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Rice Varieties and Their Comparative Yields In the United States[1]

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INTRODUCTION

Rice and wheat are the most important of the world's small-grain crops. Rice is grown largely for food, but the byproducts obtained in milling and also the straw are used in various ways. The principal rice-producing countries of the world are in Asia and the adjacent islands. In these tropical and semitropical regions rice is the most dependable and productive cereal crop that can be grown. For the crop year 1938–39 the estimated world production of rice, including China, was 7,321,000,000 bushels. Of this amount the United States produced 52,506,000 bushels, or about 0.72 percent.

[1] Submitted for publication March 1941. The yields reported in this bulletin were obtained in cooperation with the State agricultural experiment stations of Arkansas, Louisiana, Texas, California, and Missouri. The varieties were grown at the Rice Branch Experiment Station, Stuttgart, Ark., by Martin Nelson, L. C. Carter, and C. Roy Adair; at the Rice Experiment Station, Crowley, La., by J. Mitchell Jenkins; at the Texas Substation No. 4, Beaumont, Tex., by R. H. Wyche and H. M. Beachell; at the Biggs Rice Field Station, Biggs, Calif., by Loren L. Davis and Jenkin W. Jones; and on an experimental field near Elsberry, Mo., by B. M. King.

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Rice production in the United States developed from a seeding made at Charleston, S. C., about 1685. Later the crop spread to North Carolina and Georgia, and for over 200 years, from about 1685 to 1888, the rice crop of the United States was largely confined to these South Atlantic States. Rice production then moved westward, and very little rice is now grown in the Southeast. The crop is now grown extensively in Louisiana, Texas, Arkansas, and California (fig. 1).

Rice was introduced into Louisiana about 1718 but did not become important there until 1887, when it was determined that the crop could be grown by machine methods on the prairies in the southwestern part of the State. In 1889 Louisiana became, and still is, the leading State in rice production.

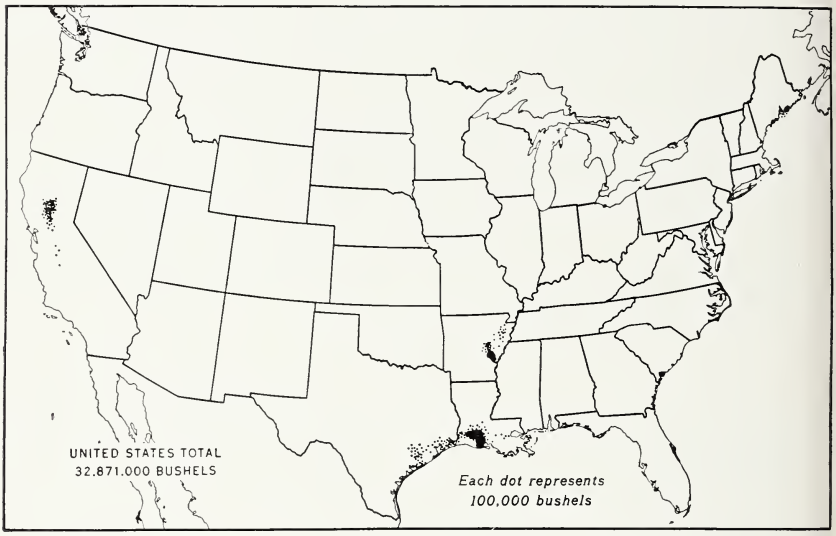

FIGURE 1.—Rough rice production in the United States in 1934.

Upland or nonirrigated rice was probably grown to a small extent in Texas as early as 1863. However, the crop did not become of commercial importance until 1899 when several thousand acres were sown in the Beaumont district of Jefferson County in southeastern Texas.

In 1902 rice was grown on a limited scale on the Grand Prairie of Arkansas near Lonoke. Several hundred acres were grown in 1904, and extensive commercial production began in 1905.

In California the first commercial rice crop was grown near Biggs in the Sacramento Valley in 1912.

In certain areas in these 4 States rice can be grown more profitably than other crops for which there is a ready cash market. In 1940, 1,051,000 acres in these 4 States were harvested, and the total production was 52,754,000 bushels. Of the total acreage and production 18.2 and 18.5 percent were in Arkansas; 42.9 and 34.2 percent in Louisiana; 27.7 and 30.3 percent in Texas; and 11.2 and 17.0 percent were in California.

There are hundreds of distinct varieties of rice, adapted for growing by various cultural methods under different climatic and soil conditions, in each of the principal rice-producing countries of Asia. These varieties undoubtedly originated through natural crossing and mutation.

During the past 30 years over 5,000 varieties of rice from various parts of the world have been introduced into this country, largely by the United States Department of Agriculture. Most of the introductions were tested in cooperative experiments at the Rice Experiment Station, Crowley, La., and at the Biggs Rice Field Station, Biggs, Calif. Only a few of the varieties introduced and tested have proved to be well adapted.

Cultivated rice varieties of the world are commonly grouped into upland and lowland types. Upland varieties are not irrigated and the land normally is not submerged during the growing season by the seasonal rainfall, which supplies the crop with moisture. Lowland varieties normally are grown on land submerged by irrigation or rainfall from 2 to 8 inches deep during the greater part of the growing season. Lowland varieties are grown much more extensively in the principal rice-producing countries of the world. Some upland rice is grown in the Southern States each year for local consumption, but the total production of such rice in the United States in 1934 was less than 87,000 bushels.

Rice varieties also are grouped into common and glutinous types, on the basis of the nature of the starch in the endosperm. Common rice is by far the most important, although considerable glutinous rice is produced in the Orient for special purposes. The varieties grown commercially in the United States include short-, medium-, and long-grain types of early, midseason, or late maturity. Usually the market price is highest for the long-grain varieties and lowest for the short-grain varieties.

Rice varieties differ in culinary properties, such as appearance, texture, taste, and flavor of the cooked grain, and in cooking time, amount of water absorbed, and cooking expansion (*7*).[2] These quality factors are difficult to appraise accurately owing to differences in the personal preferences of investigators and consumers. In Japan, the Hawaiian Islands, Puerto Rico, and Spain, and in most countries where the consumers' tastes were influenced in early times by the Spanish, the short-grain rices are usually preferred. In China, India, and other large Asiatic rice-producing countries all types of rice are grown and consumed. In India and China reports indicate that the long- and long (slender)-grain rices are preferred by the wealthy people. However, many varieties of this type yield less in the field and do not mill so well as the short- and medium-grain varieties. Therefore, the medium- and short-grain varieties are grown in preference because they are the most profitable from the standpoint of producers and millers.

In this circular certain varieties that are referred to as having good table quality are those that retain their shape and are flaky and reasonably tender when boiled. Varieties of this type sell for a higher price, which probably indicates a consumer preference, although the lower milling yields and smaller supplies of these varieties tend to

[2] Italic numbers in parentheses refer to Literature Cited, p. 34.

keep prices higher. Rice that retains its shape but is firm and slightly sticky when boiled also is considered good by many consumers, particularly in western Europe. Few if any consumers prefer pasty rice. The characteristics of the cooked rice of the principal varieties grown in the United States are given below.

Rexoro, Fortuna, Nira, Iola, and Delitus are flaky and reasonably tender. Delitus also has a distinct aroma and flavor which appeals to some people. Edith, Blue Rose, Zenith, Calady, Acadia, Caloro, and Colusa are rather firm and slightly sticky. The Early Prolific and Lady Wright varieties are rather pasty.

The purpose of this circular is to describe the commercial varieties that have been or are grown now in the United States, and to present the comparative yields of the varieties in the experiments conducted in Arkansas, Louisiana, Texas, California, and Missouri during recent years.

DESCRIPTION OF VARIETIES

Short-Grain Varieties

In 1939, The Rice Millers' Association, of New Orleans,[3] estimated that of the total quantity of rice produced in Arkansas, Louisiana, and Texas only 2.31 percent was of the short-grain type, whereas in California 99.33 percent of the total production was of this type. Caloro is the most important short-grain variety grown in the United States.

Among the short-grain varieties grown in the yield tests are Colusa, Onsen, Hattan No. 2, Nero Vialone × Caloro (221A165–8), Early Wataribune, Caloro, Shinriki, Wataribune, and Acadia.

These and other short-grain varieties have rather slender culms, narrow (about ⅜ of an inch) leaf blades, and yellow or straw-colored rough hulls enclosing the kernels. The unhulled seeds average about 7.2 mm. in length and 3.7 mm. in thickness, and the hulled kernels about 5.5 mm. in length and 3.2 mm. in thickness. In milling, short-grain varieties usually yield as large a percentage of head rice (whole kernels) as do the medium-grain varieties and more than do the long-grain varieties. The short-grain varieties usually are less susceptible to stem rot than are the medium- and long-grain varieties (*2*).

COLUSA

Colusa (*3*) was selected in 1911 by Charles E. Chambliss and J. Mitchell Jenkins at the Rice Experiment Station, Crowley, La., from Chinese, a variety introduced from Italy in 1909 by Haven Metcalf. Colusa was tested at the Biggs Rice Field Station, Biggs, Calif., and distributed in 1917 and 1918. Colusa (fig. 2, *A*) is an early-maturing, awnless variety that heads and matures rather uniformly and produces relatively high yields on fertile land of reasonably good milling quality. It is much less productive than Caloro in California on old riceland of average fertility. Colusa has been for many years and still is the most popular early-maturing variety grown in California, especially on virgin land. It yields well in Missouri, and fairly well on fertile land in Arkansas but is too early for successful growth in Louisiana and Texas. Colusa is not resistant

[3] Rice Millers' Association. estimate of the rice crop for the year 1939. [4] pp. New Orleans, La. December 12, 1939. [Mimeographed.]

to the leaf spot disease caused by the fungi *Helminthosporium oryzae* and *Cercospora oryzae*, and it frequently lodges when the crop is heavy.

ONSEN

Onsen was introduced from Japan in 1918 by a Japanese rice grower of Biggs, Calif. It is an early-maturing, awnless variety, very much

FIGURE 2.—Panicles, seeds, and kernels of *A*, Colusa and *B*, Onsen.

like Colusa. In California, Onsen (fig. 2, *B*) matures a few days earlier, yields slightly less, and when the crop is heavy, lodges more easily than Colusa. It is still grown on a small acreage in California. Like Colusa, Onsen is not resistant to the leaf spot diseases.

HATTAN NO. 2

Hattan No. 2 was introduced from Japan by the United States Department of Agriculture in 1926. It is an early maturing, awnless variety that yields well on relatively rich land. Hattan No. 2 is similar to Colusa in maturity, yield, and quality. It is not resistant to the leaf spot diseases, nor is it grown commercially in the United States.

NERO VIALONE × CALORO (221A165-8)

Nero Vialone × Caloro (221A165–8) was selected by Jenkin W. Jones from a cross between Nero Vialone and Caloro made in 1922 at the Biggs Rice Field Station, Biggs, Calif. It is an early-maturing, awnless selection that yields well on fertile land. However, the seeds are rather coarse for a short-grain rice, are inclined to be chalky, and are inferior to Colusa in quality. This selection is not grown commercially in California, but it was sown on one or two small commercial fields in Missouri in 1938, and excellent yields were reported. It also has yielded well at Elsberry, Mo. (*4*).

EARLY WATARIBUNE

Early Wataribune (*3*) was introduced from Japan in 1913 by W. K. Brown, of the Moulton Ranch, Butte City, Calif. It is a midseason, partly-awned variety that tillers freely and produces relatively high yields of good milling quality. Early Wataribune (fig. 3, *B*) matures about 10 days earlier than Wataribune and for this reason largely replaced Wataribune during the early years of rice production in California. Caloro was distributed in California in 1921 and soon replaced early Wataribune on most farms.

CALORO

Caloro (*3*) was selected in 1913 at the Biggs (Calif.) Rice Field Station from Early Wataribune and was distributed in the spring of 1921. Caloro (fig. 3, *A*) is a midseason, partly-awned variety that heads and matures uniformly in California, and produces relatively high yields on either virgin or old lands of reasonably good milling quality. Caloro is still the leading variety grown in California. It also yields well in Missouri (*4*) and Arkansas (*5*), and reasonably well in Louisiana and Texas, and thus appears to be adapted for growing under a rather wide range of conditions. It is not resistant to the leaf spot diseases that attack the crop in the South, and it is inclined to lodge when the crop is heavy. Caloro is the most important short-grain variety grown in the United States, principally in California.

SHINRIKI

Shinriki (*3*) was introduced from Japan in 1902 by S. A. Knapp of the United States Department of Agriculture. It is a late-maturing, short, stiff-strawed, awnless variety. When grown on fertile land it tillers freely and gives high yields of good milling quality. Shinriki was of some importance in Louisiana and Texas up to about 1912 when

it declined, but some is still grown in the South. Shinriki is less likely to lodge than are most of the taller, short-grain varieties. It is not especially resistant to the leaf spot diseases that occur in the southern rice area.

FIGURE 3.—Panicles, seeds, and kernels of *A*, Caloro and *B*, Early Wataribune.

WATARIBUNE

Wataribune (*3*) was first introduced from Japan in 1908 by S. Sabaira, a Japanese grower of Webster, Tex. Later, this variety was also introduced by the United States Department of Agriculture.

Wataribune (fig. 4, *B*) is a late-maturing, partly-awned variety that, on rich land, tillers freely and produces high yields of good milling quality. It has been grown in the Southern States and was the leading variety in California from 1912 until about 1918. Although Wataribune is susceptible to the leaf spot diseases, it yields well in the South.

FIGURE 4.— Panicles, seeds, and kernels of *A*, Acadia and *B*, Wataribune.

ACADIA

Acadia (*1*) was selected from Omachi in 1911 at the Rice Experiment Station, Crowley, La., and was distributed in Louisiana in 1918. Acadia (fig. 4, *A*) is a late-maturing, partly-awned variety that is

uniform in heading and ripening. It tillers freely and yields well on fertile and old land in the Southern States. Seed of the Acadia variety mills well and is of good cooking quality for this type of rice. Acadia, Omachi, and Wataribune are all very similar in morphological characters, date of maturity, yielding capacity, and in milling and cooking qualities. They are susceptible to the leaf spot diseases in the southern rice area, and are not extensively grown. Acadia yields well in the Southern States (*5*).

Medium-Grain Varieties

The Rice Millers' Association [4] in 1939 estimated that of the total rice produced in Arkansas, Louisiana, and Texas 71.29 percent was of the medium-grain varieties, whereas in California only 0.67 percent of the production was of this type. Of the total production in the 3 Southern States, Blue Rose made up 53.92 and Early Prolific 17.37 percent, respectively.

The principal medium-grain varieties grown in the yield tests were Early Prolific, Early Blue Rose, Zenith, Shoemed, Calady, and Blue Rose. These varieties have rather stout culms, relatively wide leaf blades (about five-eighths of an inch), and, with two exceptions, rough, yellow or straw-colored hulls. Shoemed has smooth hulls and the hulls of Calady are light gold in color.

The seeds average from 8.0 to 8.7 mm. in length and from 3.2 to 3.4 mm. in thickness, and the hulled kernels average from 6.1 to 6.7 mm. in length and from 2.6 to 2.9 mm. in thickness. In milling, medium-grain varieties usually yield more head rice than long-grain varieties.

EARLY PROLIFIC

Early Prolific (*3*) was selected by S. L. Wright of Crowley, La., and was distributed by him in 1915. Early Prolific (fig. 5, *A*) is an early-maturing, awnless variety that heads and matures rather unevenly, but on reasonably fertile land it produces relatively high yields of fairly good milling quality. The kernels of Early Prolific often are opaque and unattractive in appearance. Early Prolific is inferior to Blue Rose in cooking quality. Soon after Early Prolific was distributed it became and still is the leading early variety grown in Arkansas (*5*), Louisiana, and Texas (*8*). In California and Missouri it yields less and is much more uncertain than the short-grain varieties, Colusa and Caloro. In these States the cool, fall nights often prevent Early Prolific from heading and maturing normally. Early Prolific is susceptible to the leaf spot diseases, but the plants seldom lodge, except when infected with stem rot.

SHOEMED

Shoemed (*1*) was selected in 1928 by Charles E. Chambliss and J. Mitchell Jenkins at the Rice Experiment Station, Crowley, La., from the Guinosgar variety which was introduced from the Philippine Islands in 1916 by the United States Department of Agriculture. Shoemed was distributed in 1932 by the United States Department

[4] See footnote 3, p. 4.

of Agriculture in cooperation with the Louisiana Agricultural Experiment Station. Shoemed (fig. 5, *B*) is an early-maturing, awnless variety that yields well and is of good cooking quality, but shatters

FIGURE 5.—Panicles, seeds, and kernels of *A*, Early Prolific and *B*, Shoemed.

somewhat and does not mill too well. Largely for these reasons it is not grown commercially now. Shoemed is resistant to the cercospora leaf spot disease and somewhat resistant to helminthosporium leaf spot.

ZENITH

Zenith was selected from Blue Rose in 1930 by Glen K. Alter, near DeWitt, Ark. In 1931, Mr. Alter gave C. Roy Adair several selec-

FIGURE 6.—Panicles, seeds, and kernels of *A*, Zenith and *B*, Calady.

tions for testing in the cooperative breeding program at the Rice Branch Experiment Station, Stuttgart, Ark. Of these selections, Arkansas 141–8 proved to be the best and was named Zenith and

distributed in 1936. Zenith (fig. 6, *A*) is an early-maturing, awnless variety that is more uniform in heading and maturing than Early Prolific. Strains similar to Zenith have been isolated from Early Prolific. The kernels of Zenith are slightly smaller, more translucent, flatter, and of better quality than those of Early Prolific. Zenith is susceptible to helminthosporium leaf spot but is somewhat resistant to the cercospora leaf spot and stem rot.

CALADY

Calady (*3*) was selected in 1924 from a cross between Caloro and Lady Wright at the Biggs Rice Field Station, Biggs, Calif. The material was grown in bulk from 1926 to 1928. Panicle selections were made from the bulk population in 1928 and of these, one was isolated, tested for yield, increased in 1934, and named Calady. Calady (fig. 6, *B*) is a midseason, partly-awned variety adapted to the climatic conditions in California. The kernels are slightly smaller and more slender than those of Blue Rose and are hard, translucent, oily, attractive in appearance, and usually mill well. Calady is best adapted for growing on rich soils or on land that is fertilized rather heavily. The yields are considerably lower than those of Caloro on the less fertile, old ricelands in California. Calady is susceptible to the leaf spot diseases and is not adapted for growing in the Southern States.

BLUE ROSE

Blue Rose (*1*) was selected in 1907 by S. L. Wright of Crowley, La., from an unknown variety found by J. F. Shoemaker growing in a field of Japanese rice near Jennings, La. Blue Rose was distributed to growers in the fall of 1911 by S. L. Wright and was first grown on a commercial scale in 1912. It soon became and still is the leading commercial variety grown in the Southern States. Blue Rose (fig. 7, *A*) is a vigorous-growing variety, has stiff straw, and yields and mills well. The milled kernels of Blue Rose are usually translucent and attractive in appearance. It is a late-maturing, awnless variety that has retained its popularity with growers and millers for over 25 years. Blue Rose, unfortunately, is susceptible to the leaf spot diseases, and in table quality it is firm and slightly sticky. For many years it has been the most important variety exported to western Europe from the United States.

The Improved Blue Rose, Supreme Blue Rose, and Greater Blue Rose were also selected and distributed by S. L. Wright and appear to be essentially the same as Blue Rose, and when grown are marketed as Blue Rose.

EARLY BLUE ROSE

Early Blue Rose was increased from a mass selection made from Early Prolific in 1929 by G. H. Banks of the Rice Branch Experiment Station, Stuttgart, Ark. It heads more uniformly than Early Prolific but appears to be identical in all other respects, and usually is sold under the name of Early Prolific. As in Early Prolific, the kernels (fig. 7, *B*) often are opaque ("tombstone") and unattractive when milled.

Long-Grain Varieties

In 1939 The Rice Millers' Association [5] estimated that of the total rice produced in Arkansas, Louisiana, and Texas 26.21 percent was of thel ong-grain varieties. The leading long-grain varieties were Rexoro

FIGURE 7.—Panicles, seeds, and kernels of *A*, Blue Rose and *B*, Early Blue Rose.

comprising 15.80 percent, Nira 4.49, Fortuna 2.46, Edith 2.23, and Lady Wright 1.23 percent of the total production.

The principal long-grain varieties grown in the yield tests were Honduras, Edith, Lady Wright, Latex, Storm Proof, Delitus, Rexoro, Fortuna, Nira, and Iola. These varieties have rather stout culms, relatively wide leaf blades (averaging about five-eighths of an inch),

[5] See footnote 3, p. 4.

and most of them have rough, straw-colored hulls. Rexoro and Nira have smooth hulls, and the hulls of Rexoro and Delitus are light gold in color.

The seeds average from 9.0 to 9.8 mm. in length and from 2.4 to 3.4 mm. in thickness, and the hulled kernels average from 6.6 to 7.7 mm. in length and from 2.0 to 2.6 mm. in thickness. In milling, long-grain varieties usually yield a smaller proportion of head rice than do short- and medium-grain varieties.

HONDURAS

The Honduras (*1*) variety was introduced from Honduras by commercial agencies about 1890. It is an early-maturing, usually awnless variety (fig. 8, *A*) of good table quality. Owing to its productiveness, it soon replaced the Carolina varieties on the Delta lands of Louisiana. Honduras was the leading long-grain variety grown on the prairies of Louisiana, Texas, and Arkansas as long as virgin land was available for rice production. It was replaced in the Southern States largely by the early-maturing long-grain varieties, Edith and Lady Wright. Honduras is very susceptible to the leaf spot diseases and is no longer grown commercially.

EDITH

Edith (*3*) was selected by S. L. Wright of Crowley, La., and distributed by him in 1916. Edith (fig. 8, *B*) is an early-maturing, awnless variety that heads and matures rather evenly. It does not yield so well on the prairies, nor does it mill so well as Blue Rose and Early Prolific, but in table quality it is probably better than these varieties. Edith largely replaced Honduras in the Southern States. It is susceptible to the leaf spot diseases but is still grown to some extent, especially in certain parts of Texas.

LADY WRIGHT

Lady Wright (*3*) (fig. 9, *A*) is an early-maturing, awnless variety selected and distributed in 1920 by S. L. Wright of Crowley, La. It replaced Edith in the South to some extent. Lady Wright is a rather vigorous variety and under favorable conditions produces high yields, but in table quality it is the poorest long-grain rice grown in the Southern States. This variety, like Edith, is susceptible to the leaf spot diseases and is being replaced by the later maturing, long-grain Rexoro, Fortuna, and Nira varieties, which yield more and are of better cooking quality.

LATEX

Latex was selected by Jenkin W. Jones in 1927 from a natural cross that was being grown by Charles S. Jurges west of Nelson, Calif. Latex was grown on a farm or two in Texas in 1937 and 1938 but is not grown commercially now. It is an early-maturing, awnless variety (fig. 9, *B*), much like Edith, but more uniform in height. Latex is susceptible to diseases.

STORM PROOF AND MORTGAGE LIFTER

Storm Proof and Mortgage Lifter were selected from Honduras in 1915 by J. M. Satchfield of Technor, Ark. Both are early-maturing,

awnless varieties very much like Honduras. They were grown commercially for several years on a small acreage in Arkansas but have ceased to be of economic importance. Mortgage Lifter is susceptible to the leaf spot diseases, but Storm Proof is somewhat resistant to cercospora leaf spot disease.

FIGURE 8.—Panicles, seeds, and kernels of *A*, Honduras and *B*, Edith.

DELITUS

Delitus (*1*) was selected in 1911 by Charles E. Chambliss and J. Mitchell Jenkins at the Rice Experiment Station, Crowley, La., from the Bertone variety, which was introduced in 1904 by the United

States Department of Agriculture from France. It was distributed in 1918 by the United States Department of Agriculture in cooperation with the Louisiana Agricultural Experiment Station. Delitus (fig.

FIGURE 9.—Panicles, seeds, and kernels of *A*, Lady Wright and *B*, Latex.

10, *B*) is an early-maturing, awnless variety of fair milling quality, which produces relatively low yields on the prairies. Delitus is a scented rice and the cooked kernels have a distinct aroma or flavor

that to some resembles that of popcorn. It is grown on a small acreage adjacent to the Mississippi River in Louisiana. Delitus is

FIGURE 10.—Panicles, seeds, and kernels of *A*, Rexoro and *B*, Delitus.

susceptible to helminthosporium leaf spot but is resistant to cercospora leaf spot disease.

REXORO

Rexoro (*3*) was selected in 1926 by Charles E. Chambliss and J. Mitchell Jenkins at the Rice Experiment Station, Crowley, La., from the Marong-paroc variety introduced from the Philippine Islands in 1911 by the United States Department of Agriculture. Rexoro was distributed by the Department in cooperation with the Louisiana Agricultural Experiment Station in 1928. Rexoro (fig. 10, *A*) is a late-maturing, long (slender)-grain rice that yields and mills well for a variety of this type. The table quality is very good, and it is also resistant to the cercospora leaf spot disease. Owing to its late maturity, Rexoro is grown only in Louisiana and Texas where the growing season is long.

FORTUNA

Fortuna (*1*) was selected in 1911 by Charles E. Chambliss and J. Mitchell Jenkins at the Rice Experiment Station, Crowley, La., from the Pa Chiam variety, which was introduced by the United States Department of Agriculture from Taiwan (Formosa) in 1905. Fortuna was distributed by the Department in cooperation with the Louisiana Agricultural Experiment Station in 1918, but because it shatters slightly the growers did not appreciate, until recently, its desirable characteristics. Fortuna (fig. 11, *A*) is a late-maturing, awnless, vigorous-growing variety that yields well in Arkansas, Louisiana, and Texas. It is resistant to the cercospora leaf spot disease and is of good table quality. Texas Fortuna, which was selected in 1912 at the Texas Agricultural Substation No. 4, Beaumont, and released in 1925, is morphologically the same, and it yields about the same as Fortuna. Arkansas Fortuna was selected from and appears to be the same as Fortuna, except that it matures 7 to 10 days earlier and is better adapted for growing in Arkansas. The selection was made by C. Roy Adair at the Rice Branch Experiment Station, Stuttgart, Ark.

NIRA

Nira (*3*) was selected in 1928 by Charles E. Chambliss and J. Mitchell Jenkins at the Rice Experiment Station, Crowley, La., from an unnamed variety introduced from the Philippine Islands by the United States Department of Agriculture in 1916. Nira was released for commercial growing in 1932 by the Department in cooperation with the Louisiana Agricultural Experiment Station. Nira (fig. 11, *B*) is a late-maturing, long-grain rice that yields and mills well. It is resistant to the cercospora leaf spot disease and is of good table quality. It is the tallest variety grown commercially in the South. Rexoro, Fortuna, and Nira are replacing Edith and Lady Wright in the southern rice area to a large extent.

IOLA

Iola was selected in 1926 by Charles E. Chambliss and J. Mitchell Jenkins at the Rice Experiment Station, Crowley, La., from the Finindoc variety, introduced from the Philippine Islands in 1916 by the United States Department of Agriculture. Iola was released by

the Department in cooperation with the Louisiana Agricultural Experiment Station for commercial growing in 1931. It is a late-maturing, long (slender)-grain variety (fig. 12) that yields well. It has

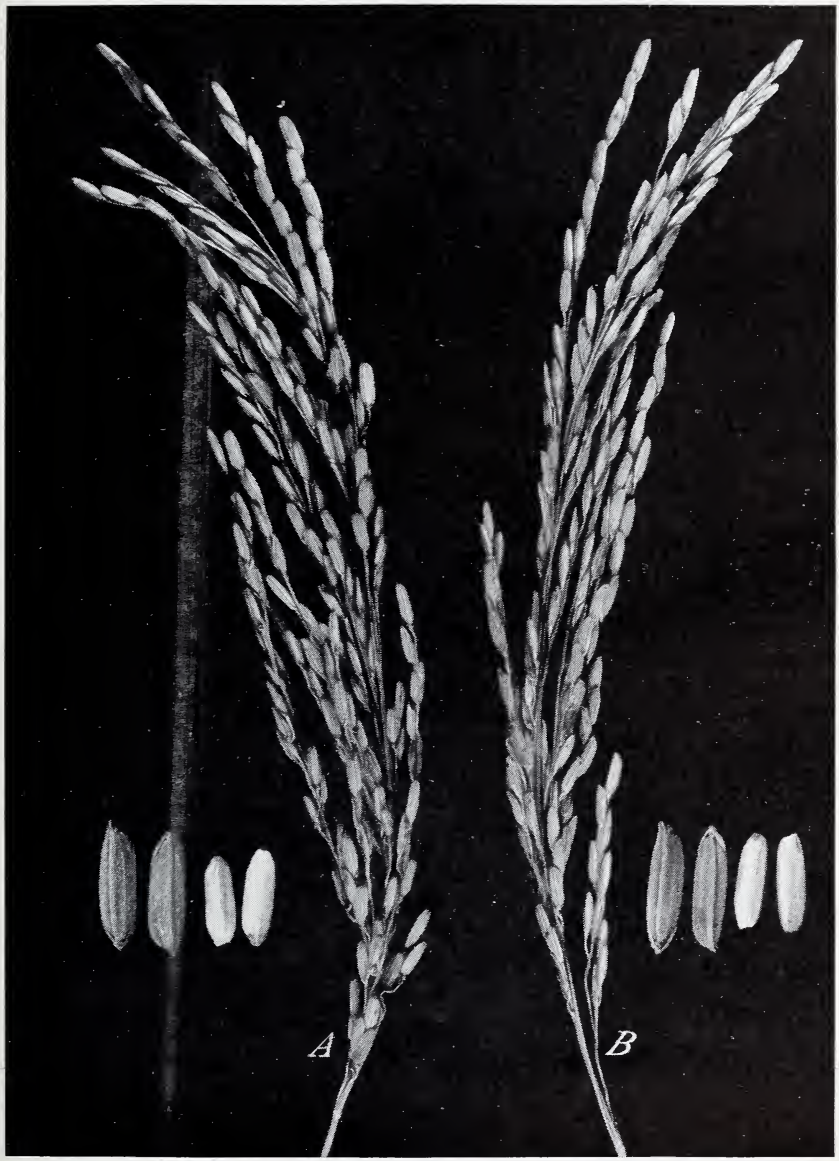

FIGURE 11.—Panicles, seeds, and kernels of *A*, Fortuna and *B*, Nira.

been grown on a small area in Louisiana. It is resistant to the cercospora leaf spot disease and is of good table quality. Like Rexoro, it matures too late to be grown commercially in Arkansas.

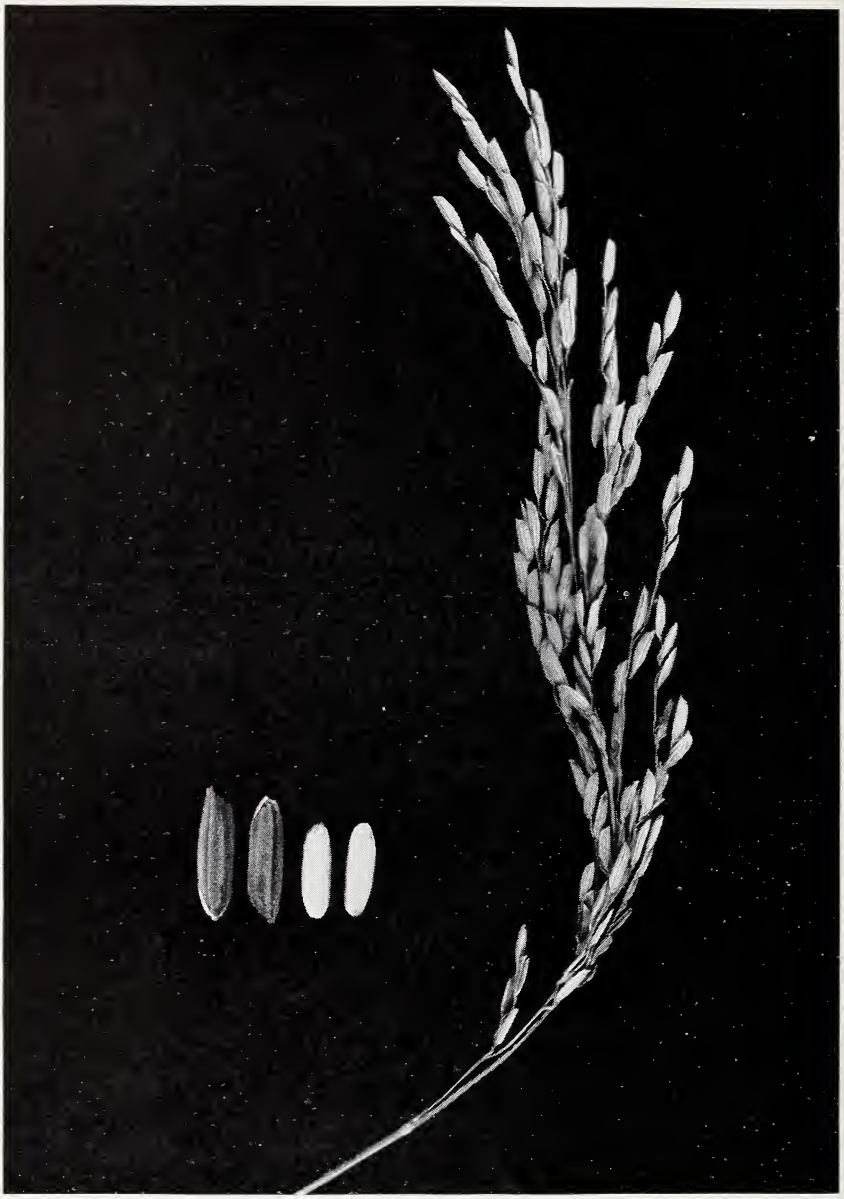

FIGURE 12.—Panicle, seeds, and kernels of Iola.

EXPERIMENTAL METHODS

The yields reported in this circular were obtained each year from three or more systematically replicated or randomized field plots on idle land, fallow land, or on land on which a row crop was grown the previous year. At each station each year all varieties were grown on

land prepared in the same manner. They were sown on the same date and at the same rate, and received similar treatment during the growing season. The yields were obtained in each State on soils commonly used for rice culture, and the results are believed to be applicable to larger areas in these States.

Results of Varietal Experiments

RICE BRANCH EXPERIMENT STATION, STUTTGART, ARK.

In the Arkansas tests the varieties were grown on old riceland, classified as Crowley silt loam, which had been cropped to rice continuously or in alternate years for 20 years or more. The annual and average yields of the varieties grown at the Rice Branch Experiment Station at Stuttgart, are given in table 1.

The three short-grain varieties, Colusa, Caloro, and Acadia, produced higher average yields for the 5-year period 1932–36 than Supreme Blue Rose. Supreme Blue Rose was damaged by rats in 1932, so the comparable yields shown are based upon averages omitting the yields in 1932. The 7-year average yields of Caloro and Acadia were about equal, and both produced higher average yields than Colusa in the 5-year period 1932–36.

The yields of the early-maturing medium-grain varieties, excepting Shoemed, were somewhat higher than that of Supreme Blue Rose. The average yield of Zenith for the period grown was considerably higher than that of Supreme Blue Rose, Early Prolific, or other varieties in the medium-grain group.

Of the long-grain varieties, Fortuna, or Arkansas Fortuna, exceeded the others in average yield for the 5-year period 1932–36. Nira ranked second in average yield for the period grown. The average yields of the early-maturing Lady Wright, Edith, and Storm Proof varieties for the 5-year period 1932–36 were higher than those of Honduras and Mortgage Lifter. Rexoro and Iola are too late to mature normally in Arkansas, and for this reason the average yields were low. The average yields of all varieties, except Fortuna, for the period 1932–38 were somewhat lower than those for the period 1928–39.

All short- and medium-grain varieties, except Shoemed, gave higher average yields for comparable years than Supreme Blue Rose, whereas the average yield of all long-grain varieties, except Fortuna, was less than that of Supreme Blue Rose.

The results indicate that of the short-grain varieties Caloro and Acadia, of the medium-grain varieties Early Prolific, Zenith, and Supreme Blue Rose, and of the long-grain varieties Edith, Arkansas Fortuna, and Nira are well suited for growing in Arkansas. The maturity of these varieties varies materially, and it should be possible for growers, by varying the date of seeding, to extend the harvest over a considerable period and, likewise, to include varieties of each grain type so as to obtain such benefits as may exist owing to variations in price of the different grain types.

There was no marked difference in the average yields of the more productive short-, medium-, and long-grain varieties. Additional data on the yields of rice varieties in Arkansas are given in Arkansas Agricultural Experiment Station Bulletin No. 403, by Nelson and Adair (*6*).

TABLE 1.—*Annual and average yields of rice varieties grown at the Rice Branch Experiment Station, Stuttgart, Ark.*

Group and variety	C. I. No.	Average			Yield per acre											Years compared	Comparable[1] yield
		Date mature	Days seeding to maturity	Height	1932	1933	1934	1935	1936	1937	1938	Average					
												1932 to 1936	1932 to 1938	1928 to 1939	1932 to 1938		
Short-grain:			*Number*	*Inches*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Pounds*	*Number*	*Percent*
Colusa	1600	Sept. 10	120	41	41.1	57.0	48.6	34.8	58.0			47.9				4	106.7
Caloro	1561-1	Sept. 24	133	41	61.9	56.4	55.7	48.8	63.7	60.8	32.6	57.3	54.3	58.6	2,444	6	115.2
Acadia	1988	Oct. 2	141	41	32.3	55.4	62.7	56.6	68.4	61.7	38.4	55.1	53.6	56.2	2,412	6	124.3
Medium-grain:																	
Early Prolific	5883	Sept. 18	127	46	54.8	52.2	40.9	39.1	59.6	53.0	33.9	49.3	47.6	53.1	2,142	6	101.1
Early Blue Rose	7785	do	127	46	55.3	55.2	53.7	39.0	59.0	49.2	35.5	52.4	49.6		2,232	6	105.7
Zenith	7787	do	126	45			48.9	44.7	64.8	67.8	34.7					5	117.6
Shoemed	3625	Sept. 22	130	47	49.6	55.3	35.8	32.2	53.8	55.9	38.5	45.3	45.9		2,066	6	98.5
Supreme Blue Rose	5793	Oct. 9	148	43	[2] 22.5	53.9	43.4	39.6	49.0	58.1	31.8	41.7	42.6	49.5	1,917	6	100.0
Long-grain:																	
Lady Wright	5451	Sept. 18	127	43	53.2	52.4	32.7	29.0	44.4	46.0	33.2	42.3	41.6	47.2	1,872	6	86.1
Edith	2127	do	127	42	32.4	41.3	35.8	35.9	51.9	53.0	29.2	39.5	39.9	45.4	1,796	6	89.6
Storm Proof	7705	Sept. 17	127	44	31.2	38.9	29.5	33.8	50.9			36.9				4	82.4
Mortgage Lifter	5550	do	127	45	19.9	33.7	19.8	36.8	48.6			31.8				4	74.6
Honduras	1643	Sept. 19	129	47	15.0	33.0	20.2	24.6	40.6			26.7				4	63.7
Latex	7788	Sept. 22	129	44				31.8	53.8	51.9	26.0					4	91.7
Delitus	1206	Sept. 25	133	51	34.2	33.8	29.2	33.1	42.6	38.1	31.0	34.6	34.6	35.5	1,557	6	75.2
Fortuna	1344	Oct. 3	142	49	53.6	54.2	42.2	58.3	52.8	64.5	40.0	52.2	52.2	52.2	2,349	6	113.0
Nira	2702	Oct. 19	158	52				39.8	44.0	52.3	35.6					4	96.2
Rexoro	1779	Nov. 13	182	41	3.3	11.1	8.4	2.4	.1			5.1				4	11.8
Iola	4559	Nov. 3	173	47	12.8	33.3	11.8	9.1	39.4			19.5				4	45.6

[1] Percentage of standard variety, Supreme Blue Rose, in the same years, 1932 omitted.
[2] Damaged by rats.

RICE EXPERIMENT STATION, CROWLEY, LA.

The varieties were grown in Louisiana on Crowley silt loam soil which had been cropped to rice continuously or in alternate years for a long period of time. The annual and average yields for the varieties grown at the Rice Experiment Station at Crowley are given in table 2. In the short-grain group the average (1932–36) yield of Caloro was higher than that of Colusa, and Caloro was definitely lower in average yield than the later maturing Acadia, Wataribune, and Shinriki varieties. The latter varieties gave about the same average yields for the periods grown.

In the medium-grain group Zenith, for the 2 years grown, gave a higher average yield than Blue Rose. The average yield of Early Prolific for the 7-year period 1932–38 was considerably less than that of Blue Rose.

The average yields of the early-maturing long-grain varieties Lady Wright, Edith, and Honduras were much lower than those of the late-maturing long-grain varieties or of Blue Rose. The average yield of Honduras for the period 1917–36 was also much lower than that of Blue Rose. The average yields of Fortuna, Nira, Rexoro, and Iola for the 7-year period 1932–38 were considerably higher than that of Blue Rose.

The highest yielding short- and long-grain varieties did not differ markedly in average yields, but in value per acre they no doubt differed materially.

The results indicate that the short-grain varieties Caloro and Acadia, the medium-grain varieties Zenith, Early Prolific, and Blue Rose, and the long-grain varieties Fortuna, Nira, and Rexoro are well suited for growing in Louisiana. The early-maturing long-grain varieties were, for the years grown, much less productive than late varieties of this grain type, as well as the higher yielding short- and medium-grain varieties. The acreage sown to the early-maturing long-grain varieties has decreased since the higher-yielding, later-maturing varieties of this grain type were released for commercial growing.

AGRICULTURAL SUBSTATION NO. 4, BEAUMONT, TEX.

The varieties were grown in Texas on Lake Charles and Crowley clay soils, which had been cropped to rice for many years. The annual and average yields of the varieties grown at the Agricultural Substation No. 4, Beaumont, Tex., are given in table 3. In the short-grain group the average yields of Acadia and Caloro were about the same from 1932 to 1936, and both were more productive than Colusa. In the medium-grain group the average yield of Supreme Blue Rose was higher than that of Early Prolific. Zenith for the 2 years grown also gave a higher average yield than Early Prolific. The average yields of the late-maturing long-grain varieties were higher than those of the early-maturing varieties of this grain type, as well as of Supreme Blue Rose. The average yields of the early-maturing long-grain varieties were essentially the same, except Honduras, which yielded much less than the others. The average yields of Nira, Fortuna, and Rexoro for comparable years were higher than those of Acadia and Supreme Blue Rose. The results indicate that the short-grain Caloro and Acadia varieties, the medium-grain Early Prolific, Zenith, and Supreme

TABLE 2.—*Annual and average yields of rice varieties grown at the Rice Experiment Station, Crowley, La.*

Group and variety	C. I. No.	Average			Yield per acre											Years compared	Comparable [1] yield
		Date mature	Days seeding to maturity	Height	1932	1933	1934	1935	1936	1937	1938	Average 1932 to 1936	Average 1932 to 1938	Average 1917 to 1936	Average 1932 to 1938		
Short-grain:			*Number*	*Inches*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Pounds*	*Number*	*Percent*
Colusa	1600	Aug. 31	129	31	25.1	22.9	17.2	39.5	15.8			24.1				5	64.1
Caloro	1561–1	Sept. 7	136	35	29.7	34.4	22.1	30.7	20.0	27.4	24.0	33.4	31.2		1,404	7	86.0
Acadia	1988	Sept. 21	150	38	41.8	59.4	35.2	85.8	25.3	21.2	26.2	49.5	42.1	51.4	1,896	7	116.0
Wataribune	1561	do	150	36	37.0	49.0	36.5	86.6	24.1	33.0	24.9	46.7	41.6	48.1	1,873	7	114.6
Shinriki	1642	Sept. 25	154	31	38.9	49.7	32.2	88.1	23.3			46.4		48.6		5	123.4
Medium-grain:																	
Early Prolific	5883	Aug. 28	126	38	16.8	21.8	23.5	32.1	18.6	38.7	25.9	22.6	25.3		1,140	7	69.7
Early Blue Rose	7785									36.2	24.2	30.2				2	91.2
Zenith	7787									45.3	31.7	38.5				2	116.3
Shoemed	3625	Sept. 3	132	41	23.2	33.2	27.7	51.3	21.6	43.2	26.7	31.4	32.4		1,458	7	89.3
Blue Rose	1962	Sept. 27	156	40	37.7	39.4	32.9	52.0	25.9	36.2	30.0	37.6	36.3	40.6	1,633	7	100.0
Long-grain:																	
Lady Wright	5451	Aug. 27	125	39	21.1	24.2	22.8	34.5	17.2	25.8	20.9	24.0	23.8		1,071	7	65.6
Edith	2127	Aug. 28	126	37	18.0	26.1	22.0	30.5	15.1	34.5	21.1	22.4	23.9		1,076	7	65.8
Storm Proof	7705	Aug. 27	125	38	21.0	24.4	23.7	36.0	15.9			24.2				5	64.4
Honduras	1643	Aug. 28	126	42	17.4	21.5	18.2	24.7	13.9			19.1		29.2		5	50.8
Vintula	1241	Aug. 26	124	40	19.5	28.9	21.5	46.6	17.9	25.8	17.4	26.9	25.4		1,141	7	70.0
Latex	7788									21.6	22.6	22.1				2	66.8
Delitus	1206	Sept. 5	134	42	25.4	39.5	27.2	54.4	22.0	35.8	23.8	33.7	32.6		1,467	7	89.8
Fortuna	1344	Sept. 20	149	42	34.8	62.6	33.7	73.0	27.6	34.1	36.4	46.3	43.2	51.4	1,942	7	119.0
Nira	2702	Sept. 22	151	47	34.6	57.1	34.8	70.5	26.6	32.1	32.6	44.7	41.2		1,853	7	113.5
Rexoro	1779	Oct. 15	174	42	33.1	50.2	37.7	81.6	25.7	37.4	39.5	45.7	43.6		1,962	7	120.1
Iola	4559	Oct. 6	165	45	34.8	49.7	41.9	73.1	27.1	35.9	35.3	45.3	42.5		1,914	7	117.1

[1] Percentage of standard variety, Blue Rose.

TABLE 3.—*Annual and average yields of rice varieties grown at Agricultural Substation No. 4, Beaumont, Tex.*

Group and variety	C. I. No.	Average			Yield per acre											Years compared	Comparable[1] yield
												Average					
		Date mature	Days seeding to maturity	Height	1932	1933	1934	1935	1936	1937	1938	1932 to 1936	1932 to 1938	1924 to 1938	1932 to 1938		
			Number	*Inches*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Pounds*	*Number*	*Percent*
Short-grain:																	
Colusa	1600	Aug. 25	122	39	79.4	47.7	59.0	39.1	39.4	.....	.....	52.9	.....	.....	.....	5	90.3
Caloro	1561–1	Sept. 8	137	38	76.0	49.2	62.1	54.4	44.9	39.5	40.6	57.3	52.4	.....	2,358	7	100.0
Acadia	1988	Sept. 20	149	42	93.0	61.8	57.4	48.5	45.2	29.1	47.4	61.2	54.6	.....	2,457	7	104.2
Medium-grain:																	
Early Prolific	5883	Aug. 29	127	43	75.1	36.7	58.4	44.0	34.3	33.4	36.2	49.7	45.4	43.0	2,045	7	86.6
Zenith	7787	.....	.....	.....	.....	.....	.....	.....	.....	34.0	42.6	.....	[2]38.3	.....	.....	2	103.2
Shoemed	3625	Sept. 6	139	44	.....	43.5	62.8	50.6	45.2	34.4	46.7	[3]50.5	[4]47.2	.....	[4]2,123	6	101.5
Supreme Blue Rose	5793	Sept. 26	155	45	88.3	58.5	62.3	48.7	35.1	37.5	36.7	58.6	52.4	51.0	2,360	7	100.0
Long-grain:																	
Lady Wright	5451	Aug. 28	127	41	71.0	41.4	56.2	41.6	31.9	29.7	33.6	48.4	43.6	.....	1,964	7	83.2
Edith	2127	do	127	41	78.4	45.6	55.5	42.0	32.2	29.8	42.1	50.7	46.5	.....	2,093	7	88.7
Storm Proof	7705	Aug. 27	125	44	70.9	38.8	55.8	45.0	32.6	.....	.....	48.6	.....	.....	.....	5	82.9
Honduras	1643	Aug. 31	128	46	51.3	28.2	46.2	39.2	24.0	.....	.....	37.8	.....	[5]36.6	.....	5	64.5
Latex	7788	Sept. 1	128	42	.....	.....	56.2	37.7	30.5	25.4	40.6	.....	[6]38.1	.....	.....	5	86.4
Delitus	1206	Sept. 5	133	44	57.4	44.3	54.0	37.3	33.9	24.5	27.1	45.4	39.8	.....	1,791	7	76.4
Fortuna	1344	Sept. 19	148	51	85.4	66.6	62.9	71.4	44.3	39.7	48.1	66.1	59.8	53.2	2,690	7	114.1
Nira	2702	Sept. 21	148	54	.....	.....	57.2	60.6	44.2	37.4	39.5	.....	[6]47.8	.....	.....	5	108.4
Rexoro	1779	Oct. 13	172	49	78.6	68.2	72.1	71.0	48.9	34.9	59.9	67.8	62.0	.....	2,788	7	118.3
Iola	4559	Oct. 4	162	52	.....	65.7	61.8	57.2	40.3	35.2	45.3	[3]56.3	[4]50.9	.....	[4]2,292	6	109.5

[1] Percentage of standard variety Supreme Blue Rose. [2] 1937–38. [3] 1933–36. [4] 1933–38. [5] 1924–36. [6] 1934–38.

Blue Rose varieties, and the late-maturing long-grain Fortuna, Rexoro, and Nira varieties are as well suited for growing in Texas as they are for Louisiana.

BIGGS RICE FIELD STATION, BIGGS, CALIF.

The varieties were grown at the Biggs Rice Field Station in California on Stockton adobe clay soil, which is relatively fertile and well suited for rice culture. Each year the varieties were grown on land that was idle or fallowed the previous year.

The late-maturing medium- and long-grain varieties grown in the Southern States often fail to mature properly in California. The early, medium- and long-grain varieties can be grown, but they are not so well adapted as the short-grain varieties, and in cool autumn seasons often fail to set seed and mature normally.

The yields of nine varieties at the Biggs Rice Field Station are given in table 4. In the short-grain group the average yields of Colusa and Onsen, early-maturing varieties, were essentially the same, and considerably less than those of the later maturing Caloro, Selection No. 175, and Early Wataribune varieties. The average yields of the medium-grain Early Prolific and Calady varieties were similar, and both were considerably more productive than Lady Wright, a long-grain variety. Caloro and Colusa are the leading commercial varieties in California.

The results indicate that unless the market price of the medium-grain Early Prolific and Calady varieties is considerably higher than that of the short-grain varieties they cannot be grown so profitably as the short-grain varieties, owing to lower average yields.

EXPERIMENTAL FIELD NEAR ELSBERRY, MO.

In Missouri the varieties were grown on Wabash clay ("gumbo") soil on an experimental field near Elsberry. This heavy soil is difficult to till but is fertile and under favorable conditions produces high yields of adapted crops.

The annual and average yields of the varieties grown at Elsberry are given in table 5. Of the varieties grown at Elsberry Caloro × Colusa (231A pl. 12), Selection No. 289, Selection No. 176, Chinese Originario, Hattan No. 2, and Moriwase are not and have not been grown commercially. These varieties and selections are early-maturing short-grain rices similar in most respects to Colusa, and for this reason the yields are given. Of the varieties grown 8 years (1930–34 and 1936–38), the highest average yields were produced by the early-maturing short-grain selections and varieties, Caloro × Colusa (231A pl. 12), Nero Vialone × Caloro (221A165–8), Colusa, Selection No. 289, Chinese Originario, and Hattan No. 2. The average yields of these varieties and Caloro were essentially the same for the 8-year period. These were also the highest yielding early-maturing varieties in California. However, in California on old riceland Caloro was more productive than the early varieties listed.

Zenith, an early-maturing medium-grain variety, and Lady Wright, an early-maturing long-grain variety, gave lower average yields in

TABLE 4.—*Annual and average yields of rice varieties grown at the Biggs Rice Field Station, Biggs, Calif.*

Group and variety	C. I. No.	Average			Yield per acre												Years compared	Comparable[1] yield
		Date mature	Days seeding to maturity	Height	1932	1933	1934	1935	1936	1937	1938	Average						
												1933 to 1938	1932 to 1938	1924 to 1938	1919 to 1938	1932 to 1938		
Short-grain:			*Number*	*Inches*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Pounds*	*Number*	*Percent*
Colusa	1600	Sept. 19	138	36	103.2	44.0	90.0	57.7	89.8	84.1	100.1	77.6	81.3	77.9	68.3	3,657	7	86.7
Onsen		Sept. 17	136	36	106.1	45.0	93.4	52.3	90.2	81.2	89.6	75.3	79.7	75.5		3,586	7	85.0
Caloro	1561–1	Oct. 5	155	38	108.2	87.2	118.3	54.1	101.9	89.0	98.1	91.4	93.8	89.6	82.0	4,222	7	100.0
Selection No. 175		do	155	38	113.4	78.2	116.8	53.8	108.5	92.4	93.5	90.6	93.8	89.1	82.6	4,222	7	100.0
Early Wataribune	7789	do	154	38	116.4	77.7	105.6	56.7	106.7	87.8	86.5	86.8	91.1	86.8		4,098	7	97.1
Kairyo Shinriki	6363	Oct. 1	151	34	87.0	74.3	103.2	45.0	93.9	73.8	69.5	76.6	78.1			3,514	7	83.3
Medium-grain:																		
Early Prolific	5883	Sept. 30	149	38	82.6	75.8	102.7	46.1	78.7	74.3	84.5	77.0	77.8			3,501	7	82.9
Calady	7786	Oct. 6	156	39	85.1	85.6	98.3	39.6	74.8	71.4	74.2	74.0	75.6			3,400	7	80.6
Long-grain:																		
Lady Wright	5451	Sept. 29	143	39	49.9	62.6	102.2	36.2	67.1	63.6	79.9	68.6	65.9	64.4		2,966	7	70.3

[1] Percentage of standard variety Caloro.

TABLE 5.—*Annual and average yields of rice varieties grown at Elsberry, Mo.*

Group and variety	C. I. No.	Average			Yield per acre									Average			Years compared	Comparable [2] yield
		Date mature	Days seeding to maturity	Height	1930	1931	1932	1933	1934	1936	1937	1938	1939	1930 to 1939 [1]	1930 to 1938 [1]	1930 to 1938 [1]		
			Number	*Inches*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Pounds*	*Number*	*Percent*
Short-grain:																		
Caloro×Colusa (231A pl. 12)		Sept. 24	143	42	124.2	129.5	62.7	102.9	77.4	98.2	80.1	95.9	124.1	99.5	96.4	4,337	8	104.6
Nero Vialone×Caloro (221A-165-8)		Sept. 17	136	37	104.3	138.5	62.4	105.6	73.0	100.4	76.9	104.7	108.9	97.1	95.7	4,308	8	103.8
Selection No. 289		Sept. 25	144	41	106.2	127.7	65.6	100.7	70.6	101.6	79.5	84.9			92.1	4,145	8	99.9
Chinese Originario	6716	do	144	42	113.5	121.7	59.8	101.6	70.4	95.5	67.5	92.7			90.4	4,066	8	98.0
Colusa	1600	do	144	40	90.9	132.1	64.6	107.3	67.0	93.2	84.0	100.0	115.8	95.0	92.4	4,158	8	100.2
Hattan No. 2	6805	Sept. 23	142	40	93.7	126.8	63.2	100.6	66.2	98.2	75.6	78.0	118.9	91.3	87.8	3,951	8	95.2
Moriwase	5698	do	142	41	96.9	112.8	60.3	88.2	52.6	90.0	74.5	0 77.1	107.8	84.5	81.6	3,670	8	88.5
Caloro	1561–1	Oct. 7	154	40	102.7	142.3	50.2	96.0	65.9	121.5	77.4	81.3			92.2	4,148	8	100.0
Selection No. 175		do	156	43	100.2	128.8	51.3	97.8	44.1	115.7							6	93.0
Selection No. 176		Oct. 5	154	39	115.2	124.7	62.3	93.6	60.7								5	99.9
Medium-grain:																		
Zenith	7787	Sept. 26	132							69.3	68.4	68.3	94.9				3	73.6
Early Blue Rose	7785	Oct. 1	134	48			54.1	77.3	57.7								3	89.2
Long-grain:																		
Lady Wright	5451	Sept. 27	146	46	100.6	118.4	46.2	83.6	65.4	78.5	74.0	81.3	113.7	84.6	81.0	3,645	8	87.9

[1] Excluding 1935.
[2] Percentage of standard variety Caloro.

the years grown at Elsberry than the more productive early and late short-grain varieties. Similar results were obtained in California.

The results indicate that the varieties best adapted in California are also well adapted for growing at Elsberry. However, at Elsberry, owing to the relatively short growing season and fertile soil, the early-maturing varieties, such as Colusa and similar types tested, apparently can be grown to the best advantage. The early-maturing medium- and long-grain varieties can be grown, but they yield less than the more productive early short-grain varieties. Late-maturing short-, medium-, and long-grain varieties are not recommended for Missouri.

Comparison of Yields at Different Stations

The annual and 8-year average yields of five varieties grown at the Biggs Rice Field Station, Biggs, Calif., and at Elsberry, Mo., are shown in table 6. The average yields of Colusa, Caloro×Colusa (231A pl. 12), and Hattan No. 2, short-grain early-maturing varieties for the 8-year period were slightly higher in Missouri than in California. The average yield of Lady Wright, an early-maturing long-grain variety, was also higher in Missouri than in California, whereas Caloro gave a slightly higher average yield in California than in Missouri owing largely to the fact that it matures better in California.

The short-grain varieties are best suited to conditions in California and Missouri, because they are less sensitive to wide daily ranges in temperature during the flowering and ripening periods than are the commercial long- and medium-grain varieties now grown in the Southern States.

Table 6.—*Comparison of yields of 5 varieties at Biggs, Calif., and Elsberry, Mo.*

CALIFORNIA

Group and variety	C. I. No.	Yield per acre								
		1930	1931	1932	1933	1934	1936	1937	1938	Average
Short-grain:		*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*
Colusa	1600	83.1	81.6	103.2	44.0	90.0	89.8	84.1	100.1	84.5
Caloro × Colusa (231A pl. 12)		90.0	85.6	108.5	52.3	91.9	99.0	77.7	92.9	87.2
Hattan No. 2	6805	84.1	82.1	92.4	59.6	87.0	96.4	71.4	102.7	84.5
Caloro	1561–1	96.0	97.6	108.2	87.2	118.3	101.9	89.0	98.1	99.5
Long-grain:										
Lady Wright	5451	75.5	63.1	49.9	62.6	102.2	67.1	63.6	79.9	70.5

MISSOURI

Group and variety	C. I. No.	Yield per acre								
		1930	1931	1932	1933	1934	1936	1937	1938	Average
Short-grain:		*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*	*Bushels*
Colusa	1600	90.9	132.1	64.6	107.3	67.0	93.2	84.0	100.0	92.4
Caloro × Colusa (231Apl. 12),		124.2	129.5	62.7	102.9	77.4	98.2	80.1	95.9	96.4
Hattan No. 2	6805	93.7	126.8	63.2	100.6	66.2	98.2	75.6	78.0	87.8
Caloro	1561–1	102.7	142.3	50.2	96.0	65.9	121.5	77.4	81.3	92.2
Long grain:										
Lady Wright	5451	100.6	118.4	46.2	83.6	65.4	78.5	74.0	81.3	81.0

A summary of the average yields and other agronomic data at each station for the 5-year period 1932–36 is shown in table 7.

The average yield of each variety for the 5-year period was somewhat higher in Arkansas and Texas than in Louisiana, excepting Rexoro and Iola, which are too late to mature well in Arkansas. The early-maturing long-grain varieties and Supreme Blue Rose produced higher average yields in Texas than in Arkansas, but all other varieties, excepting Rexoro and Iola, were about equally productive at the two stations.

The average yields of Colusa and Lady Wright were lower and of Caloro and Early Prolific higher in California than in Missouri.

The average yields of Colusa, Caloro, Early Prolific, and Lady Wright, which were grown at all stations, were much higher in California and Missouri than in Arkansas, Louisiana, and Texas.

In Arkansas, Colusa matured in 120 days, in California in 138 days, and in Missouri in 144 days. Caloro matured in 133 days in Arkansas, and 155 days in California. Caloro requires as many days to mature in California and Missouri as Acadia, a late-maturing variety, does in the Southern States. Early Prolific required 126 days to mature in Louisiana, 149 days in California, and 153 days in Missouri. Early Prolific required nearly as many days to mature in California and Missouri as Blue Rose, a late variety, does in the Southern States. Lady Wright also required a much longer period to mature in California and Missouri than in the Southern States.

TABLE 7.—*Average data for 14 varieties grown at 3 southern stations and 4 varieties at all 5 stations*

Group and variety	C. I. No.	Arkansas			Louisiana			Texas			California			Missouri			Average	
		Date mature 1932–38	Days to maturity	Average yield 1932–36	Date mature 1932–37	Days to maturity	Average yield 1932–36	Date mature 1932–38	Days to maturity	Average yield 1932–36	Date mature 1932–37	Days to maturity	Average yield 1932–36	Date mature 1930–38[1]	Days to maturity[1]	Average yield 1932–37[1]	Arkansas, Louisiana, and Texas	California and Missouri
Short-grain:			*Number*	*Bushels*		*Number*	*Bushels*		*Number*	*Bushels*		*Number*	*Bushels*		*Number*	*Bushels*	*Bushels*	*Bushels*
Colusa	1600	[2] 9–10	120	47.9	[2] 8–31	129	24.1	[2] 8–25	122	52.9	9–20	138	76.9	9–25	144	83.2	41.6	80.1
Caloro	1561–1	9–24	133	57.3	9– 7	136	33.4	9– 8	137	57.3	10– 7	155	93.9	10– 7	154	82.2	49.3	88.1
Acadia	1988	10– 2	141	55.1	9–21	150	49.5	9–20	149	61.2							55.3	
Medium-grain:																		
Early Prolific	5883	9–18	127	49.3	8–28	126	22.6	8–29	127	49.7	10– 1	149	77.2	[3] 10– 2	[3] 153	[3] 63.0	40.5	70.1
Shoemed	3625	9–22	130	45.3	9– 3	132	31.4	9– 6	139	[4] 50.5							42.4	
Supreme Blue Rose	5793	10– 9	148	41.7	[5] 9–27	[5] 156	[5] 37.6	9–26	155	58.6							46.0	
Long-grain:																		
Lady Wright	5451	9–18	127	42.3	8–27	125	24.0	8–28	127	48.4	9–30	148	63.6	9–27	146	69.5	38.2	66.6
Edith	2127	9–18	127	39.5	8–28	126	22.4	8–28	127	50.7							37.5	
Storm Proof	7705	[2] 9–17	127	36.9	[2] 8–27	125	24.2	[2] 8–27	125	48.6							36.6	
Honduras	1643	[2] 9–19	129	26.7	[2] 8–28	126	19.1	[2] 8–31	128	37.8							27.9	
Delitus	1206	9–25	133	34.6	9– 5	134	33.7	9– 5	133	45.4							37.9	
Fortuna	1344	10– 3	142	52.2	9–20	149	46.3	9–19	148	66.1							54.9	
Rexoro	1779	11–13	182	5.1	10–15	174	45.7	10–13	172	67.8							[6] 56.8	
Iola	4559	11– 3	173	19.5	10– 6	165	45.3	10– 4	162	[4] 56.3							[6] 50.8	

[1] 1935 omitted.
[2] Average 1932–36.
[3] Average 1932, 1933, 1934, Early Blue Rose.
[4] Average 1933–36.
[5] Blue Rose.
[6] Average Louisiana and Texas.

The effect of climatic conditions on date of maturity is not generally appreciated by rice growers, and for this reason they often assume that if, for example, Blue Rose matures in 155 days in Texas it also will mature in the same number of days in California. This, however, is not the case for even though Blue Rose matures in 155 days in Texas it may fail to mature in a much longer period in California. Likewise, late-maturing California varieties mature relatively early in the Southern States and, for this reason, may be disappointing in yield. Rice growers who ignore this relationship often sustain rather heavy financial losses.

Experiments in the Southern States have also shown that rice varieties differ in their seasonal reactions when sown on different dates. Based on the time required to mature when sown on different dates, the varieties may be grouped as (1) sensitive, and (2) indifferent. The sensitive varieties, Colusa, Caloro, Acadia, Wataribune, and Blue Rose, show a gradual but marked decrease in the number of days required to reach maturity when sown on successively later dates, whereas the indifferent varieties, Fortuna, Nira, Rexoro, Iola, Delitus, Zenith, and Early Prolific, show a smaller and less consistent shortening of the growth period as sowing is delayed.

For example, at Crowley, La., the 6-year-average period from seeding to maturity for the sensitive varieties, Caloro and Blue Rose, and the indifferent varieties, Early Prolific and Fortuna, was 170, 186, 143, and 164 days, respectively, when sown March 17, and 112, 132, 119, and 144 days, respectively, when sown June 1.

The sensitive varieties, regardless of the date of seeding if between March 15 and June 1, are inclined to mature at nearly the same time in the fall, whereas the indifferent varieties are more likely to mature after an approximate period of growth regardless of date of seeding. The indifferent varieties tend to mature correspondingly later as seeding is delayed than do the sensitive varieties. The sensitive varieties are not, therefore, well suited for use when it is desired to extend the harvest over a long period, but they are well suited for seeding late in the spring because they have the ability to mature in a relatively short time. On the other hand, the indifferent varieties are well adapted when it is desired to extend the harvest over a long period, but they are not suitable for seeding late in the spring, because they may fail to mature.

Milling Quality

The milling quality of the varieties grown in Arkansas and Texas was determined for several years by means of the Smith Shelling Device, and in California with the McGill Miller. The average results of the milling tests in Arkansas and Texas show that the short-grain varieties, Colusa, Caloro, and Acadia, gave higher yields of head rice (whole kernels) than the medium-grain varieties Supreme Blue Rose, Early Prolific, Zenith, and Shoemed; and Supreme Blue Rose, Early Prolific, and Zenith gave higher average yields of head rice than the early- and late-maturing long-grain varieties Lady Wright, Edith, Fortuna, Nira, and Rexoro.

The average yields of head rice for the short-grain varieties in Arkansas and Texas ranged from 92 to 97 pounds, for the commercial

medium-grain varieties from 85 to 92 pounds, and for the commercial long-grain varieties from 46 to 84 pounds per barrel of 162 pounds of rough rice. The average total yield of milled rice was also slightly higher for the short-grain than for the medium-grain varieties, and the long-grain varieties, as a group, gave the lowest average total yield of milled rice.

In California, the average indicated yield of head rice for Calady was 97 pounds, for Early Wataribune 91, for Selection No. 175, 89, for Caloro 88, for Colusa 82, for Onsen 72, for Early Prolific 74, and for Lady Wright 73. The late-maturing short-grain varieties Early Wataribune, Selection No. 175, and Caloro gave higher average yields of head rice than the early short-grain varieties Colusa and Onsen, but less than Calady, a late medium-grain variety. Early Prolific, a medium-, and Lady Wright, a long-grain variety, gave rather low average yields of head rice as compared with better early and later maturing short-grain varieties. All varieties in California gave about the same average total yield of milled rice.

The yields of head rice (milling quality) for a given variety vary materially from year to year. This is due largely to variable climatic conditions during the period of ripening, the effect of diseases, the way the crop is harvested and handled prior to milling, the stage of maturity at harvest, and the moisture content of the rough rice when milled. Generally, rice that matures during a period of high temperatures, or a period of wide daily ranges in temperature and humidity, is of lower milling quality than rice that matures more slowly under relatively uniform temperatures and humidity conditions.

CONCLUSIONS

A brief description of the rice varieties grown in the United States and their yields in the principal rice-producing States are reported. The varieties grown include early-, midseason-, and late-maturing short-, medium-, and long-grain types.

In Arkansas, Louisiana, and Texas, Caloro and Acadia short-grain; Zenith, Early Prolific, and Blue Rose medium-grain; and Edith, Fortuna or Arkansas Fortuna, Nira, and Rexoro long-grain varieties were the most productive of the three grain types, and all are well suited for growing in these States, except Rexoro, which cannot be grown successfully in Arkansas owing to late maturity. In California and Missouri, Caloro and Colusa produced high yields as did also Caloro × Colusa (221A pl. 12) and Nero Vialone × Caloro (221A165–8). In these States Early Prolific, Zenith (medium-grain), and Lady Wright (long-grain) can also be grown, but they are less productive than the better early- and late-maturing short-grain varieties.

From the varieties listed each grower should select for growing a set of two or three varieties that differ in date of maturity and grain type. By so doing the principal advantages are: (1) The harvest can be extended over a period of a month or more, which results in a more efficient use of labor and harvesting equipment; (2) the early rice harvested may be sold to help finance the harvesting of late varieties; and (3) rice of different grain types will be available for sale, thus enabling the grower to take advantage of such variations in prices of different types as may occur from year to year.

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