On-farm varietal evaluation is a vital step in the variety development process for many crops, including rice. Conducting variety trials under producers’ field conditions helps identify the released varieties or hybrids, as well as elite experimental breeding lines, that are best suited to specific growing environments, including niche markets. It also helps determine which specific entries are widely adapted to and/or have consistent performance across varying growing conditions. This information not only helps in future breeding, but also is important for proper deployment of released varieties.

It is typical in on-farm variety trials for standard varieties and hybrids, new releases, and elite experimental lines to be evaluated in the population of environments to which they are targeted for release. Based on the performance of elite breeding lines in these multiple-environment tests, the most promising are selected for possible release as new varieties. The information collected on these lines include yield and milling performance, insect and disease susceptibility, tolerance to environmental stresses, and vigor and lodging scores. However, apart from using the data generated for line advancement decisions, they could also be used to recycle yet-imperfect lines back into the hybridization program.

With the inclusion of released varieties from Mississippi and the U.S. Mid south as entries in the on-farm trials, the testing process also helps local rice producers determine the most suitable released varieties to plant on their respective farms based on the test locations. By placing these trials at multiple key locations throughout the Mississippi Delta, varieties, hybrids, and elite lines are exposed to the prevalent growing conditions and practices that are commonly used in commercial production in Mississippi. Many of these growing conditions and management practices cannot be reproduced at the Stoneville Experiment Station, thus giving great value to the on-farm evaluations from the research and development perspective.

In return, growers are afforded the opportunity to evaluate side-by-side the current varieties and hybrids in commercial circulation, under their own management conditions. Ultimately, this process helps them decide which variety or hybrid to use on their farms the following year, and it allows them to place advanced seed orders for the chosen varieties accordingly with the seed suppliers for the Mississippi rice industry.

Variety selection is one of the most important decisions a grower makes in crop-production planning. Growers should attempt to select varieties that offer the best combination of yield and quality factors, while also considering the variety’s tolerance or susceptibility to both biological and environmental factors that could limit yield potential. As grain quality is becoming more important for improving U.S. rice global competitiveness, producers will benefit from having grain-quality data for the commercial varieties evaluated in the variety trials. Millers, consolidators, and traders may also use this data in implementing strategies for “identity-preserved” varieties, which are gaining importance for improving overall grain quality.

Rice researchers and Extension specialists, on the other hand, can use the variety trials as an educational platform for demonstrating the merits of on-farm evaluation to other scientific or technical staff, growers, private consultants, rice industry personnel, students, policy makers, and the general public. Through these trials, interested parties are afforded a “first look” at new or potential releases not only from Mississippi State University, but also from other participating rice-breeding programs, including from the private industry.

For 2017, the Rice On-Farm Variety Trials consisted of 34 entries, including five hybrids (two Clearfield® and three conventional types), 12 Clearfield® purelines (five released varieties and seven elite experimental lines) and 17 conventional purelines (11 released varieties and six elite experimental lines). All hybrids were provided by RiceTec, all Clearfield® purelines by HorizonAg, and all conventional pureline released varieties from the public breeding programs of Mississippi (three), Arkansas (five), Louisiana (two), and Texas (one).

Trials were conducted in seven locations from north to south of the Mississippi Delta, in Tunica, Clarksdale, Ruleville, Drew (Brooks), Choctaw, Stoneville, and Hollandale (Figure 1). Individual plots consisted of eight drilled rows that were 15 feet in length and spaced 8 inches apart. Varieties and experimental lines were
planted at a seeding rate of 85 pounds of seed per acre, while the hybrids were planted at 25 pounds of seed per acre. Seeds were mechanically drilled approximately 1.25 inches deep into stale seedbeds at all locations. All entries were replicated three times at each location using a randomized complete block experimental design.

Crop management practices for each location, as well as the stresses encountered, are presented in Tables 3-9. Readers who may be less familiar with pesticide formulations and application rates may wish to refer to pesticide product label information available on the Internet or to the 2017 Weed Control Guidelines for Mississippi available in print and online (MSU Extension Service Publication 1532, http://msuces.msstate.edu/pubs/publications/p1532.pdf).

Agronomic and crop phenology data were collected at appropriate times during the growing season. Lodging ratings were obtained on a plot-by-plot basis. The entire plot was harvested with a small-plot combine equipped with a computerized weighing system and moisture meter. Due to differences in maturity, the majority of the entries at each location were required to have achieved the appropriate harvest moisture level prior to the test being harvested. Average harvest grain moisture levels for each entry are reported in Tables 3-9. Subsamples of each entry were collected at harvest, and these were used for measuring milling-related traits, chalkiness, bushel weight, and 1,000-seed-weight parameters.

For yield, previous replicated research has shown that the border effect common in small-plot research could result in increases in grain yield estimates of 10% for inbred varieties and 15% for hybrids. Therefore, the plot yields reported for the test entries should be compared in a relative manner rather than just through the absolute values for the reported yield potential.

Analysis of variance procedures were conducted for all relevant data gathered from the trials using SAS Version 9.4 statistical software. The Least Significant Difference (LSD) test at the 5% significance level may be used to determine significant differences between entries. If the value of the yield difference between any two trial entries at a location, as computed from the yields reported in Tables 3-9, is greater than the LSD value for that particular location, the entries are deemed to be statistically different from each other.

In addition, a coefficient of variation (CV) was calculated for each test. This measure is an indication of the variability or “noise” in the trial, and thus the level of precision of each test. Lower CV values indicate greater reliability of the test. CV values of 10% or less are generally considered to be optimum for plant breeding trials, and CV values above 25% are considered unacceptable. The LSD and CV values for yield in these tests are reported in the footnotes of Tables 3-9 and are included for the other measured variables in Table 11.

RESULTS

To assist Mississippi rice producers in their variety selection process for 2018, preliminary results of the 2017 rice variety trials were immediately processed and made available online as early as October 7, 2017, via the Mississippi Agricultural and Forestry Experiment Station Variety Trials (http://mafes.msstate.edu/variety-trials/includes/crops/rice.asp) and the Mississippi Crop Situation (http://www.mississippi-crops.com/2017/10/07/2017-mississippi-rice-variety-trial-data-preliminary-results/) websites. Hard copies of the preliminary results were also distributed to rice producers attending the Delta Rice Producers Meeting in Cleveland, Mississippi, on November 14, 2017.

Complete details on the performance of each entry at each of the seven test locations are presented in Tables 3-9. As in 2016, planting times during 2017 spanned a narrow window of only 3 weeks (March 22 to April 13). The Stoneville trial was the only trial planted on a branch experiment station. In general, plant stands were excellent, with uniform emergence and optimum plant density for all the locations. Among the diseases reported to have occurred at some point in the growing season were leaf blast, panicle blast, and sheath blight. However, none of these factors occurred to a level that was economically damaging, or that completely wiped out any test entry.

Lodging was reported in four of the seven locations, with the most lodging occurring in Hollandale (19 entries) and Drew (10 entries). Only one entry each lodged in Tunica and Choctaw. On the other hand, as in the previous year, significant bird damage occurred in Stoneville.

The average rice yield across entries and locations for the 2017 trials was 228 bushels per acre, up 23 bushels per acre from the 2016 average of 205 bushels and 14 bushels more than the 214-bushel running 10-year variety trial overall average (2007–16). However, this amount was still 14 bushels less than the highest recorded average trial yield in 2014. This yield trend in the trials closely mirrors Mississippi statewide yield trends based on the NASS...