New Rices; New Practices

by JENKIN W. JONES

A GOOD many thing have happened to rice in the past few years. New and better varieties have replaced the old stand-bys on four-fifths of the million-odd acres used to grow rice in the United States. Consumers get a tastier grain. Growers have received higher prices. Yields have been increased or fully maintained. Five improved varieties grown on nearly half of the southern rice acreage in 1945 yielded about 13 percent more than the older varieties, and added 10 million dollars to farmers' incomes.

The higher production helped out materially in the war. Normally, Burma, French Indochina, and Siam supply 90 percent of the rice that enters international trade. When Japan took those countries, a serious food problem arose for several Allied countries that depend upon imports of rice. To help meet the critical situation, production in the Western Hemisphere was expanded from a prewar average of 153 million bushels to more than 225 million in 1945. The largest increases were in Brazil and the United States.

The United States grew an average of 46.6 million bushels of rice on 950,000 acres, or 49 bushels an acre, in the 1930's. In 1945, the production was more than 70 million bushels on 1½ million acres—an all-time high. But because of continuous cropping of old lands and the use of lands less well suited to rice, our average yield went down 2 bushels an acre during the war.

Rice cannot be grown under nearly so many conditions as other cereal crops. It grows well in sections of Arkansas, California, Louisiana, and Texas where other small grains do not do so well because of soil types, excessive moisture, and high temperatures. Rice is the main cash crop of many counties of the four States.

In each of the States, extensive research to breed better types is carried on. The rice breeder's ideals are kinds that mature early, late, and in between, have stiff straw, are healthy, taste good, yield and mill well, and are suited to various climates and methods of culture.

The most serious fungus diseases of rice in the South (but not in California) are the brown, narrow brown, and blast leaf spot diseases and stem rot. White tip, a physiological disease, is another enemy. In severely infected fields, they all cut yields and lower milling quality. The best controls, as for most other cereal diseases, are the use of resistant varieties.

Before 1912, Shinriki, a short-grain rice, and the long-grain Honduras were the main varieties in the South. Shinriki was introduced by the Department from Japan in 1902. Honduras was introduced by commercial agencies in 1890. Shinriki is late-maturing, short, and stiff-strawed. It tillers freely and produced high yields of good milling quality. Honduras, which matures early, produced well on virgin lands.

Shinriki and Honduras were largely replaced by the more productive Blue Rose and Early Prolific, which have a medium grain, and the long-grain Edith and Lady Wright, all of which S. L. Wright, of Crowley, La., distributed. But they succumb to leaf spot diseases and white tip. Healthier replacements in the South include the long-grain Rexoro, Fortuna, Nira, Texas Patna, Bluebonnet, and Prelude, and the medium-grain Zenith, Blue Rose 41, and Arkrose. Federal and State agencies cooperated in developing and distributing them.

In California, the late, short-grain Wataribune, popular from 1912 to 1920, gave way to the earlier-maturing Colusa and Caloro, short-grain varieties developed and distributed by the Biggs Rice Field Station. They were grown on about 95 percent of the California acreage in 1945.

Of the new kinds, Rexoro and Texas Patna were grown on a fourth of the total rice acreage in 1946. Fortuna and Arkansas Fortuna were grown on 9 percent, Prelude on 5 percent, and Nira and Bluebonnet on about 6 percent. Varieties with smooth hulls are preferred to those with rough hulls for harvesting by the combine-drier method because the smooth-hulled types disperse much less dust during drying. Rexoro, Texas Patna, Nira, and Bluebonnet all have smooth hulls.

Rexoro matures late and has stiff straw. It has long, slender grain, and yields and mills well for a rice of that type. It was selected at the Rice Experiment Station at Crowley from a variety introduced by the Department of Agriculture from the Philippines. Rexoro resists white tip and several forms of narrow brown leaf spot, and is of good table quality. Because of its late maturity, it is grown only in Louisiana and Texas, where the growing season is long.

Fortuna matures late and has stiff straw. It yields well in Arkansas, Louisiana, and Texas. It was selected at Crowley from seed brought by the Department from Formosa. Fortuna resists white tip and several forms of the narrow brown leaf spot. Arkansas Fortuna, selected at the Rice Branch Experiment Station at Stuttgart, Ark., is from 7 to 10 days earlier than Fortuna. It is better adapted to the shorter seasons in Arkansas. Fortuna and Arkansas Fortuna thresh easily, a characteristic appreciated by growers who harvest with combines.

Texas Patna was selected at the Texas Substation No. 4 at Beaumont from the cross Rexoro × C. I. 5094—"C. I." referring to the accession number of the Division of Cereal Crops and Diseases. It is a long, slender grain variety, similar to Rexoro in disease resistance, yield, and table quality, but it matures 10 days earlier. Texas Patna is inclined to lodge more readily than Rexoro on rich land. Its earlier maturity, compared to Rexoro, appeals to growers, and the acreage sown to Texas Patna has increased in Louisiana and Texas.

Nira is late maturing and has long, slender grain. It yields and mills reasonably well. It was selected at Crowley from a variety brought from the Philippines. Nira is resistant to white tip and narrow brown leaf spot, and is of good table quality. It is the tallest variety grown commercially in the South, and although it does not tiller freely, it usually yields well in the South on old rice lands.

Bluebonnet, a midseason type with long, slender grain, was selected from the cross Rexoro × Fortuna at Beaumont. Bluebonnet tillers freely, matures quickly and evenly, threshes easily, and yields well. It resembles Rexoro and Texas Patna in table quality and in resistance to white tip and to narrow brown leaf spot, but it matures much earlier. Bluebonnet is well suited for harvesting by the combine-drier method.

Prelude is an early-maturing variety selected at Stuttgart from the cross Improved Blue Rose × Fortuna. It grows vigorously, has stiff straw, and withstands white tip and narrow brown leaf spot better than the older Edith and Lady Wright. Prelude produces much higher yields in Arkansas than Lady Wright, and has much better table quality.

Of the improved medium-grain varieties, Zenith was grown on 16 percent of the total rice acreage in 1946. Blue Rose 41, Arkrose, and Blue Rose were grown on 12 percent of the acreage. Calady 40 occupied a small part of the acreage in California.

Zenith, selected from Blue Rose, was tested and increased at Stuttgart. It is more uniform in heading and in ripening, and also is more resistant than Early Prolific and Blue Rose to white tip, the narrow brown leaf spot, and blast diseases. The kernels of Zenith are smaller, clearer, and of better quality than those of Early Prolific.

Blue Rose 41 was selected at Crowley from Blue Rose. It resists one form of the narrow brown leaf spot disease and white tip, and resembles its parent in growth habit, grain type, maturity, and milling and table qualities. Its resistance to diseases, however, makes it preferable to Blue Rose in the South.

Arkrose, a late-maturing variety, was produced from the cross Caloro × Blue Rose at Stuttgart. It is prey to the narrow brown leaf spot diseases and white tip, which do not, however, reduce its yield or affect its quality as much as they do that of Blue Rose. In grain shape and quality, Arkrose is like Blue Rose, but in Arkansas it produces higher yields.

Calady 40 was selected from the cross Caloro × Lady Wright at Biggs. A late-maturing, high-yielding variety, Calady 40 has stiff straw, a rather compact head, a clear, medium grain, and good milling quality. In California it yields as well as Caloro and is of better quality.

Plant breeders think the improved varieties described are pretty good, all factors considered. But that does not mean the breeder's job is completed, for new diseases or new races of old diseases appear unexpectedly. Methods of tillage and processing change, and changes in market demands create new problems.

New Production Methods

Either application of fertilizer or additions of soil organic matter can make rice grow better. A combination of the two makes rice try to jump out of its roots.

The reason is that rice is mostly grown on poorly drained land where other cash crops give mediocre yields; consequently, it is almost impossible to use the rotations that are so successful elsewhere. The virgin soils of our rice-growing regions contain fair amounts of organic matter, but it decomposes rapidly in the warm, humid climate that rice likes. Farmers generally agree that the humus must be restored after a few years of growing rice. But how? Heavy soils deficient in organic matter are usually compact, rather impervious to water, and hard to work. Rice grown on them, moreover, often fails to respond well to commercial fertilizers or to rotations with legumes.

An attempt to correct the shortcoming is being made in Louisiana and Texas, where more than 950,000 acres of rice were grown on the coastal prairies in 1945 and where some farmers grow only rice. Other growers have both rice and beef cattle, a logical combination that controls weeds, maintains soil productivity, and provides two sources of cash income. They plant rice usually in alternate years, or once in 3 years, on land that otherwise is fallowed or left in stubble pasture. The stubble comprises volunteer red rice, native grasses, some legumes, and weeds—not very good grazing for cattle during late winter and early spring.

Few farmers use improved pastures. They, as we shall see, can solve the problem, although each farmer must decide for himself whether it will pay him.

Yields of rice in coastal Louisiana average 40 to 50 bushels an acre. At the Rice Experiment Station at Crowley, La., the average in 2-year rotations ranged from 47 bushels, following red clover, to 35 bushels an acre, following cotton which had been dusted until residual arsenic was in the soil. The average following the usual practice of alternate pasture was 45 bushels. Similar yields followed Italian ryegrass, fallow, soybeans and bur-clover, and crotalaria.

Notable results have been had in experiments with improved pastures at the station at Crowley. A mixture of Dallis grass, lespedeza, white clover, and California and southern bur-clover are sown; volunteer native grasses are allowed to stand 4 years before the land is plowed up and planted to rice. A complete fertilizer is applied at the rate of 400 pounds an acre every other year. The pasture is clipped now and then during the growing season, but the clippings are not removed. When rice is planted, 400 pounds an acre of a complete fertilizer that contains phosphorus from three sources are applied. The average yield on unfertilized plots is 57 bushels. The average on the fertilized plots, following improved pasture, is 72 bushels.

Thus, the usual system of rice and native pasture gives an average yield of about 45 bushels. Fertilizers increase that figure 5 bushels; 4 years of improved pasture between rice crops raises the yield about 12 bushels more, and fertilization, in addition to improved pasture, lifts the yield about 27 bushels. Besides, on such pastures, organic residues are returned to the soil and cause the rice to respond better to fertilizers.

Agronomists at the Louisiana Agricultural Experiment Station learned from experiments that the production of beef per acre is two to four times as much on improved fertilized pastures as on unfertilized native pastures. Improved pastures also have at least 50 percent higher carrying capacity and supply good grazing for a longer period each year. The calf crop on improved pastures is said to be a fifth greater than on ordinary pasture. Obviously, then, a more extensive use of improved pastures for grazing, with rice, promises well for the Gulf Coast section.

Further evidence on the benefits to the rice crop from additional organic matter is given in the larger yields obtained from the application of straw in preparation for a succeeding rice crop. At Crowley, the average yield of unfertilized rice, grown in alternate years, was 47 bushels an acre. Plots on which three tons of straw were turned under in the fall yielded 52 bushels an acre; plots on which three tons of straw were turned under, plus 400 pounds of complete fertilizer (half applied with the straw and half at seeding time), gave a yield of 62 bushels. Thus, application of straw alone in alternate years increased the yield 5 bushels. Fertilizer alone usually increased the yield by the same amount. The application of both straw and fertilizer increased the yield 15 bushels, or 32 percent. The increases for the same treatments on land cropped each year, with a yield of 38 bushels for unfertilized rice, were again 5 bushels for straw alone, and 15 bushels an acre for straw plus fertilizer.

The combine-drier method of harvesting, which is replacing the binder-thresher, leaves the straw on the fields. This is desirable, but straw stacks for winter roughage are not available to cattle grazing on stubble pastures. Thus, on combined stubble fields it is advisable to provide better winter pastures and some hay for supplemental winter feeding.

Average rice yields in California are relatively high, but on the older rice lands ammonium sulfate increases yields. Recent studies indicate, however, that the time is approaching when it probably will be necessary to use both phosphates and nitrogenous fertilizers to maintain yields.

Fertilizer experiments at the Biggs Rice Field Station in California showed that rice responds well to applications of nitrogen. Ammonium sulfate was the most profitable nitrogen carrier tested. At first, 100 pounds an acre of ammonium sulfate appeared to give the most profitable returns. Later, rates of 150 to 200 pounds were found to be more profitable. Increases in the yield of Caloro rice from the application of ammonium sulfate have averaged about 22 bushels for the 150-pound rate, bringing the average yield up to 100 bushels an acre. The early-maturing Colusa variety gave an average increase of 30 bushels an acre for the 200-pound rate, or from 64 to 94 bushels an acre, and gave a net return of about $30 an acre on the fertilizer applied. In more recent experiments on less fertile land, the average increment has been about 26 bushels for the 200-pound rate and 42 bushels for the 350-pound rate.

A vital point that the farmer weighs carefully is the relative cost of developing improved pastures and the value of the increased yields of rice and beef. When the costs of pasture development and fertilizers are high and the prices of rice and beef are low, the extra yields of rice and beef may not result in a profit. But high prices for these products and relatively low costs of improved pastures should make the practices pay. Because costs and prices vary from year to year, it usually is good practice to apply fertilizers liberally when they are relatively cheap and rice and beef cattle high.

THE AUTHOR

Since 1931 Jenkin W. Jones has been in charge of rice investigations in the Bureau of Plant Industry, Soils, and Agricultural Engineering. From 1912 to 1931 he was successively the superintendent of the Cheyenne Field Station at Archer, Wyo., superintendent of the Nephi Substation in Utah, and then in charge of the Biggs Rice Field Station in California. In 1925 he went to Japan, Korea, China, Java, and the Philippines to collect rice varieties and study methods of production and improvement. Mr. Jones is the author of various scientific publications on dry-land crops and rice.

FOR FURTHER READING

Davis, Loren L., and Jones, Jenkin W.: *Fertilizer Experiments with Rice in California,* U. S. D. A. Technical Bulletin 718, 1940.

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