At the Texas A&M University AgriLife Research and Extension Center at Beaumont and the David R. Wintermann Rice Research Station at Eagle Lake, research is conducted to sustain and improve the rice industry in Texas. Scientists work to develop better rice varieties and management practices. These efforts are aimed at increasing rice profitability, minimizing risk, and preserving the environment. However, these are not the only objectives of agricultural scientists, particularly off-campus scientists who are located in geographic areas where the crop or commodity of interest is produced. Job descriptions, as formulated by Texas A&M University, set forth the requirements and responsibilities of each scientist. Often these responsibilities include researching specific commodities produced in the area where the scientist is located. So, scientists in the Texas Rice Belt primarily are required to conduct research on rice. However, job responsibilities can and do change as does agriculture, which is an increasingly dynamic and rapidly evolving sector of our society. For instance, we all know urban and suburban communities are expanding, sometimes at the expense of our farming communities. Agricultural scientists in or near metropolitan areas also have an obligation to answer stakeholder questions concerning horticulture, landscaping, recreation, nutrition, and commercial/residential pests. On a more local level, stakeholders in SE Texas have become interested in biofuels production due to our long growing season, abundant rainfall, and relatively high spring/summer temperatures. As a result, scientists in our area are initiating and conducting research on potential biofuel crops such as energy cane and biomass sorghum. But, how do the results of all these research become available to stakeholders - farmers, crop consultants...
From the Editor ... 

From Rice Production to Fire Ants

Welcome to the July issue of *Texas Rice*.

The Texas rice acreage estimates for 2010 are in and stand at 175,858 acres, which is 3.5% above last year’s number, and the highest for the last 5 years. On a much less positive note, September 2010 futures prices for rough rice were $10.08/cwt on July 28, which is $3-4/cwt below average production costs, and $4.02 below the average selling price for all rough rice in the U.S. in 2009 (USDA July 9 “World Agricultural Supply and Demand Estimates”). An increase in carryover stocks and 2010 planted acreage of long grain rice in the U.S. are placing negative pressure on rice prices. The Chicago Mercantile Exchange September 2010 futures prices (previously from the Chicago Board of Trade) for rough rice has steadily dropped from an April figure of $12.91/cwt to a low of $9.68 at the end of June, with a rebound during July to its current value of ca. $10.80. The USDA report projects U.S total rice supplies at a record 309 million cwt, with U.S. production for the 2010 crop projected to reach a record 250 million cwt. From a global perspective, consumption estimates are slightly down, and ending stocks are slightly up and are projected at just under 100 million tons.

On the local front, yields are coming in and they do not look good. There are increased reports of severe panicle blight on a newly released variety, CL111, with a number of growers reporting harvest yields around 6,000 lbs/ac or less. During a meeting with crop consultants and growers in early August, it was obvious that some CL111 fields were suffering severe injury from a number of diseases with panicle blight being the worst, and bacterial panicle blight present in a number of fields (Fig. 1). Tongue in cheek, this resulted in the suggestion that this variety should be renamed 911 or 9/11, to convey the disaster that these low yields represent. 2010 is certainly building up to be a severe disease season, possibly being worse than the 1995 season when panicle blight was bad. I have also heard reports of Cocodrie and Presidio fields showing increased levels of panicle blight, but not nearly as severe as is being observed with CL111.

Several producers are also reporting higher than average incidence of narrow brown leaf spot. The hot and wet growing conditions have undoubtedly contributed to the increased disease problems. Only time will tell how later planted fields and later maturing varieties fair.

Insect pressures are fairly light so far, although grasshoppers have been fairly abundant. However, increased stem borer injury to sorghum and energy cane suggests pressures by these pests are on the upswing.

Fig. 1. The outbreak of bacterial panicle blight of rice in a CL111 field at East Bernard in Wharton County, Texas. (Photo by Shane Zhou) 

Continued on page 8
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.

Simulating the Impact of Fire Ant Parasitoids and Pathogens

Fire Ants and Their Natural Enemies

The red fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae), has become an important urban pest in the southern United States since it was imported into Mobile, Alabama, in the early 20th century. Currently, this invasive exotic ant species occurs in 11 states and in Puerto Rico, covering more than 325 million acres. In Texas, fire ant colonies have been found in 187 counties, with both monogyne (colonies contain only one queen) and polygyne (colonies contain multiple queens) forms observed. Fire ants prefer disturbed habitats with low plant diversity. They interfere with gardening and outdoor activities, occasionally invade human habitats, severely suppress avian wildlife and many naturally occurring ant species, and cause ca. $1.2 billion in annual loss in Texas (Drees and Lard, 2006).

The fire ant populations in the U.S. are much more vigorous, with colony densities ca. 4 times higher, and average colony size ca. 40% larger than those in their original home of South America (Porter et al., 1992; 1997). The flourishing of fire ant populations in the U.S. is mainly due to the absence of its co-existing natural enemies. In contrast, in South America, the fire ants suffer from multiple species of microorganisms, nematodes, parasitic phorid flies, and other parasitoids and predators. Biological control through the introduction of its co-existing natural enemies shows great potential in fire ant management in the U.S. The key biocontrol organisms that have been established or have been proposed for release in Texas include several species of phorid flies (*Pseudacteon* spp.) and microsporidian protists (*Kneallhazia*, formerly *Thelohania*, and *Vairimorpha* spp.) (Fig. 1).

Phorid flies are solitary parasitoids of fire ants. Each female attacks ca. 100 to 200 fire ants by injecting an egg through the intersegmental membrane of each ant. Up to 2 to 3% of worker ants will be parasitized when they encounter phorid flies (Morrison and Porter, 2005; Calcaterra et al., 2008). Although the parasitization-induced mortality is not high enough to greatly reduce the fire ant population size, phorid flies also reduce foraging efficiency of ant workers (Feener and Brown, 1992; Orr et al., 1995) and modify their nest defensive behavior (LeBrun et al., 2009). These effects are considered to be important in suppressing fire ant population growth, and will be more important when multiple *Pseudacteon* species co-occur. In natural systems, 8 to 10 phorid fly species might be encountered at some sites (Calcaterra et al., 2008). Three *Pseudacteon* species have been introduced and established in Texas (Gilbert et al., 2008).

![Fig. 1. Natural enemies of fire ants: A phorid fly attacking a fire ant worker (left photo); and microsporidian protists (right photo). (Pictures provided by L. Gilbert, S.D. Porter and R. Plowes)](image-url)
Microsporidian infection has a strong negative impact on ant colony growth and can be an important mortality factor in ant colonies. Briano and Williams (1997) reported that 92% of microsporidian infected lab ant colonies die within 3 months. Between the two microsporidian groups, *Kneallhazia* is more abundant than *Vairimorpha*, and is already widespread in Texas. Although the source of the *Kneallhazia* infection in Texas is uncertain (Mitchell et al., 2006), it is clear that *Kneallhazia* can be easily transmitted among fire ant colonies through a series of interactions, including brood raiding, queen adoption, and worker exchanging. In Argentina, both monogyne and polygyne social forms may have similar rates of infection (Valles and Briano, 2004), but monogyne colonies typically have low rates of infection in the U.S. (Oi et al., 2004). It has been recently proposed that phorid flies may act as vectors for microsporidian and viruses (Valles and Porter, 2007; Oi et al., 2009). This interaction and the outcome on social form infections and mortality would be an important hypothesis to test using a population model.

Simulating the Pest-Natural Enemy Relationship using a Population Model

An integrated fire ant simulation and analysis system is being developed by our team, based on up-to-date knowledge of biology, genetics, and ecology of the fire ant and its natural enemies. This system will link individual colony growth to spatially referenced climate, soil, and resource data, reflecting the range of population densities and phorid fly and microsporidian levels in various habitats of Texas. This further allows for the evaluation of potential and ongoing fire ant control strategies, taking into account local prevailing climatic, soil, and biotic conditions.

As part of this effort, we are developing a spatially-explicit model of monogyne and polygyne fire ants, and associated phorid and microsporidian populations. This model will be used to simulate within-colony and between-colony dynamics of several population variables (birth, aging, growth, intrinsic mortality, and extrinsic mortality) for a wide-range of environmental conditions for accuracy. Intrinsic mortality refers to death associated with normal aging, while extrinsic mortality refers to death caused by low and high temperatures, excess rainfall, and death caused by predators, parasitoids, and pathogens. The model will include metabolic costs associated with fire ant respiration and growth, with movement kinetics incorporated and focusing on the rate and scale of movement of brood, workers, alates, queens, and food from one colony to another.

Fire ant colony dynamics will be simulated based on resource availability, competition, local environment, and its natural enemy abundance. The major processes to be used here are: general developmental biology, colony forming behavior, queen regulation and reproduction behavior as a function of food availability, resource allocation and worker size distributions, foraging behavior and colony energetics, colony competition and nestmate recognition, resource sharing between colonies, colony relocation behavior, biotic and abiotic mortality, temperature activity thresholds, winter hardiness, chemical, mechanical, and biological control efficacy, and landscape patterns of density and social form (Fig. 2).

A distributed-maturation method will be used to simulate the population dynamics (growth, death, and reproduction) of phorid flies and microsporidian pathogens. Basically, this method takes into account that individual ants born the same day do not develop at the exact same rate. Some that are provided to a greater amount of food or that are reared slight closer to the soil surface as immatures will develop at a different rate than those that started developed the same day but experienced a different biotic and abiotic environment. Major factors that will be incorporated in simulating parasitization include temperature, fire ant colony and worker density, and fire ant population spatial distribution. A parasitoid-prey response function model, referred to as the Frazer-Gilbert equation, will be used to estimate the parasitization rate as affected by host density, natural enemy density, temperature, and host preference (Frazer and Gilbert, 1976). The impact of phorid flies will be estimated based on its population establishment and spread to different parts of Texas and elsewhere in the U.S., community dynamics, habitat associations, partitioning of host resources, fire ant worker mortality
Fire Ants ...

through parasitoid oviposition, reduced fire ant foraging efficiency, and reduced nest defensive behavior. Microsporidian dynamics will be simulated in terms of transmission between colonies as a result of brood raiding, adoption of queens or exchange of workers and epidemic development within a colony. The impacts of microsporidian pathogens will be based on laboratory and field infection and mortality rates, seasonal dynamics and distributions, social form prevalence, and transmission pathways.

The integrated fire ant simulation and analysis system will 1) track the development of multiple colonies in different stages of development, and link their growth to climate and resource data reflecting the range of conditions found in Texas, 2) simulate the interactions between fire ants and its parasitic phorid flies and microsporidian pathogens, and 3) identify combinations of biological and pesticide management options that can enhance fire ant population suppression, thereby reducing property damage, stinging incidences, and wildlife destruction by fire ants.

For more information, please consult the following references:


Mitchell, F.L., K. Snowden, J.R. Fuxa, and S.B.
Fire Ants ...


* Article by Jiale Lv, Yubin Yang, Lloyd Ted Wilson, Robert Plowes, and Lawrence Gilbert. Drs. Lv, Yang, and Wilson work at the Texas A&M AgriLife Research and Extension Center at Beaumont, TX, while Drs. Plowes and Gilbert work at the University of Texas at Austin, TX.

Extension and Famers ...

and other vested parties, who depend on agriculture for jobs and rural/urban community sustainability? This is where “the rubber meets the road”, where transfer of knowledge from the lab bench to stakeholders is crucial to helping clientele, the taxpayers of Texas!

University and USDA/ARS scientists are required to publish results in scholarly journals and to deliver presentations at scientific meetings. However, these communication vehicles generally are not suitable for stakeholder use. The language and visuals are too technical and arcane for the average stakeholder’s consumption. However, the federal government back in 1914 had the foresight and wisdom to make sure the results of agricultural research are made available to stakeholders through the Smith-Lever Act, which established the Federal-State Extension Service. This agency is responsible for “extending” or communicating research results to clientele. In other words, extension scientists, including county extension agents and specialists, serve as liaison between researchers and stakeholders. Extension scientists consult with research scientists, take their results and extend them to clientele. Frequently, research and extension scientists collaborate and cooperate on research, so extension scientists, in reality, are very involved in the investigations of their research counterparts and vice versa. This melding of responsibilities can confuse clientele who frequently do not perceive a difference between the functions of research and extension scientists. As long as the information is delivered in an effective manner, the clientele are satisfied. Thus, a seamless stream of information generated by research and delivered by extension is the goal of our scientific agricultural community.

* Continued on the next page
The actual communication vehicles for extension scientists are varied and becoming increasingly sophisticated which is a reflection of major changes in our society, in large part brought on by the electronic age. When I started my career at the Beaumont Center in 1982, scientists communicated with stakeholders primarily via 1-on-1 conversations, telephone calls, meetings, and hard copy publications. No farmer had email or internet capabilities. Now, the vast majority of farmers and crop consultants are computer-literate, which means they can communicate and obtain answers to questions in a matter of seconds or minutes. Extension, however, is not a 1-way communication path. Scientists must learn from the clientele the ability to identify and prioritize researchable problems and solve them utilizing limited resources and time available. Hence, the communication processes between scientists and stakeholders must be 2-way. Learning from each other is key to the relationship and this will always be there, regardless of the level of communication sophistication. So, the following are some of the current methods of extending information to stakeholders:

1) **One-on-One Conversations.** These conversations are crucial in developing trust and rapport, which is especially important for new scientists who need guidance to effectively accomplish the mission. Furthermore, inspecting fields with stakeholders, “house calls”, is essential for the scientist to grasp the nature and severity of a particular problem. Some extension scientists have “verification fields”, which are inspected regularly and information gleaned for these fields is conveyed to other clientele.

2) **Meetings with Groups of Clientele.** These are crucial and are usually termed extension meetings that can be held off-site, typically in an extension conference auditorium, or on-site (“turn-row”). Results of research are presented in a relatively informal atmosphere to encourage questions and discussion. Often handouts are passed out and PowerPoint presentations are delivered. The advent of PowerPoint capability has greatly simplified and improved this type of transfer of knowledge to clientele.

3) **Long-Distance Video and Conference Calls.** These can save vast amounts of travel money. I now frequently participate in conference calls involving clientele and scientists from other states. This is an excellent way to network and accomplish regional and national goals.

4) **Extension and Research Publications.** These can be delivered electronically, such as the Texas Rice newsletter (available online at [http://beaumont.tamu.edu/eLibrary/eLibrary_default.htm](http://beaumont.tamu.edu/eLibrary/eLibrary_default.htm)) and reach a vast audience, or can be published as hard copies such as the Texas Rice Production Guidelines (which is also published electronically and available online at [http://beaumont.tamu.edu/eLibrary/ExtensionBulletins_default.htm](http://beaumont.tamu.edu/eLibrary/ExtensionBulletins_default.htm)). Both delivery methods are very useful. Many farmers like to have a hard copy of a particular extension bulletin to carry in their pick-ups for easy reference.

5) **Field Days.** These events are opportunities to show research plots to clientele and present information on current research (Fig. 1).

6) **Research Review Meetings with Check-off Funding Boards.** For instance, rice check-off monies are distributed to research projects after an extensive review process by the Texas Rice Research Foundation Board. Scientists present findings and proposals to the board members composed of rice farmers, their industry advisory panel comprised of crop consultants, and their research advisory group comprised of one or more scientists. This process helps insure research is relevant to producer needs and provides another opportunity to interact with clientele.

To effectively serve clientele, scientists must use all the above communication techniques. For the young scientist, developing 1-on-1 relationships with clientele is most important. This “hands-on” approach engenders trust and open communication. No matter the advancements in communication technology, building relationships with stakeholders is the bedrock of effectively serving clientele groups. Clearly, these relationships must be based on frequent 2-way flows of information among scientists and stakeholders. So, you might say we are all members of the Texas rice industry family, which only runs smoothly when all members are working together. Just like any family,
we have problems, but let’s continue to learn from one another so we can solve them quickly to move on to the next opportunity and challenge!!! *

* Article by Mo Way, Texas A&M System AgriLife Research and Extension Center at Beaumont, TX.

For areas of the Texas ricebelt that experience heavy Mexican rice borer or sugarcane borer population pressures, monitor your fields carefully and apply stem borer insecticides when needed.

Late June and early July marked the Eagle Lake and Beaumont field days, respectively. Turnout was strong at Eagle Lake, but due to the weather, turnout was weak at Beaumont. 2010 marks the first time in my 12 years of MC’ing the Beaumont field day that we had to cancel the Beaumont Center field tour, with heavy rains the previous day closing the field roads. We made the best of a difficult situation with the field tour speakers providing PowerPoint presentations of their field research in the Center’s auditorium.

A highlight of the morning program was the presentations by our keynote speakers. The take home message of Dennis DeLaughter’s presentation was the need for rice producers to have a plan for how they market their rice. Eric Webster followed up with a very good talk on weed management and emphasized the importance of proper use of Clearfield varietal management and the need to avoid repeatedly growing Clearfield varieties in the same fields. Rick Norman gave a great talk on a new method of sampling soil to determine the amount of nitrogen fertilizer to apply to individual fields. This method has the potential to revolutionize nitrogen fertilization and allow producers to optimize their yields. It is based on measuring available soil nitrogen and an analysis of the amount of fertilizer required to achieve 90%, 95%, and 100% of maximum crop yield. The beauty of the soil sampling method that Rick and colleagues have developed is that it places fertilizer management on a very firm quantitative foundation and accurately predicts yield response as a function of residual nitrogen in the soil and the amount of nitrogen applied.

The lead article in this issue of Texas Rice focuses on the importance of the partnership between research and extension and our role in serving the needs of agriculture. The Land Grant University System, which Texas A&M University is a part, was created in 1862 when President Lincoln signed into law the first Morrill Act. The Morrill Act authorized states to select federal lands for sale to fund creation of what we now refer to as the Land Grant University System. Fifteen years prior to the first Morrill Act, a movement was underway within the U.S. to create agricultural colleges, with a major goal being to provide U.S. farmers with the latest and best methods for producing crops. The Morrill Act was first proposed in 1857 by Justin Smith Morrill, a Congressman from Vermont. Although the act was passed by Congress in 1859, it was vetoed by President Buchanan. The act was resubmitted in 1861 and passed due to a number of dissenting states having temporarily withdrawn from the Union as part of the War Between the States.

In 1914, the Smith-Lever Act became law and provided for the creation of cooperative extension services, which was specifically linked to the Land Grant Universities. Extension agents were located in almost every county within the U.S. Cooperative Extension has through the years helped to maintain the bridge between our agricultural clientele and the scientists who help to develop improved management solutions. Since that day forward, the partnership between Land Grant University research and extension has been an important part of what we do for agriculture.

The second article in this issue of Texas Rice describes research at the Beaumont Center that is being conducted on the imported fire ant. The fire ant was accidentally brought into the U.S., probably from soil used as ballast in ships from South America. Once it arrived, the fire ant rapidly spread. This species is incredibly aggressive and has reshaped much of the animal life found in Texas and several other states where it is now present. From ground and tree dwelling birds, to almost anything it its path, the fire ant has a major impact. About the only good thing that can be attributed to fire ants is it causes a major reduction in densities of ticks.

The first ant article provides information on research being conducted to predict the impact of Continued on the next page
insecticides, parasitoids, and pathogens that are being introduced to help control fire ant populations in different areas of Texas. Hopefully, these releases will contribute to reducing fire ant mounds to the level that occurs in their native areas of South America, which is roughly about 1/4th of what it is in the U.S.

Please keep on sending us your suggestions.

Rice Crop Update

As of July 15, 2010, the main crop rice acreage in Texas that was at the panicle differentiation (PD) stage was 84.3%. In comparison, 95.3, 94.9, 93.1, and 95.4% were at PD by July 15 in 2006, 2007, 2008, and 2009, respectively. About 62.6% of the main crop rice acreage in Texas was at the heading stage by July 15, 2010. In comparison, 86.0, 72.4, 65.1, and 79.1% were at heading by July 15 in 2006, 2007, 2008, and 2009, respectively. The figures on the right show the comparison in rice acreage percentage that were at PD and that were at heading by July 15 in 2006 to 2010.

Weekly updates on the acreage and percentage of rice grown in Texas that are in the various growth stages are available at our website at http://beaumont.tamu.edu/CropSurvey/CropSurveyReport.aspx.

Texas Rice Acreage at Panicle Differentiation as of July 15

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>95.3</td>
</tr>
<tr>
<td>2007</td>
<td>94.4</td>
</tr>
<tr>
<td>2008</td>
<td>93.1</td>
</tr>
<tr>
<td>2009</td>
<td>95.4</td>
</tr>
<tr>
<td>2010</td>
<td>84.3</td>
</tr>
</tbody>
</table>

Texas Rice Acreage at Heading as of July 15

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>86.0</td>
</tr>
<tr>
<td>2007</td>
<td>72.4</td>
</tr>
<tr>
<td>2008</td>
<td>65.1</td>
</tr>
<tr>
<td>2009</td>
<td>79.1</td>
</tr>
<tr>
<td>2010</td>
<td>62.6</td>
</tr>
</tbody>
</table>