Texas Rice

Texas A&M University System Agricultural Research and Extension Center
Beaumont, Texas

May 2001 Volume I Number 3

The Origin and Diffusion of Cultivated Rice

Rice is an integral part of the culture, cuisine and economy of many societies.

For example, folklore tells us that when the Kachins of northern Myanmar (Burma) were sent forth from the center of the Earth, they were given the seeds of rice and were directed to a wondrous country where everything was perfect and where rice grew well. Rice is an integral part of their creation myth and remains today as their leading crop and most preferred food. In Bali, it is believed that the Lord Vishnu caused the Earth to give birth to rice, and the God Indra taught the people how to raise rice.

Lord Vishnu of Hindu belief

In both tales, rice is considered a gift of the gods, and even today in both places, rice is treated with reverence, and its cultivation is tied to elaborate rituals.

Chinese myth, by contrast, tells of rice being a gift of animals rather than of gods. China had been visited by an especially severe period of floods. When the land had finally drained, people came down from the hills where they had taken refuge, only to discover that all the plants had been destroyed and there was little to eat. They survived through hunting, but it was very difficult, because animals were scarce. One day the people saw a dog coming across a field, and hanging on the dog's tail were bunches of long, yellow seeds. The people planted these seeds, rice grew, and hunger disappeared. Throughout China, tradition holds that "the precious things are not pearls and jade but the five grains", of which rice is first.

According to Shinto belief, the Emperor of Japan is the living embodiment of Ninigo-no-mikoto, the god of the ripened rice plant. While most modern Japanese may intellectually dismiss this supernatural role, they cannot deny the enormous cultural importance of rice to their country - and so it is in much of the rice world.

★ *Indicates possible regions of origin for rice cultivation*

The origins of rice have been debated for some time, but the plant is of such antiquity that the precise

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From the Editor...

In this month's editorial, I would like to discuss changes that are occuring to *Texas Rice*, to the Beaumont-Eagle Lake Center, and to the Texas A&M University System, all of which have the potential to improve how we serve Texas agriculture and the Texas rice industry.

The *Rice Crop Statistics Report* represents the newest additions to *Texas Rice.* This section will provide current and historic data on acreage, crop development, and yield for different areas of the Texas rice belt. The data are obtained from the Beaumont Center's weekly rice crop survey. The survey was started about 18 years ago by Dr. Jim Stansel to provide growers with timely and accurate information from across the Texas rice belt.

Funding provided by the *Texas Rice Research Foundation* has allowed us to expand our surveyed acreage. This will allow us to more accurately estimate ratoon crop acreage and ratoon crop yield. This funding will also allow us to collect data on rice carry-over stocks. Accurate data on carry-over stocks could help to insure that rice future's prices better reflect rice surplus levels. While *Texas Rice* provides a *Rice Crop Statistics Report* once a month, the *Crop Survey* reports will continue to be available on a weekly basis via fax. Starting with this week's survey, pdf copies of reports will also be made available from our website at http://aesrg.tamu.edu/cropsurveys.htm or upon request via email.

The continuing evolution of *Texas Rice* is mirrored by changes that are occurring at the Beaumont-Eagle Lake Center. In January, Dr. Lee Tarpley was hired by the Texas A&M University System as the Center's Plant Physiologist. Lee brings training that will help us better understand the physiological basis for main crop and ratoon crop yield performance. Shortly after joining the Center, Dr. Tarpley hired Mr. Ronnie Porter to work with him as his Research Technician. In February, Dr. Ming Chen was hired by Dr. Christine Bergman with USDA-ARS as a post-doc to work in the Grain Quality Lab. In March, Mr. Robert Weatherton began full-time employment as the Foundation Seed Manager for the Texas Rice Improvement Association. For the previous 4 years, Robert held two positions at the Center, working as both our Foundation Seed Manager and our Farm Services Manager. To fill the vacancy created by the change in Robert's responsibilities, Mr. Randy Eason became the Center's Farm Services Manager. I encourage you to drop by and welcome Robert and Randy to their new roles. Upcoming issues of *Texas Rice* will highlight the important roles that each serves at the Center.

While the Beaumont-Eagle Lake Center is changing, so is the higher administration in College Station. This past September saw the retirement of John Beverly. John served in numerous capacities within the A&M system, most recently as Associate Director for the Texas Agricultural Experiment Station. John tirelessly worked to insure that the off-campus Centers were strongly represented to our administration.

In January, Dr. Charlie Scifres was hired to fill John's position. Charlie comes to Texas A&M from

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Inside This Issue

Cover: The Origin and Diffusion of Cultivated Rice

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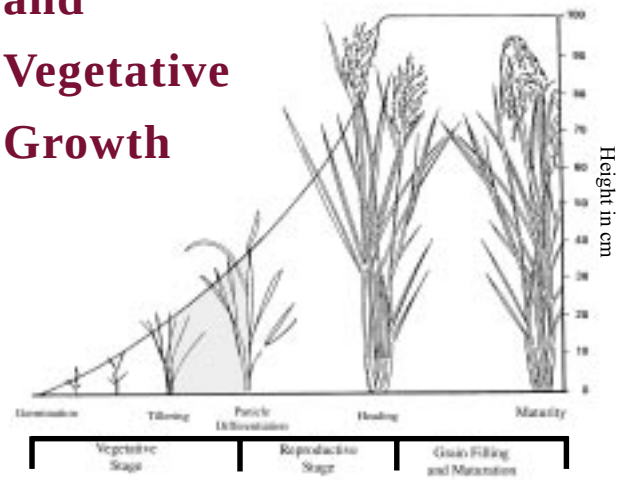
Farming Rice

a monthly guide for Texas growers

This is the third in a series of articles that will be published throughout the year. Our intention is to provide useful and timely information to Texas rice growers, so that they may increase productivity and profitability on their farms.

Tiller Production and Vegetative Growth



The number of tillers produced and the amount of vegetative growth that occurs prior to panicle differentiation has a large effect on the subsequent reproductive development and yield of a rice crop. The maximum number of tillers that a rice variety produces is genetically determined, but can be modified by environment, plant population and management. Asian varieties typically produce a greater number of tillers than do U.S. varieties. This greater tillering ability results from the varietal selection practice used in Asian rice plant breeding programs. In Asia, most of the rice acreage is transplanted. Selecting for higher tillering rates allows for the tillers to rapidly fill in the gaps between clumps of transplanted rice plants.

In the U.S., where the plant densities are generally higher, varieties typically produce fewer tillers. The data shown in the following graph was from a study conducted by Ted Wilson and Anna McClung during 2000, and funded by the Texas Rice Research Foundation. Each of the six varieties was planted on the same date at a 7" row-spacing. When the seedlings reached the 3-leaf stage, the plants were thinned to a uniform density of 10 seedlings per meter-row (228,000 seedlings acre). This density is less than half of what is normally found in most commercial rice fields. This procedure greatly reduces plant-to-plant variation in tillering and allowed for an assessment of each variety's tillering ability. As is apparent from the data, Cypress produces a far greater number of tillers than do the other varieties, with about 64% more tillers at this plant density than either Jefferson or Wells, and about 24% more tillers than Saber, the next highest tillering variety in the study.

A variety with a higher tillering ability will in general suppress weed germination more effectively than a variety that produces fewer tillers. The degree of weed suppression is directly related to the speed with which the rice plants produce leaf mass to shade the ground. Some varieties that have low tiller production rates but extremely leafy tillers could have the ability to suppress weeds as well as a higher tillering variety with smaller leaves.

Higher tiller production does not necessarily mean a crop will produce a greater number of

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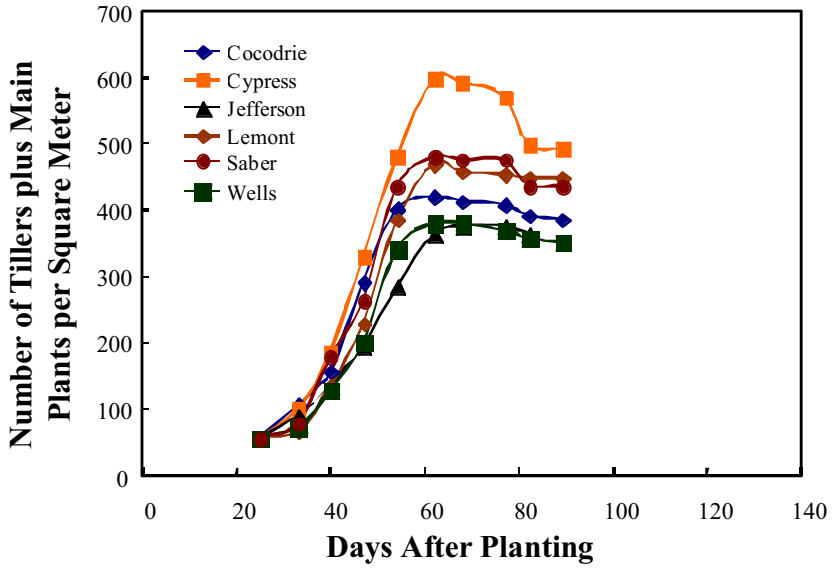
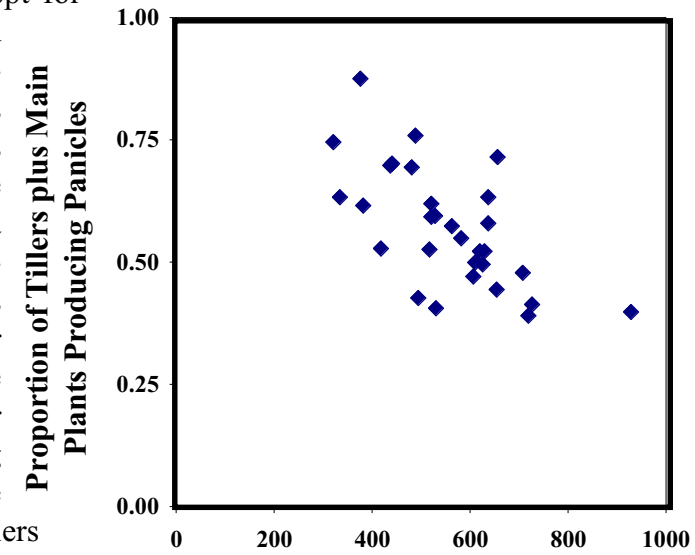


panicles. Not all tillers produce panicles. As a rice plant begins to produce tillers, leaf area begins to rapidly increase. Except for tillers that are produced during periods of unseasonably cool weather, as a general rule, tillers that are produced the earliest usually have a greater chance of developing panicles. Tillers that have produced 7 or more leaves prior to the main plants (mother plants) producing panicles will produce their own panicles. Tillers with fewer than 7 leaves by this date rarely receive enough sunlight to store the energy need to produce a panicle and almost always die. Tillers that produce panicles are referred to as reproductive tillers. Tillers that do not produce panicles are non-reproductive tillers.

Varieties with a higher tillering ability usually experience higher rates of tiller death. This is a normal process and should not be confused with disease symptoms. While Cypress produced about 615 tillers/m^2 (2.5 million tillers/ac) in the above study, only 495 tillers/m^2 (2.0 million/ac) survived to produce panicles. In contrast, over 90% of the tillers produced by the two lowest tillering varieties, Wells and Jefferson, survived to produce panicles. In general, as tiller production increases, tiller survival decreases. The following graph shows the results of a two-year study conducted by Omar Samonte and Ted Wilson in the mid-1990's on the growth and development of 16 rice genotypes that had very different growth characteristics. The results from this study suggest that survival drops by about 1% for each 10 additional tillers at a density above 200 tillers plus mainplants per m^2.



The percent of tillers that become reproductive is largely determined by fertilizer management, temperatures during early tillering, seeding rate and by a variety's intrinsic tillering rate. It is important that the early tillers not be starved for nitrogen. Tillers that are starved for nitrogen grow at a slower rate, have a lower photosynthetic rate, and store less non-structural carbohydrates. In general, the less the amount of non-structural carbohydrates in the rice plant at the time of panicle differentiation, the fewer the number of panicles that will be produced by the tillers.

The reproductive stage of rice begins with the development of the panicle buds, known as panicle initiation (PI). At this point, the newly formed buds can only be viewed under a microscope. It is sometimes referred to as the 'green ring' stage, as a thin green band is visible just above the top node. Roughly 4 days after PI the stage known as panicle differentiation (PD) begins. A field is said to be at PD when 30% of the main culms sampled have a panicle 2mm long, and can be viewed with the naked eye.

The immature panicle looks white and has a fuzzy texture similar to a small ball of cotton. It is enclosed in white immature leaf tissue just above the top node or joint. In sampling the field for PD avoid non-representative areas such as levees, bare spots, plants in deep water and the edges of a field. Sample at least ten plants, examining only the main culms.

We will pick up in the next issue with more details on the reproductive stage of rice.

The panicle at the panicle differentiation stage of development (2 mm in length).

This article was written by Ted Wilson with PD information compiled by Jay Cockrell, with help from Jim Stansel and Fred Turner.

Researcher in the News...

Dr. Mike Chandler

Weed Science is a crucial area of study that greatly benefits Texas farmers

Mike was born in Wichita, Kansas in 1943. His mom and dad had moved there at the start of WWII, as his dad worked for Beechcraft Industries building airplanes for the war effort. After the war, the family moved back to central Oklahoma where his grandparents lived. Besides a furniture business in town, his dad raised beef cattle for market and his granddad had a dairy operation. Mike decided way back then that his interest was not in the cows, but in the crops that fed them.

Dr. Mike Chandler with his student Brian Ottis

The family moved to Amarillo when Mike started high school. After finishing, he began his undergraduate studies at West Texas State in Canyon. In 1963 he received the Outstanding Aggie Sophomore award for his academic achievements and leadership skills, and in 1965 Mike was honored as Outstanding Agricultural Senior. He completed his BS degree in Agriculture at West Texas State in 1965. It was during this time that he worked for Dr. Allen Wiese at the Texas Agricultural Experiment Station at Bushland. Dr. Wiese made a tremendous impact on Mike, and is responsible for his lifelong interest in weed science. From there Dr. Chandler went on to Oklahoma State University and received his Masters in Agronomy. While there he met Bonnie Niece, a fellow student working on her Masters in Education. They were married in 1967. Mike then continued on to get his PhD in Crop Science at OSU, finishing in 1971.

After school his first position was as a Research Agronomist with the USDA-ARS Southern Weed Science Laboratory in Stoneville, MS. There he was responsible for developing new and improved technology for controlling weeds in cotton. Working with Ken Frick they devised a protocol for augmenting the native moth, *Bactra verutana*, as a potential bio-control for purple nutsedge. This paper was published, along with 15 others, while working at the lab in Stoneville. Dr. Chandler joined the Texas Agricultural Experiment Station in 1982 as an Associate Professor. Dr. Perry Adkissin facilitated the appointment, as he was leading the National Consortium for IPM and needed a weed science specialist. In 1989 Dr. Chandler was promoted to professor in the Department of Soil & Crop Sciences, and has published over 50 papers while at Texas A&M. He advises graduate students and teaches courses in Chemical Weed Control and Weed Biology & Ecology. Dr. Chandler's research focuses on the ontogeny of selected weed species, crop-weed interference, and the evaluation of crop herbicide rotations in conventional and con

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Spotlight on Support

The following graduate students have worked under Dr. Chandler's supervision.

Gregory Lee Steele was raised in Hillsboro where he received an Associate of Science degree from Hill College in May of 1995. Greg received a Bachelor of Science degree in Rangeland Ecology and Management from Texas A&M University in May of 1997. In the Fall of 1998, Greg began to pursue a Master of Science degree in Agronomy, specializing in weed science. Greg completed his Master's degree in May of 2000. He is currently working toward a Doctor of Philosophy degree in Agronomy. Greg lives in College Station with his wife, Michelle and son, Luke.

Brian Ottis was born and raised in Bay City. He graduated from Bay City High School in 1995 and then went on to Texas A&M University to receive a Bachelor of Science degree in Plant and Environmental Soil Science. Brian is currently studying red rice diversity and management in pursuit of a Master of Science degree in Agronomy.

Melanie Hessler was born in Shiner, Texas on August 13, 1974. She is the youngest of four children of Leon and Janice Hessler. She graduated from Victoria High School in May of 1992. She received a BS in Rangeland Ecology and Management from Texas A&M in May 1996. In the summer of 1996, she began to pursue a MS degree in Agronomy specializing in weed science. She completed her master's degree in August of 1999. She is currently enrolled at St. Mary's School of Law pursuing a Doctor of Jurisprudence with specialization in environmental law.

servation tillage systems. Most of his early work concentrated on cotton, corn and grain sorghum production in Central Texas, but since the early 90's he has worked extensively in rice.

To cite significant research accomplishments in the past ten years, Dr. Chandler's research provided the basic biological data, control procedures and environmental based guidance for the control of broomrape, *Orbanche ramosa*, in Karnes County, Texas. Discovered in 1981, this infestation was the only known occurrence in the U.S., and very little information was available on the biology and control of this parasitic plant. As a result of Dr. Chandler's research the eradication program has drastically reduced the levels of infestation, both in terms of density per unit area and area of infestation.

Also, Dr. Chandler was the first to document deleterious corn injury as a result of the interaction between Counter, an insecticide for corn root worms, and Beacon, a herbicide for johnsongrass. His research showed that five corn hybrids widely grown in Texas were tolerant to the herbicide when no insecticide was used, but all were injured when the insecticide had been applied in-furrow at planting for the control of rootworms. The data has helped commercial companies develop labels that guide producers in the use of herbicides and insecticides in the production of corn.

Dr. Chandler was also the first to document that Roundup applied over the top of Roundup Ready cotton after the 4 to 6 leaf stage would result in yield reduction. The manufacturer used this information to make changes on the label so producers would not experience yield loss due to improper applications.

Most recently, Dr. Chandler documented that the TX4 red rice ecotype possessed a high degree of tolerance to Liberty herbicide prior to the release of Liberty tolerant rice. This finding is very significant as red rice is the most troublesome weed in commercial rice production. Red rice from across Arkansas, Louisiana, Mississippi and Texas was studied using 42 plant and seed traits. Large variability in herbicide sensitivity among the ecotypes was found. Jose Noldin led this research, and did his dissertation based on the findings.

Jose Noldin was instrumental in bringing Dr. Chandler into rice research. He was a graduate student from Brazil, and the government there paid for his assistantship but specified that his work must be done in rice. This led to a productive working relationship between Dr. Garry McCauley and Chandler, and since that time Dr. Chandler has done extensive research in the control of red rice. The original samples collected by Noldin have been fingerprinted by Dr. Bill Park, Department of Biochemistry and Biophysics at Texas A&M. This has led to significant findings that will greatly impact how this noxious weed is controlled.

Dr. Chandler and Dr. Park's students, Brian Ottis and Kelly Vaughan, have shown that all red rice does not fall into the category of *Oryza sativa* ssp. indica, as was previously thought. This may in part explain the varying degrees of resistance red rice has to herbicides such as Liberty. Another one of Dr. Chandler's students, Gregory Steele, studies the control of red rice in imazethapyr (Newpath) tolerant rice. With the help of Chandler and Dr. McCauley, Steele has determined optimum rates and timing of applications to obtain over 90% control. This technology will require good management techniques and can be a powerful tool for producers if used correctly.

Dr. Chandler puts a great deal of emphasis on training graduate students, as he has supervised 18 students in the past 5 years. He gives credit to the Rice Belt Warehouse Fellowship Fund, which is set up within the Department of Agronomy at Texas A&M to support graduate students who are pursuing a career in rice research.

Dr. Chandler is also active in the Southern Weed Science Society (SWSS) and the Weed Science Society of America (WSSA). He has served as Vice-President, President Elect and President of both the WSSA and SWSS and as Treasurer of WSSA. In 1995 Dr. Chandler received the SWSS Distinguished Service Award given to outstanding scientists in the field of weed science, who have made significant contributions through research and graduate student training.

Dr. Chandler and his wife Bonnie live in College Station. Bonnie teaches 2nd grade in Hearne, and they have two children, Stacy (who is also a teacher) and Jonathan. When I asked Dr. Chandler what he did in his free time, he said he didn't have any, which given the research and teaching load, is easy to believe. *

Grower Profile...

Gertson Partnership: A Family Tradition in Rice Farming

Kris Gertson immigrated to the United States from Denmark when he was only nine years old. His parents bought a farm in Kansas where they farmed wheat and corn. Later Kris married Elsie, also a native of Denmark. With their son Peter, they moved to Lissie, Texas in 1909. After arriving, Kris realized the crops that they grew in Kansas were not well suited to the shallow soils near Lissie, so he began growing rice. Pete worked with his dad on the farm, learning the peculiarities of growing rice in Texas. In 1923, Pete married Temperance Hutchins of Lissie and they had three children – Ruby, Bettie and Dan. With the help of their children, the couple farmed 1200 acres of rice and raised registered Brahma cattle. Dan Gertson learned the trade from his father, continuing the tradition that began with his grandfather in 1909.

From left to right: Dan Gertson with his sons Ronald, Stephen, Danny and John.

Dan met his future wife, Maryan, in the fall of 1950 when her family moved to East Bernard. They attended school together one year but then her father, who worked for the Tennessee Pipeline Company, was transferred to South Texas. Maryan and Dan wrote to each other all through their remaining high school years, and were married after graduation in the summer of 1954. They worked hard together to build the farm, as the couple wanted to have a family business to pass on. In addition to rice, they maintained a herd of registered Brahma cattle that grew to as many as 1500 head. When Maryan was carrying their first child, she told her doctor they would have six children, and she was exactly right. The same doctor delivered Danny, Terry, Ronald, Rhonda, John, and Stephen.

Dan Gertson was always an innovator, experimenting with different ways to strengthen and diversify the family business. Besides the cattle and rice, he also had 2 acres of greenhouses where he raised hydroponic tomatoes. When the tomato market dropped due to heavy imports from Mexico, Dan began growing ornamentals such as Easter lilies and poinsettias. During this time he was also half owner of a John Deere dealership in East Bernard. In 1977 Dan started his own flying service, because air service in the area was inadequate for the needs of their farm. And while all four of his boys have their pilots' license, they made a promise to their dad never to fly the crop dusters. Following a bout with cancer, Dan sold his interests in the John Deere dealership and greenhouses, and concentrated on the rice-cattle part of the operation.

The story of the Gertson children is one that is rich in tradition, with a strong emphasis on family values. All the boys and their wives graduated from Texas A&M, Terry graduated from TCU and Rhonda from Baylor. The Gertson children all married local country folk like themselves and all remain active in the farming operations to this day. Each lives within 10 miles of the farm where they grew up. They have blessed Dan and Maryan with 14 grandchildren that range in age from three to eighteen.

Gertson Partnership, now operated by the boys and their wives, has roughly 8000 acres of land in Colorado and Wharton counties. Each year they plant approximately 2300 acres in rice, with the rest in cattle and permanent pasture. They practice a tight rice-cattle-rice rotation, and this year will grow only two varieties – Cocodrie and Jefferson. The cattle are Angus breeding stock with Brangus calves for market. Their water comes from LCRA canals (60%) and un

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derground wells (40%). The family utilizes a multiple inlet system on all the fields to get water on and off in a hurry. They aim for 3 to 4 inlets per 100 acres and they are confident the multiple inlets help them save water and increase nutrient efficiency. Ratoon crops are common, with 90% of their fields prepared for second cropping each year.

Lissie Flying Service, owned by the Gertson family, serves 35 producers on 15,000 acres – in addition to the family's 2300 acres that are in rice each year.

For nutrients, urea is the mainstay and potassium & phosphorus are added as the soil tests indicate a need. They practice stale seedbed culture in which the fields are cultivated for the last time around February, with Round-up applied before planting to eliminate any weeds that have grown up. Their biggest problems are weeds and stinkbugs. They use the pre-emergent herbicide Command just after planting into a stale seedbed. If the rains don't come in a week or so, they will flush to activate the herbicide and get the rice off to a good start. Other herbicides including Permit, Aim, Stam and Duet are used to clean up what Command leaves behind. Fungicide applications are generally limited to 1 per season, but stinkbug control may require 3 to 4 sprays each year. For that they use methyl parathion, which is cheaper, or Seven XLR Plus, which is more expensive but has the added benefit of residual control.

With the newly erected bins, the Gertson's have an on-farm storage capacity of 150,000 cwt of rice.

The family sells most of their rice through East Bernard Rice Marketing's sales office in East Bernard, and the primary buyers of their rice are ARI in Freeport, Gulf Rice in Houston and Colorado County Rice Mill in Eagle Lake. Though the Gertsons have on-farm storage for most of their crop, they practice a marketing technique that moves quantities of rice throughout the fall, winter and early spring with the intention of selling everything by May. Their yields range from 8500 to 9100 lbs/ac.

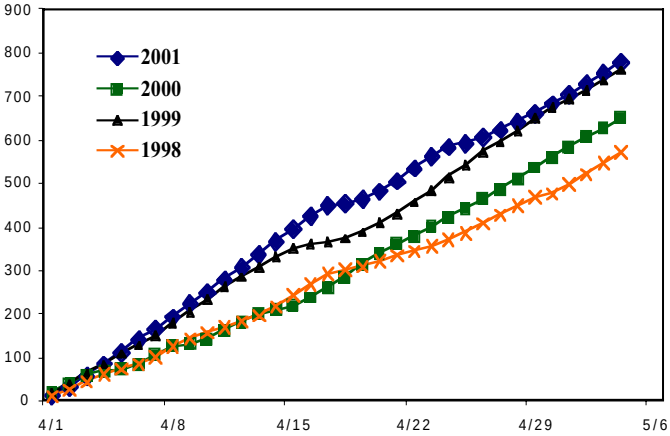
One of the major benefits of being part of a family operation is being able to do community service work, knowing that there is always someone to look after the store. Dan is a member of the U.S. Rice Producers Legislative Group, and served on the School Board in East Bernard for 16 years. In the past his dad, Pete, also served on that board for 20 years and presently his son Stephen holds the school board position. Danny is participating in the Rice Leadership Program this year and also has served on the Board of Directors for the Wharton County Junior College for the past 10 years. Ronald is on the Regional Water Planning Group for the Lower Colorado Region K, which came up with the innovative idea that will partner them with Region L to provide water to San Antonio and the rice producing counties along the Colorado River. John serves on a local bank board, and they all fill civic and church leadership positions.

When I asked the Gertson boys what has contributed most to their success in the farming business the answer was unanimous – their Dad. Besides being a top notch farmer he had the foresight to teach them many other valuable skills, such as mechanic work. When a tractor would break down Dan would send it to the dealership for repair, and send the boys with it. Now they do 90% of the repairs on farm.

Dan is also credited by his sons for allowing them to make their own decisions, and being very tolerant of their mistakes. When asked how four brothers can work so closely without conflict, they credit both their parents for bringing them up in a loving Christian home, and instilling in them values that would last a lifetime. *

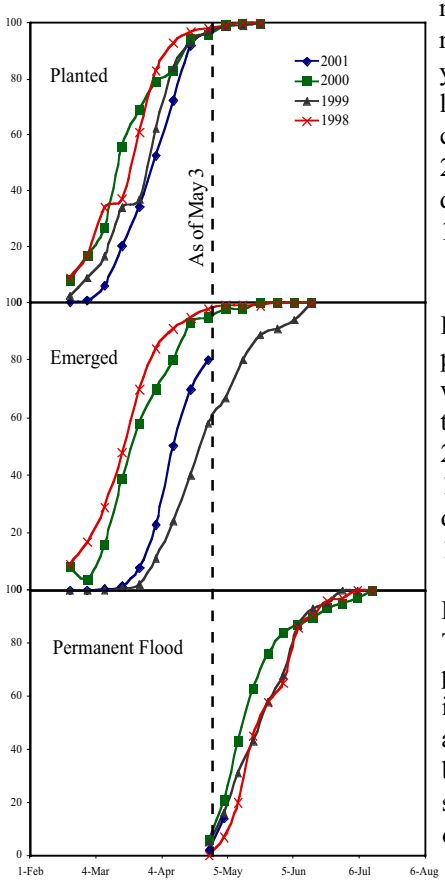
Rice Crop Statistics Report

Heat Accumulation: The accumulation of heat units above 50˚F at the Beaumont Center has been greater this year than any of the previous three years, with 20% more than 2000, 2% more than 1999, and 36% more than 1998. At this stage of crop growth, temperatures are not hot enough to cause plant stress, except when pre-flooded fields are allowed to become too dry. The higher temperatures can make up for some of the delays in planting.



Cumulative Degree-Days greater than 50ºF from April 1 for the Beaumont Center

Planting: The 2001 crop season planting was delayed by both early season rainfall and cool temperatures across much of the Texas rice belt. Planting this year was 16 days later at 50% planting compared with the 2000 season and 4 days later than the 1999 season.



Emergence: Fifty percent emergence was 20 days behind the 2000 crop and 24 days behind the 1998 crop, but 11 days ahead of the 1999 crop.

Permanent Flood: The trajectory for permanent flood is inline with the 1999 and 1998 seasons, but behind the 2000 season by about 8 days.

Marketing News

Highlighting buyers, processors and distributors

Arrowhead Mills
Hereford, Texas

Frank Ford and two partners started Arrowhead Mills in 1960. In those days the facility consisted of an old tin roofed building that housed a stone mill, and an old rail car for an office. In July of 1998, Arrowhead Mills became part of the Hain-Celestial Group, the largest natural/organic food company in the U.S. Other companies of the Hain Group include Earth's Best baby food, Health Valley, Terra Chips, Garden of Eatin' Chips, Hain Foods and West Brae. They currently buy organic wheat, soybeans, rice and edible beans. For more information contact Dale Hollingsworth at 806-364-0730 ext. 334 or dale@wtrt.net

Colorado County Rice Mill
Eagle Lake, Texas

Colorado County Rice Mill is owned and operated by Betty and Dickie Adams. Dickie has worked for the USDA as a rice inspector, for Comet Rice, P&S Rice Mills and Gulf Pacific Rice. In May of 1996 they opened the Colorado County Rice Mill, which Dickie designed and constructed. They take great pride in handling only Texas long grain rice. The head miller is Joe Morin, who has worked with Dickie for over 35 years. They are located next to Rice Industries, Inc. just off Hwy 90, 4 miles east of Eagle Lake. Besides milling, they also have palletizing and packaging capability, and ship orders throughout the U.S. and abroad. For more information call 979-234-5554.

East Bernard Rice Marketing
East Bernard, Texas

East Bernard Rice Marketing is part of Coastal Rice and Futures, Inc., which is owned by Andy Hewes and Jay Davis. They market rough rice, advise farmers on market conditions and make recommendations on the timing of the sale that will best fit the producer's individual needs. Jay Davis, who operates the sales office locally, bought rough rice for P&S Rice Mills for 12 years. Andy Hewes has been engaged in U.S. and global rice market analysis, exporting and shipping, and export consulting since the early 1970's with Riviana Foods. Coastal Rice and Futures, Inc., founded in 1990, is a cash rice brokerage operation which offers marketing analysis and export consulting. Andy and Jay are both licensed futures brokers. Jay can be reached by phone in East Bernard at 979-335-7591 or by email at EBernardRM@aol.com. Andy Hewes can be reached by phone in Houston at 281-558-4333, or by email at berange@houston.rr.com.

High Yielder's Tips

On February 25, 2000, about a dozen consistently high-yielding rice producers from across Texas met to discuss their production practices. The following summarizes important points made at the meeting, along with input from Beaumont Center scientists.

Q: What do all the consistently successful growers have in common?
A: First they have a good understanding of the basic physiology of the rice plant. They know how to recognize signs of stress, because they know what the plant is supposed to look like at any given stage. They understand what the plant needs at each stage of crop development. These growers walk their fields regularly so they can stay ahead of problems. That's true for weed control, insect and disease control, and fertility maintenance. The other thing successful growers have in common is good record keeping. It's important for reasons of economics and sound production decisions. It also gives the grower vital information for making production decisions in future years. *The record sheet that follows was provided by Jacko Garrett and can be copied or used as a template.*

Q: Through active tillering and approaching PD, what are the critical issues?
A: Water is very important. If the plants are stressed for water it will hurt your yield. Check the water level every day and make sure to keep adding more as needed. If you are using a multiple inlet system, regulating your water is much easier. Also, if your fields have been precision leveled you can maintain the flood at a uniform shallow depth. On uneven fields, some plants are in too deep a flood, while others may have barely enough. Either way, you decrease yield. There will also be weed problems if you let the water drop.

Q: What insects should growers be scouting for at this point?
A: Begin looking for Rice Water Weevil larva about 2 weeks after permanent flood. You'll need a core sampler (4" diameter PVC with attached handle) and a screen bucket (40-mesh screen). The plug containing plant material and soil is placed in the screen bucket. The sample is washed vigorously by moving the bucket up and down in the water. The larva will separate from the soil/root matter and float to the top for counting. The root damage caused by the larva can reduce yield in the main and ratoon crop. In areas with a history of RWW damage, Icon is recommended as a seed treatment. Drying the fields down will reduce populations but may damage plants due to water stress. Chinch bugs can be a problem on seedling rice as can fall armyworms. For chinch bugs, if populations on seedling rice approach one adult per plant, quick control is suggested. Sevin, Karate and Icon are all labeled for chinch bug control. With fall armyworms research has shown that 25% leaf loss at the seedling stage can decrease yields an average of 130 lbs per acre. Very small larva will feed in groups near the heart of the plant, while older larva can be seen on the upper leaves. Also start checking for stem borers as the rice approaches PD. The lesions will be at the water line and either be orange or brown. While Karate is not labeled for stem borers, preliminary data has shown that it gives control when also being applied for other pests. Icon seed treatment is labeled for borers and preliminary tests have shown good yield response due to stem borer control.


Sheath Blight damage

Photo courtesy of Dr. Toni Marchetti

Q: Which diseases will be prevalent shortly after PD?
A: Sheath blight symptoms may begin to show up shortly after PD. To scout effectively divide large fields into 50-acre sections and monitor each section separately. Walk the section in a U-shaped pattern randomly stopping to detect for the presence of sheath blight by observing the plants several inches above the water line. Record the stop as positive if any lesion is detected, or as negative if no lesions are found. The number of stops should at least be equal to the number of acres in the section being scouted. The thresholds for economic fungicide application are 35% positive stops for very susceptible varieties such as Gulfmont, Lemont, Cypress and Cocodrie and 45% positive stops for moderately susceptible varieties such as Jefferson, Dixiebelle and Madison. Sheath blight is encouraged by over application of nitrogen and excessively dense canopies. *

FIELD NOTES

GROUP # _____
FIELD # _____
ACRES _____
YIELD/AC _____
LEVEES _____

ANTICIPATED GREEN RING DATE: _____
ANTICIPATED PANICLE DIFF. DATE: _____

	1ST CROP	2ND CROP
PLANTING DATE:		
EMERGENCE DATE:		
PANICLE INIT:		
1ST SIGN OF HEADING:		
DRAIN DATE:		
HARVEST DATE:		
MOISTURE AT HARV:		
# DAYS EMERG TO HARV:		
1ST HARV.- 2ND HARV:		

FIRST CROP:

SEED

VARIETY	DATE	APPLICATOR	RATE

FERTILIZER

MATERIAL	DATE	TIME	PNDS/AC	UNITS/AC	TTL UNITS/AC

WEED CONTROL

PRODUCT	DATE	TIME	WIND	ADDITIVE	AMT CHEM	AMT WATER

INSECT CONTROL

PRODUCT	DATE	TIME	WIND	ADDITIVE	AMT CHEM	AMT WATER

FUNGICIDE

PRODUCT	DATE	TIME	WIND	ADDITIVE	AMT CHEM	AMT WATER

SECOND CROP:

FERTILIZER

MATERIAL	DATE	TIME	PNDS/AC	UNITS/AC	TTL UNITS/AC

WEED CONTROL

PRODUCT	DATE	TIME	WIND	ADDITIVE	AMT CHEM	AMT WATER

INSECT CONTROL

PRODUCT	DATE	TIME	WIND	ADDITIVE	AMT CHEM	AMT WATER

WATER RECORDS

GROUP # _____ FIELD # _____ # ACRES _____

DATE	TIME	IRRIGATION WATER	RAIN WATER	COMMENTS

FIELD NOTES

Pest of the Month

Fall Armyworm:

In spite of the name, it causes damage in the springtime on young rice plants

The fall armyworm, *Spodoptera frugiperda*, is a sporadic pest of rice. The larval stages defoliate rice and can cause significant stand loss when seedling rice is attacked. Adult moths are active at night and lay egg masses on rice foliage. Eggs hatch and small larvae disperse and begin feeding on rice foliage. The insect has about five larval stages with each stage, or instar, larger than the previous instar. Consequently, the older larval instars consume more foliage than the younger instars. Older instar larvae have a distinctive inverted "Y" on their heads which is a good diagnostic characteristic. The last instar larva transforms to a pupa (resting stage) in the soil. A new generation adult moth emerges from the pupa and the cycle is repeated. One generation takes about 1 month to complete.

Heavy infestations of larvae can defoliate entire rice fields in a short period of time which means fields should be scouted at least twice a week for fall armyworms from rice emergence to the permanent flood. Be sure to scout all parts of a field since infestations are rarely distributed evenly over the whole field. Thus, you may get by treating only a portion of a particular field. Generally, fall armyworms attack rice before the permanent flood but many rice fields in 2000 were infested after the permanent flood. Data show that rice can tolerate about 25% defoliation before yield losses occur.

Several biological agents help keep fall armyworms under control. A parasitic wasp, *Cotesia* sp., lays an egg in the fall armyworm larva. The egg hatches and the small wasp larva kills the fall armyworm larva. The wasp larva pupates in a small white cocoon which is often observed on rice foliage. Other biological control agents are predaceous wasps (like mud daubers) and spiders. Egrets and other wading birds also feed on fall armyworms. In fact, some farmers begin scouting for fall armyworms when egret flocks appear in their rice fields. Generally, this is not a good practice because significant defoliation can occur before birds enter fields.

Frequently, fall armyworms can be controlled by timely flushing or flooding. Insects drown and become susceptible to diseases. Water also forces larvae up plants where they are more vulnerable to predators, parasites and insecticide sprays.

Methyl parathion, carbaryl (Sevin XLR Plus) and Karate 1EC/Z are commonly applied to control fall armyworms. Remember that methyl parathion and carbaryl can interact with propanil to cause a phytotoxic response in rice (if these insecticides and herbicides are applied within 14 days of one another). Icon 6.2FS does not control fall armyworm. If Karate 1EC/Z is applied within 7 days of the permanent flood for fall armyworm control, rice water weevil control may also be obtained. Please consult the 2001 Rice Production Guidelines for more details on scouting, identification and control. *

Article and photos by Beaumont Station Entomologist Dr. Mo Way. If you have any questions call Mo at (409) 752-2741 ext. 2231.

Editor's Page continued

the University of Arkansas, where he served in a similar capacity. Charlie is a straight-shooter and has already visited all 13 of the off-campus Centers in Texas. I am banking on him serving the Texas rice industry well. At the same time that Charlie was hired, Dr. Fuller Bazer was hired as Associate Director for Academic programs for the College of Agriculture and Life Sciences. Fuller brings exceptional credentials to his position. A partial changing of the guard in College Station brings with it the opportunity for our Center and the rice industry to highlight our importance to the Texas A&M University System and the people of Texas. I hope you will welcome Charlie and Fuller in their new roles.

From left to right: Charlie Scifres, Fuller Bazer, Frank Gilstrap, Billy Harris

Texas Rice is available as a printed-copy via the mail and as an electronic copy via email. If you would like to receive an electronic copy, please send your email address to me at lt-wilson@aesrg.tamu.edu. If you know of someone who you think would like to receive a copy of the newsletter, send me their name, address, and email.

Please send your suggestions so we can continue to improve *Texas Rice*.

Sincerely,

L. T. Wilson

Ted Wilson
Professor and Center Director

History continued

time and place of its first development will perhaps never be known. It is certain, however, that the domestication of rice ranks as one of the most important developments in human history, for this grain has fed more people over a longer period of time than has any other crop.

The earliest agriculture may have developed by accident when women of the settlement recognized that the mix of plant life growing around refuge heaps was especially rich in edible forms. The earliest agriculture was probably focused on plants that reproduced vegetatively, but the seeds of easily shattering varieties of wild rice such as *Oryza fatua* may have found their way to the gardens at an early date. If these assumptions are correct, then domestication most likely took place in either the Korat area of Thailand, in some sheltered basin area of northern Thailand, in one of the longitudinal valleys of Myanmar's Shan Upland, in southwestern China, or in Assam.

Cultivated rice belongs to two species, *O. sativa* and *O. glaberrima*. Of the two, *O. sativa* is by far the more widely utilized. *O. sativa* is a complex group composed of two forms endemic to Africa but not cultivated, and a third form, *O. rufipogon*, having distinctive partitions into South Asian, Chinese, New Guinean, Australian, and American forms. The subdivision of *O. sativa* into these seven forms began long ago and came about largely as a result of major tectonic events and worldwide climatic changes.

Based on measurements by electrophoresis, it appears that the Australian form of *O. sativa* began to diverge from the main forms during the Miocene about 15 million years ago. At that time, the Asian portion of Gondwanaland collided with the Australia/New Guinea portion, creating a land bridge across which *O. sativa* migrated. Once the tectonic plates separated, the Australian form was free to follow an evolutionary path somewhat different from that followed by the *O. sativa* ecotype on the mainland.

Divergence between the South Asian and Chinese forms, the ancestors of what are commonly referred to today as indica and japonica (or sinica) types, is believed to have commenced 2-3 million years ago. At that time, migration of fauna across the proto-Himalaya was still possible, and with the animals went wild rice. The climate was suitable for rice even in

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State, National and International News

LCRA/SanAntonio Bill

USRPA - HB1629 by Cook, D-Eagle Lake—relating to the provision of water by the Lower Colorado River Authority to a municipality outside the Colorado River basin, sucessfully passed out of the Senate Natural Resources Committee. Senator Fraser, R-Marble Falls raised concerns regarding lake levels and proposed an alternative bill which would have significantly changed the bill as passed by Rep. Cook. The Fraser proposal did not pass. The Cook bill has passed through the House and Senate, and has been sent to the governor to sign.

Water Bill Leaves Senate

USRPA - SB 2 By Brown, Buster. Relating to the development and management of the water resources of the state. When this bill was debated in the committee, agriculture made significant gains especially regarding groundwater groundwater districts. On the Senate floor an amendment was added by Senator Bob Duncan, R-Lubbock which placed agriculture at the same level as industrial uses in the appropriation preferences Section of Chapter 11 of the Water Code. This was a big gain for agriculture. The bill is currently in the House Natural Resource Committee.

Veneman's First 100 Days

USA Rice Federation - Secretary of Agriculture Ann Veneman reviewed her first 100 days at USDA during a conference call sponsored by the National Cattlemen's Beef Association. In her opening comments, Secretary Veneman stated that foot-and-mouth disease and bovine spongiform encephalopathy bovine outbreaks in Europe have kept USDA on the front page of national newspapers more than she would have liked. She then discussed how the president's budget had increased funding to several agencies to ensure that the problems in Europe do not spread to the United States.

The Secretary commented on USDA's commitment to open new markets for agricultural trade, enter into new agreements for free trade, and also pursue "fast track" trading authority for the President. The recent Quebec City summit, kicking off talks on the Free Trade of the Americas Agreement, is a prime example of what USDA supports to strengthen agricultural exports.

Secretary Veneman commented on improving the economic situation for producers and rural residents. She mentioned disaster payments that recently went out to farmers as an example of USDA efforts in this area.

GM Crops in Canada

ORYZA - A scientific panel, commissioned by the Canadian government, has released a report on the Regulation of Food Biotechnology in Canada which concludes that GM crops and foods in Canada should be subject to more rigorous testing, and that the level of government support for independent research on the safety of food biotechnology is inadequate. In response, the GOC has assured the public that the government will study the report in detail to determine how it can help to improve Canada's regulatory system for GM food products.

On February 5, 2001 the Royal Society of Canada released their report entitled: *Elements of Precaution: Recommendations for the Regulation of Food Biotechnology in Canada.* Although the GOC is not bound by the panel's recommendations, GOC Ministers have assured the public that the government will study the report in detail to determine how it can help to improve Canada's regulatory system for genetically modified food products.

US Rejects 13 Claims of Basmati Rice Patents

PLANET RICE Asia Pulse May 4, 2001 - The United States Patent and Trademark Office (USPTO) has rejected 13 out of 16 claims for a controversial patent on Basmati rice. RiceTec, Inc. a Texas company filed these claims.

Experts said the decision would benefit Pakistani Basmati exporters. The patent (No. 5,663,484) claiming 20 different characteristics of Basmati rice produced in Pakistan and India was allowed to the said company in 1997 under the U.S. Patent Law in line with the Trade Related Intellectual Property Rights (TRIPS) agreements.

The USPTO judged that rice lines, plants and grains that RiceTec has claimed were substantially identical to Basmati varieties grown in India and Pakistan, and hence could not be patented. Three patent claims are still pending. RiceTec reserves the right to appeal against the decision until May 27, 2001.*

History continued

what today is Central Asia, and north China had almost ideal conditions.

Botanical evidence concerning the distribution of cultivated species is based chiefly on the range and habitat of wild species that are believed to have contributed to the cultivated forms. The greatest variety of such rice is found in the zone of monsoon rainfall extending from eastern India through Myanmar, Thailand, Laos, northern Vietnam, and into southern China. This diversity of species, including those considered by many to have been involved in the original domestication, lends support to the argument for mainland Southeast Asia as the heartland of rice cultivation.

Linguistic evidence also points to the early origin of cultivated rice in this same Asian area. In several regional languages the general terms for rice and food, or for rice and agriculture, are synonymous. Such is not the case in any other part of the world. Religious writings and practices are also seen as evidence of the longevity of rice as a staple item of the diet. Both Hindu and Buddhist scriptures make frequent reference to rice, and in both religions the grain is used as a major offering to the gods. In contrast, there is no correspondingly early reference to rice in Jewish scriptures of the Old Testament, and no references exist in early Egyptian records.

The earliest and most convincing archeological evidence for domestication of rice in Southeast Asia was discovered by Wilhelm G. Solheim II in 1966. Pottery shards bearing the imprint of both grains and husks of *O. sativa* were discovered at Non Nok Tha in the Korat area of Thailand. These remains have been confirmed by 14C and thermo-luminescence testing as dating from at least 4000 B.C.

This evidence not only pushed back the documented origin of cultivated rice but, when viewed in conjunction with plant remains from 10,000 B.C. discovered in Spirit Cave on the Thailand-Myanmar border, suggests that agriculture itself may be older than was previously thought. *

Excerpted with minor modification from the publication Rice: Then and Now by R.E. Huke and E.H. Huke, International Rice Research Institute, 1990.

Web Resources

Food and Agricultural Organization of the United Nations
http://www.fao.org/

No Potatoes
http://nopotatoes.com/

Southern Crop Producers Assoc.
http://www.southcrop.org/

Texas Department of Agriculture
http://www.agr.state.tx.us/

Insect Image Gallery – Texas A&M Dept. of Entomology
http://insects.tamu.edu/imagegallery/

Resource for All Branches of the Government
http://firstgov.org/

Ohio State University Plant Dictionary
http://www.hcs.ohio-state.edu/plants.html

Measurements, Conversion Units and Calculations
http://www.attra.org/attra-rl/measurements.html

Find Articles
http://www.findarticles.com/

The American Livestock Breeds Conservancy
http://albc-usa.org/

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