afternoon floodwater pH and dissolved oxygen levels, which were lower especially in the rice-carp-tilapia culture. Methane emission rate was highest in the rice-carp culture, followed by rice-carp-tilapia culture, then in the rice monoculture [5]. Methane emission tended to increase due to the increased release of soil-entrapped methane and the decline of floodwater oxygen, which promotes the anaerobic character of the soil environment.

### Rice-Crawfish Culture

In the U.S., crawfish is produced as a monocropping system or multi-crop rotational system [7]. In the former, a rice crop is planted as a crawfish resource, but its grain is not harvested. This method is preferred in small farms or where marginal lands are available and permanent ponds are devoted to consecutive production cycles. Crawfish yields range from around 201 to 1,000 lb/acre, although some ponds have yielded more than 2,679 lb/acre. In the crop rotational system, crawfish and rice are rotated in the same physical location in a year, this practice is conducted over several cycles, and the rice grain is harvested. The disadvantages of the crop rotational system include: the need to construct ponds, unlike in the rice-crawfish multicropping system where the rice fields serves as the ponds; cost must be amortized over one crop only; and there may be overcrowding after several annual cycles resulting in small low-priced crawfish. However, the advantage of the monocropping is that producers can concentrate on optimum crawfish production without worrying about practices associated with other crops, such as pesticide exposure or seasonal limitations. In 1999, ICON-treated rice seed and tailwater contaminated with ICON and its metabolites resulted in the catastrophic losses of crawfish in areas where ICON-rice seed was

used [1]. Currently, most of the crawfish produced in the U.S. is in Louisiana and occupies more than 120,000 acres, of which about 50% is practiced in conjunction with rice production [8].

A variety of fish species are used in rice-fish cultures. The examples above from several countries serve to introduce the major species and culture systems that have been used sustainably.

For more information, please consult the following references:

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## Rice-Fish Culture continued ...

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\* Article by Dr. Stanley Omar PB. Samonte, Texas AgriLife Research and Extension Center, Texas A&M University System, Beaumont, TX.

## Rice Multilines continued ...

the susceptible rice varieties planted in mixtures with resistant varieties had 89% greater yield and blast was 94% less severe than when they were grown in monoculture. Height differences between the taller susceptible and shorter resistant varieties resulted in temperature, humidity and light conditions that were less conducive for blast on the susceptible varieties in the mixtures than in the monocultures. Due to the simple procedure in implementing the mixture or interplanting technology, about 501,613 acres of rice were planted to high quality but disease-susceptible traditional varieties interplanted in rows of hybrid rice in Yunnan by 2003 [7].

In Japan, the multiline variety Sasanishiki BL, which is composed of 7 isogenic lines with different resistance genes to blast disease, has been cultivated in farmers' fields with relatively lower levels of rice blast damage compared to common varieties since its release in 1994 [1]. From 1995 to 2002, the proportion of each isogenic line in the multiline was changed three times depending on the blast races present in the farmers' field. Varieties that are popular in the rice market are generally used as the recurrent parent in the backcrossing and development of isogenic lines that compose a multiline. In this case, the recurrent parent was Sasanishiki, which was the predominant



Fig. 1. High yielding Entry 316 (blast susceptible), Entry 321 (blast resistant), and its mixture at the grain filling stage in a yield trial at the Texas AgriLife Research and Extension Center at Beaumont in 2008.

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## Rice Multilines continued ...

variety released in 1963 due to its high yield and excellent grain and eating quality.

At the Texas AgriLife Research and Extension Center at Beaumont, TX, Drs. Stanley Omar Samonte and Rodante Tabien are evaluating the yield potential of resistant and susceptible high-yielding rice lines in mixtures and in monoculture (Fig. 1). Seed of the rice lines that have similar number of days to heading were mixed in a 50:50 ratio of susceptible and resistant lines, respectively. Dr. Tabien suggests that an ideal mixture would be phenotypically homogenous while genotypically heterogeneous.

In 1972, Harlan [4] attributed the diminished importance of using variety mixtures as an alternative to pureline cultures to the pureline mentality, that is, uniformity is good, while variation is not. However, the discussion above provides some recent positive information about the use of rice multilines and variety mixtures as an alternative to purelines.

For more information, please consult the following references:

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\* Article by Dr. Stanley Omar PB. Samonte, Texas AgriLife Research and Extension Center, Texas A&M University System, Beaumont, TX.

## From the Editor continued ...

Some of our producers to the west of Houston are reporting phenomenal first crop yields, while east of Houston, yields have been average or a bit below average. Yield reports are only just now starting to come in so the early reports are preliminary at best. I anticipate being able to provide a detailed yield report in the October issue of *Texas Rice*. One reason for the less than stellar yields for at least some of the early reported fields to the east of Houston may have to do with higher than normal incidence of rice blast. In one of the plant physiology studies at the Beaumont Center, Cocodrie was grown as “guard rows” at the edge of each plot. Cocodrie, in these plots, experienced unusually high levels of yield loss, mostly due to panicle blast. The heavier rainfall averaged east of Houston tends to delay planting more than typically occurs west of Houston and it can promote a greater incidence of some foliar and panicle infesting pathogens. Some growers reported much higher than usual levels of narrow brown leaf spot as well. Narrow brown leaf spot is a plant pathogen that historically has been of only minor and occasional economic concern, but more recently is contributing to yield losses.

A surprising problem occurred this year with some of our very best growers reporting some fields of XP744 yielding ca. 2,000 lb/acre less than nearby fields growing other hybrid varieties. Upon further examination, upwards of 25% of the plants

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in fields with the hybrid had blanked panicles, with the plants being slightly shorter and interspersed among normal sized plants having fertile panicles. The sterile plants were also nice and green, and did not have any disease symptoms. I was made aware of the problem by one of the best rice growers in Texas. I then initiated a sample of the Center's large-scale long-term rotation experiment and the Center's large-scale drip irrigation experiment, both of which were planted to XP744. Both studies show almost identical results, with ca. 11.5% of the tillers having blanked panicles. As with the XP744 grower fields, the affected plants were slightly shorter, very green and healthy in appearance, with no disease symptoms, but with nearly completely blanked panicles. Once the fields were harvested, the green vigorously growing "sterile" plants were clearly identified. The greenness, by the way, is a result of the sterile plants not draining the carbohydrates and nitrogen from the culms, leaf sheaths and leaf blades to feed developing grain. The same effect can be observed if you pinch or cut off each of the panicles on a plant as the panicles emerge from the boot.

Because the sterile plants did not produce grain, they did not contribute to producing a yield, and instead were analogous to a vegetatively produced weed, basically capturing sunlight and taking up nitrogen that would otherwise be captured by productive rice plants. For producers who normally average 10,000 or more lb/acre, a 20 to 25% contamination could easily result in a 2,000 lb/acre yield loss. In today's market, with long grain November 2008 rough rice trading at \$17.69/cwt, that's a lot of money.

Unlike most of RiceTec's hybrid seeds, I was told by RiceTec that XP744 is a mixture of seed. I was also told that XP744 was produced in two separate lots and that only one lot experienced the sterility problem. It appears that this particular lot included a mixture of hybrid seed and seed from a normally male sterile line that selfed due to cooler than normal early summer temperatures causing the normally male sterile line to become fertile. While the incorporation of temperature-sensitive male sterile genes into rice contributed to the development of the hybrid rice industry, when temperatures are too low during flower development, the gene is turned off. Normally, when RiceTec harvests their foundation hybrid seed,

almost all of the seed will be hybrids. However, if temperatures are cooler than normal during the period when the flowers are forming, the male sterile lines will produce viable pollen. Because the viable pollen is part of each rice flower, and because each rice flower also produces a female part, flowers that produce viable pollen have a much greater chance of pollinating their female counterpart than does pollen from nearby rows containing male fertile donor plants. As a result, when the seed were harvested in 2007 (or possibly earlier), they contained a significant percentage of self-pollinated seed that contained the genes that would normally produce male sterile flowers, intermixed with foundation hybrid seed. Examination of the 2006 climate records for the rice producing areas west of Houston where much of the foundation hybrid seed is produced showed a higher number of nights (27) with temperatures less than 70°F during flowering, which could have contributed to the normally sterile plants becoming fertile. In contrast, only 12 nights were less than 70°F during the flowering period in 2008. When this seed mixture was planted in 2008 and when the normally warm early summer temperatures occurred during the period when flowers were forming, these flowers became male sterile. Because rice pollen normally moves only a very small distance, only a small percentage of male sterile flowers were fertilized by nearby male fertile plants. It is only through the use of helicopters flying low over Foundation hybrid seed producing fields during flowering to stir up the pollen, as is done during the production of foundation hybrid seed, that pollen from adjacent male fertile hybrid plants fertilize 50% or so of the normally male sterile flowers. Although hybrid rice production has provided significant yield advantages over conventional inbred rice varieties, it is obviously not without its problems. RiceTec has stated that XP744 will not be marketed this coming year.

The timing of hurricane Ike could have been worse for Texas rice producers. The large majority of producers had harvested the main crop. Producers east of Houston, for the most part, suffered the greatest ratoon crop loss, with flowers or developing grain stripped from the plants. One grower in Liberty county

# David R. Wintermann Rice Research Station at Eagle Lake, Ribbon Cutting Ceremony

On September 26, a ribbon cutting ceremony was held at the David R. Wintermann Rice Research Station at Eagle Lake, honoring David and Eula Wintermann, and the Wintermann Foundation for their generous donations to the Texas Rice Industry, the people of Eagle Lake Texas, and Texas AgriLife Research (Fig. 1). The following is based on the presentation made by Ted Wilson at the ribbon cutting ceremony.

I would like to welcome all of you to the ribbon cutting ceremony commemorating the David R. Wintermann Rice Research Station at Eagle Lake. I would like to thank the David and Eula Wintermann Foundation and its Board of Directors Jack and Judi Johnson, Don Bendy and Steve Balas, and all of our guests for being present at this event.

The purpose of this ceremony is to formally honor David and Eula Wintermann and the David and Eula Wintermann Foundation for their tremendous and continuing contribution to the Texas rice industry, the community of Eagle Lake, and Texas AgriLife Research.

I would like to read a few words about David and Eula Wintermann.

David's active involvement in the rice industry dates back to 1942 when his father passed away and he took over the family's business interest, which included the Lakeside Irrigation Company and thousands of acres of rice land in Colorado and Wharton counties.

David Wintermann understood the importance of rice research to the Texas rice industry. In 1970, he began work with the Texas state legislation to convince them of the need to build the Eagle Lake Station. In 1971, the Texas House of Representatives



Fig. 1. Ribbon cutting ceremony at the David R. Wintermann Rice Research Station at Eagle Lake, Texas, last September 26, 2008.

passed legislation to establish a substation in Eagle Lake, to conduct rice research. As with most legislative decisions, the real job of creating the Eagle Lake Station began after the legislation's approval.

To find the best site to establish the station, David worked closely with Dr. Jim Stansel, who at that time was the scientist in charge at Eagle Lake. The site that was chosen consisted of 77 acres of land, which includes where we stand today. As president of the Eagle Lake Division of the American Rice Growers, David worked to implement a check-off fund that paid for the land, the offices, and research facilities at the Eagle Lake Station. This was the first check-off program in the state that supported rice research. After that, construction at the new site began. Not surprising, David paid for all the costs of the canals and roads using his own money.

Throughout their lifetime, David and Eula Wintermann were also strong supporters of conservation practices. They were life members of Ducks Unlimited, the Audubon Society, and many other conservation organizations. In 1975, David

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## Wintermann Rice Station continued ...

and Eula sold 850 acres of rice land to the Nature Conservancy for a fraction of its value to establish the Attwater's Prairie Chicken National Wildlife Refuge, a few miles from Eagle Lake. David served on the Advisory Committee and was responsible for making recommendations on conservation policies. The couple also established the Wintermann Wildlife Preserve just outside of Eagle Lake, to serve as a winter refuge for migrating ducks and geese. John E. Walker, who was President of Ducks Unlimited (DU) in the U.S. from 1990 to 1993, was a friend of David Wintermann. When asked about David's involvement in Ducks Unlimited, Walker had a long list of contributions and service. He said that although Ducks Unlimited was established in Texas in 1940, it wasn't until David became involved that the state chapter really bloomed. He was elected a Trustee in 1968, then became Regional Vice President, and then went on to serve as Senior Vice President for the Central Flyway in 1974.

David and Eula Wintermann not only supported the rice industry, the fine arts, and countless conservation organizations, but they did a tremendous amount for the people of Eagle Lake. With their influence and resources, the couple was responsible for establishing the Eagle Lake Community Hospital (now known as the Rice Medical Center), the Prairie Edge Museum, the Eagle Lake Library, and a new community center. As Steve Balas once said, "For every publicized donation or contribution, there were 20 that went untold."

Even after their deaths, David and Eula Wintermann's legacy of charity has continued. In 2002, the David and Eula Wintermann Foundation bestowed nearly 36 acres of land to the Eagle Lake Rice Research Station, allowing our scientists to expand their research programs. The generosity of David, Eula, and the Wintermann Foundation did not stop there. Through a twist of fate, the original 77 acre piece of land that David had worked so hard in purchasing back in 1971 to establish the Eagle Lake Station was in jeopardy of being sold due to financial difficulties faced by the non-profit organization that held the deed for that land. In late 2006, the Wintermann Foundation and its Board of Directors, chaired by Jack Johnson, voted to provide funding to the Texas A&M System Agricultural Experiment

Station to purchase this land (now known as Texas AgriLife Research). When combined with the 36 acre donation made by the Wintermann Foundation in 2002, the Eagle Lake Station now occupies 113 acres of land, and continues to serve as a vital component of Texas A&M's research in the Western area of the Texas ricebelt. The Eagle Lake Station allows our scientists to conduct replicated, highly-controlled experiments. These experiments are an important reason why Texas rice yields have increased from an average of ca. 1700 lb/acre in 1945 to ca. 7300 lb/acre in 2007.

I would like to ask Jack and Judi Johnson, Don Bendy, and Steve Balas to join us in unveiling a plaque commemorating the David R. and Eula Wintermann Eagle Lake Rice Research Station.

I would also like to ask Bill Dugas, who is the Deputy Director of Texas AgriLife Research to say a few words before we present Jack, Judi, Don, and Steve with a few tokens of our appreciations. \*

\* Article by Dr. Lloyd T. Wilson, Texas AgriLife Research and Extension Center, Texas A&M University System, Beaumont, TX.

## From the Editor continued ...

has estimated that 50% of his ratoon crop production has been destroyed. Most growers are waiting until ratoon crop harvest to estimate the impact of Ike.

On September 26, a ribbon cutting ceremony was held at the David R. Wintermann Rice Research Station at Eagle Lake. The ceremony commemorated the generous donations provided by David Wintermann that led to the creation of the Eagle Lake Station in the early 1970s, and more recently donations by the David R. and Eula Wintermann Foundation that resulted in the expansion of the Eagle Lake Station and the purchase of the original 77 acre station to allow Texas AgriLife Research to continue to serve the rice producers in the western part of the Texas ricebelt. Please see the article in this issue of *Texas Rice* that describes but a few of the tremendous deeds that David, Eula, and the Wintermann Foundation

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## From the Editor continued ...

did and continue to do for the Texas rice industry, the people of Eagle Lake, and the Texas A&M University system.

Please keep on sending your suggestions.

Sincerely,

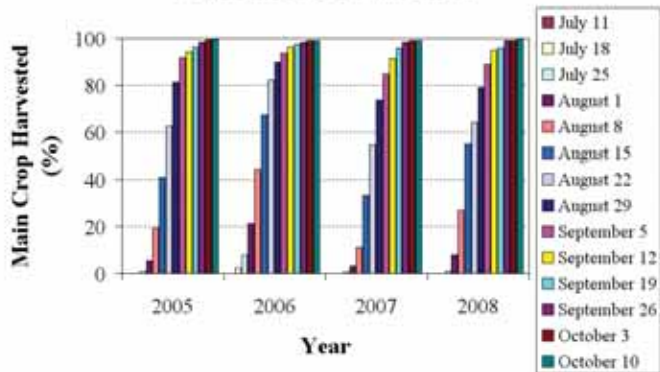


L.T. Wilson  
Professor and Center Director  
Jack B. Wendt Endowed Chair in  
Rice Research

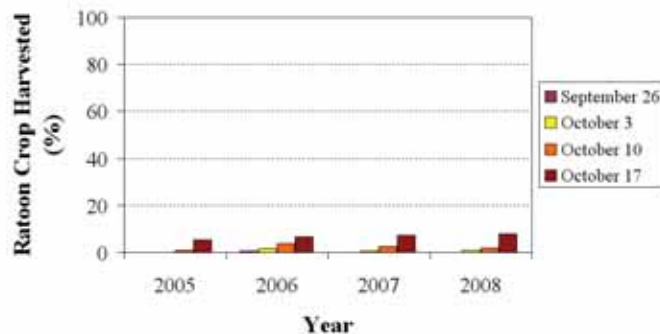
## Rice Crop Update

As of October 17, 2008, 100% of the rice acreage in Texas had been harvested, while 8% of the ratoon crop had been harvested. The weekly development of the rice crop across Texas for 2008 and previous years is available at <http://beaumont.tamu.edu/CropSurvey/CropSurveyReport.aspx>.

Texas Rice Acreage Harvested for Main Crop



Texas Rice Acreage Harvested for Ratoon Crop



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