COMPREHENSIVE RESEARCH ON RICE
ANNUAL REPORT

January 1, 1983 - December 31, 1983

PROJECT TITLE: Cooperative Extension Rice Variety Adaptation and Cultural Practice Research

PROJECT LEADER AND PRINCIPAL UC INVESTIGATORS:

Project Leader: James E. Hill, Extension Agronomist and Associate in the Experiment Station

Principal UC Investigators: L. A. Post, SRA (UCD) and Farm Advisors M. Feyler (Stanislaus), M. Canevari (San Joaquin), S. C. Scardaci (Colusa), C. M. Wick (Butte), J. F. Williams (Sutter), and D. E. Snell (Fresno)

LEVEL OF 1983 FUNDING: $46,000.00

OBJECTIVES AND EXPERIMENTS CONDUCTED BY LOCATION TO ACCOMPLISH OBJECTIVES:

Objective I

Determine the adaptation of improved experimental rice lines to the rice production areas of California to maximize yield and quality.

Statewide Uniform Rice Variety Tests

Very Early Maturity Group - Three uniform tests were conducted; at the Rice Experiment Station (Butte County), the Lauppe Ranch (Natomas-Sacramento-Sutter County), and the Beck Ranch (Stanislaus County). Twenty-two experimental lines and several commercially available varieties were included.

Early Maturity Group - Five uniform tests were conducted; at the Rice Experiment Station (Butte County), the R. and L. Grell Ranch (Butte County), the Wylie Ranch (Colusa-Glenn Counties), the Mohammed Ranch (Yuba County), and the Geer Ranch (District 108, Yolo County). Twenty experimental lines and several commercially available varieties were included.

Late Maturity Group - Three uniform tests were conducted; at the Rice Experiment Station (Butte County), the Nevis Industries Ranch (Sutter County), and on Terhel Farms (Glenn County). Twenty-one experimental lines and four commercially available varieties were included. Because of spring rains the number of late maturity tests were reduced from four in previous years to three in 1983. The variety testing program may continue to emphasize early and very early variety tests in the future because of

the high interest in these varieties by the California rice producer.

Special Long Grain Test - Two uniform tests were conducted; at the Rice Experiment Station (Butte County) and the Geer Ranch (District 108, Yolo County). Twenty-two experimental lines were included along with two commercially available long grains (California Belle and L-201) and two medium grain standards (M-201 and M-302).

Commercial Variety Tests

Commercial variety tests were conducted on the Paulus Ranch (San Joaquin County) and on the Britz Ranch (Fresno County). The San Joaquin County trial also included variety by nitrogen treatments.

Objective II

Provide research on the improvement of cultural practices related to fertilizer management, seed coating, and other aspects of rice production.

1. Coated seed tests

Five tests comparing coated and presoaked noncoated seed were made in Butte County (2), Yuba County, and Sacramento County (2). The purpose of these trials was to determine if stand density remained the same for both methods of planting and if delays in stand emergence occurred (the latter potentially affecting timing of early herbicide application as well as stand vigor).

2. Rice nutrition tests

Three trials were conducted in Colusa County (2) and Glenn County to determine the proper timing of postplant nitrogen applications.

One potassium by nitrogen trial was conducted in Yuba County. A starter fertilizer test, a slow release nitrogen trial and a nitrification inhibitor trial were conducted in Colusa County.

Objective III

To provide professional assistance to field research projects of UC rice research project leaders; to maintain a UCD Agronomy Extension-based rice project equipment pool for planting, fertilizing and harvesting field experiments.

Forty-nine rice field experiments were planted or harvested with the UC rice equipment. Twenty-three of these were directly related to this project (RM-2). Others included six rice disease studies conducted by Dr. R. K. Webster (RP-2); three rice water weevil studies to verify monitoring techniques to determine if treatment is needed (conducted by Craig Weakley, Carl Wick and Jack Williams); eight trials on nitrogen inhibitors, growth regulators and slow-release fertilizers conducted by Dr. D.

S. Mikkelsen; and nine trials on weed control conducted by Dr. D. E. Bayer and J. E. Hill.

SUMMARY OF 1983 RESEARCH OBJECTIVE:

Objective I

Statewide Uniform Rice Variety Tests

Thirteen variety evaluation trials were conducted in ten locations ranging from Butte to Stanislaus counties as described above. A total of 82 experimental cultivars were tested. Additional public and proprietary varieties were also included to serve as standards and to develop additional information on their performance over years. The seed for experimental cultivars and standard public varieties were provided by the Rice Experiment Station. Proprietary varieties were obtained from their respective owners. Four of the variety tests were conducted on the Rice Experiment Station by the plant breeders, H. L. Carnahan, S. T. Tseng and C. Johnson.

The over-location averages for each maturity group will be reported here. A detailed Agronomy Progress Report to be published later will provide the results for individual locations.

Summary of the Very Early Variety Tests (>90 days to 50% heading at Biggs)

A summary of the two-location analysis of the very early trials at Biggs (the Rice Experiment Station) and Sacramento County are given in Table 1. The Stanislaus County trial was highly variable as a result of uneven water depth and possibly other factors and is not included in this analysis. Agronomic data from the Stanislaus trial will be summarized separately in an Agronomy Progress Report. Three standards were included in both locations, Cal Pearl, M-9, and M-101. The off-station test also included California Belle, Calmochi 202, M-201, M-302, and S-201. No long grain experimental cultivars were included in the very early tests.

Seventeen of 25 cultivars yielded over 10,000 lbs/A as an average of two locations, indicating the tremendous yield potential of the commercial as well as experimental cultivars. Of the commercially available varieties, Cal Pearl and M-9 yielded 10,490 lbs/A and M-101 9,460 lbs/A in the two-location average. In the Biggs test M-9, Cal Pearl and M-101 ranked 3rd, 17th, and 24th, respectively, whereas in the off-station test Cal Pearl, M-9, and M-101 ranked 2nd, 11th, and 28th, respectively. In the off-station tests the ranking of commercially available varieties among the total of 30 entries was as follows: Cal Pearl (2nd - 10,640 lbs/A), Calmochi 202 (6th - 10,190 lbs/A), S-201 (8th - 10,090 lbs/A), M-9 (11th - 9,860 lbs/A), M-201 (16th - 9,710 lbs/A), M-302 (21st - 9,450 lbs/A), M-101 (28th - 9,000 lbs/A), and California Belle (30th - 8,480 lbs/A) with 780 lbs/A required for a difference to be considered significant at the 5% level. Among commercial varieties Cal Pearl produced good yields for the second consecutive year. M-9 has also out-yielded M-201 in this location

for the third year indicating that although M-201 is superior to M-9 in most rice climates, it appears to yield less in the cooler Natomas area.

Several experimental cultivars are in second, third or fourth years of off-station testing. In 1981 and 1982 the highest yielding cultivars were predominately short grain types, whereas in 1983 both medium and short grain cultivars are in the highest yielding group. The Rice Experiment Station and the University of California are working cooperatively to identify improved very early cultivars. Among the goals are to find (1) an improved variety to replace M-101, (2) a cool region medium grain substitute for M-9 or M-201 and (3) a very early pearl. 81-y-124, entry number 10 in this test, represents a potential variety for cool regions and a preliminary increase of seed may be made in 1984 in anticipation of possible release. Other additions or replacements may exist within the experimental cultivars tested this year, but only 81-y-124 has been tagged for preliminary increase at this time.

Summary of the Early Rice Variety Tests (90-97 days to 50% heading at Biggs)

Table 2a shows the agronomic performance of the early cultivars tested over five locations. Table 2b shows the four location average of the eight commercial varieties tested off-station in grower fields only. Five standard varieties, California Belle, Calmochi 202, M-9, M-201 and S-201, were included in all five locations whereas Cal Pearl, M-101 and M-302 were added to the four off-station sites. Cal Pearl was the leading commercial variety in the four off-station tests where it was entered with a yield of 9,330 lbs/A. Over five locations the leading variety was S-201, producing 9,310 lbs/A, whereas the lowest was California Belle yielding 7,570 lbs/A.

A number of experimental cultivars in the early tests produced very high yields. Several of these represent potential new varieties. 81-y-124, previously discussed in the very early test, was also entered in the early test (number 36) to evaluate its performance in a broader range of environments. This cultivar was approximately equal in yield to Cal Pearl in the four location average.

One of the goals of the rice variety development program has been to develop a high yielding long grain with acceptable market quality. 81-y-295 (82-y-21), number 44 in the early test, is a candidate for release as L-202. This cultivar is a short stature (note the plant height in Table 2a) rather than an intermediate height long grain such as L-201 or California Belle. This cultivar ranked 10th and 4th in the five and four location averages, respectively, but was not statistically different from the leading variety in either case. Yields were approximately 1,500 lbs/A better than California Belle. The status of this cultivar as a varietal release depends heavily on the results of tests on appearance, cooking quality, and other marketing factors.

Other experimental cultivars are being evaluated on the basis of improved cold tolerance to blanking, increased yield and other factors. As examples, 82-y-33 (number 33) is an apparently improved mochi type,

83-y-45 (number 45) is a promising early to very early long grain (approximately five days earlier than the candidate for L-202) and 82-y-52 (number 52) may have improved cooking qualities for a long grain.

Summary of the Intermediate and Late Rice Variety Tests (97-105 and >105 days to 50% heading at Biggs)

Table 3 shows the agronomic performance of the three location average of the late variety tests. Four standard varieties, Calrose 76, M-7, M-302 and M-401, were included. M-401 was the leading variety producing 9,660 lbs/A. M-7 yielded 8,660 lbs/A in the same tests. M-401 has consistently out-yielded M-7 in past years excepting 1982 when cool weather and high nitrogen levels caused early and excessive lodging in the variety M-401 (see 1982 report).

A number of the late experimental cultivars look promising from the standpoint of yield and other agronomic characteristics, however, none have been clearly identified as potential varietal candidates at this time. Probably the closest to release would be an intermediate or late pearl, however, the tendency to move toward early and very early varieties is widely accepted by the rice industry and the need for an intermediate, or especially a late pearl, has not been established.

Summary of the Long Grain Test

The results of the two location long grain test are shown in Table 4. The standard varieties included California Belle, L-201, and the medium grains M-201, and M-302. M-201 was the leading variety at 10,330 lbs/A whereas California Belle was lowest at 8,460 lbs/A.

Nine experimental long grains in addition to M-201 yielded over 10,000 lbs/A. 81-y-295 (number 452) is the same as entry number 44 in the early test or the candidate for L-202. This entry ranked fourth in the long grain test at 10,550 lbs/A or approximately equal to M-201 and nearly 1,000 and 2,000 lbs/A over L-201 and California Belle, respectively.

Commercial Variety Tests

Commercial variety tests are conducted in areas where it is not possible to have one of the large regional variety adaptation tests. These smaller tests contain only those commercial varieties that are appropriate for the area and planting date of the test conditions. Two of these tests were conducted in 1983, in Fresno and San Joaquin counties. The Fresno County test was highly variable with no significant differences between the 12 varieties tested. The San Joaquin test contained only four varieties, Cal Pearl, Earlirose, M-101, and S-201, by five nitrogen rates, 0, 50, 100, 150, and 200 lbs/A. Tables 5a to 5e show the yield, moisture at harvest, lodging, days to 50% heading, and seedling vigor at each of the nitrogen rates. Cal Pearl was the leading variety in yield. Earlirose, however, had the highest yield at the low N rate, but lodged at higher N rates. Cal Pearl was the driest at harvest at all N rates, and did not increase in moisture with increasing N as rapidly as did the other varieties.

Objective II

Several studies were conducted on cultural practices by farm advisors under the umbrella of this report. These included coated seed tests, post-plant N timing tests, starter fertilizer tests, potassium nutrition test, studies on a rice growth model and others. The progress of these tests is summarized below.

Field Evaluation of a Rice Seed Coating - Butte, Sacramento, Sutter, and Yuba Counties

Replicated trials comparing standard soaking with commercially prepared coated seed, were established. Matched lots of M-201, S-201 and M-9 varieties were planted at an equal number of seeds per square foot in both soaked and coated treatments. The coating contained talc, wood molasses, zinc oxide and a fungicide. Yield, harvest moisture, plant growth rate, stand, vigor, heading data and midge damage were measured.

Preliminary data shows that differences occurred in several of the variables measured and suggests that further study is justified to more completely evaluate this practice as it affects growth and yield of rice. However, data from the 1983 trials is still being analyzed and a full report cannot be made at this time.

Rice Postplant Nitrogen Timing Trials - Colusa County

Preplant nitrogen applications are more efficient than split applications. Even so, postplant nitrogen deficiencies do occur and midseason applications are sometimes necessary. Previous studies on the proper postplant application timing have shown a slight decrease in yield at some application times. The present studies were initiated to determine if these observations were valid, and if so, to better define the problem.

In 1982 and 1983, eight trials were established to study postplant nitrogen application timing. Leaf samples were taken at various plant growth stages and analyzed to monitor plant nitrogen levels over time.

In 1982, two of the five trials and in 1983 one of the three trials were lost due to fertilizer overflights in the trials. Results for individual trial locations show significant nitrogen timing trends, however, the trends differ. The nitrogen plant tissue analyses from this year's trials hopefully will help explain some of these differences when the data becomes available. Further work in this area is needed.

Potassium Nutrition of Rice - Yuba County

One replicated potassium by nitrogen experiment was established on a potassium deficient soil in District 10 of Yuba County. This trial is identical to two done in 1982, one at the same location. Data is still being analyzed, but it appears that there was a significant yield increase of 9 to 12% with rates of potassium chloride up to 200 lbs/A. Split

applications were less effective. Extra nitrogen did not increase yield. These results are comparable to those from last year, and suggest that some soils in the area are gradually running out of potassium. Leaf and soil samples complement the yield data, and are adding to our ability to predict and manage this difficult nutritional problem. Stem disease did not develop sufficiently to evaluate, as in 1982.

Starter Fertilizer Trial - Colusa County

Several new fertilizers, whose performance as starter fertilizers in rice is unknown, were compared to a standard starter fertilizer.

A trial testing the efficacy of these starter fertilizers as compared to 16-20-0 was conducted in cooperation with local growers and experiment station staff. The trial was established in a field which was deficient in zinc and near deficient in phosphorus. The fertilizers were applied at various rates and combinations of nitrogen, phosphorus and zinc. At the seedling stage, plant samples were taken to determine plant dry weights (a relative growth measurement), and to analyze the plants for nitrogen, phosphorus and zinc content. Later, heading dates, plant heights, lodging and yield of the various plants were measured.

Results (Table 6) show that the performance of US18-18 or US10-20 is not significantly different from 16-20-0 as a starter fertilizer for rice. Rice fertilized with US18-18 (20 lb N and 20 lb P_2O_5 per acre with or without zinc), though not significantly different from 16-20-0 (at the same rate with or without zinc), produced slightly smaller seedlings and yielded 160 to 340 pounds less than 16-20-0. Rice fertilized with US10-20 (20 lbs N and 40 lbs P_2O_5 per acre) produced seedlings of similar size as, and yielded about the same as, rice fertilized with 16-20-0 (at the same rate). Plants responded to US28 (contains nitrogen only) but because the soil was deficient in phosphorus the response was less than adequate. The situation, as indicated by the soil analysis, required a starter fertilizer containing phosphorus.

Super 60/Urea and Nitrification Inhibitor Trials - Colusa County

Nitrogen losses in rice can be substantial if fields are drained and allowed to aerate for a significant length of time (7 to 10 days or more). If fields must be drained, several approaches are available to minimize these losses; one is to use slow release nitrogen sources and another is to inhibit nitrification (the process of conversion of ammonium to nitrate), the first step in the nitrification-denitrification loss process.

During 1983, two trials, one testing a slow release nitrogen fertilizer source and another testing anitrification inhibitor, were established in cooperation with Experiment Station staff. In the first trial, the efficacy of Super 60, a slow release nitrogen source, was compared to Urea, each being applied at various rates. In the other trial, the efficacy of Urea treated with a nitrification inhibitor was compared to Urea without the inhibitor, each at various rates. Leaf samples from all plots

were taken at various plant growth stages to monitor the plant's nitrogen status during the season.

Results from leaf tissue analysis of the super 60/Urea trial showed that Super 60 did not become widely available to the rice plant in the early to midseason growth stages. Although Super 60-treated plants became nitrogen deficient during this period, there were no differences in yield between rice plants treated with Super 60 or urea at the same rates.

Results from the nitrification inhibitor trial show that rice fertilized with Urea treated with DCD yielded slightly higher (300 to 400 pounds) though not significantly higher, than rice fertilized with Urea alone.

PUBLICATIONS OR REPORTS:

The following publications resulted from this project. Information from this project hs also been used in numerous popular articles in magazines, newspapers, radio reports and selected information was presented to rice growers at meetings and field days.

1. Hill, J. E., L. A. Post, M. Canevari, M. Feyler, D. Snell, S. C. Scardaci, C. M. Wick and J. F. Williams. 1983. Comprehensive Rice Research; Annual Report 1982, 69-85.

2. Scardaci, S. C. and K. D. Olson. 1983. Rice production costs: Colusa, Glenn and Yolo Counties. 12 pp.

3. Hill, J. E., L. A. Post, S. C. Scardaci, J. F. Williams, C. M. Wick, M. Canevari and B. Weir. August 1982. California rice varieties: Description and performance summary of the 1980 and multi-year rice variety tests in California. 22 pp.

4. Hill, J. E., L. A. Post, S. C. Scardaci, J. F. Williams, B. L. Weir, M. L. Feyler, C. M. Wick, D. E. Snell and W. M. Canevari. March 1983. California rice varieties: Description and performance summary of the 1981 and multi-year statewide rice variety tests in California. 22 pp.

5. Hill, J. E., L. A. Post, S. C. Scardaci, J. F. Williams, B. L. Weir, C. M. Wick, D. E. Snell, W. M. Canevari and M. L. Feyler. March 1983. California rice varieties: Description and performance summary of the 1982 and multi-year statewide rice variety tests in California. 25 pp.

6. Carnahan, H. L., C. W. Johnson, S. T. Tseng, J. J. Oster and J. E. Hill. 1982. Registration of M-201 rice. Crop Science, 22:1087-1088.

CONCISE GENERAL SUMMARY OF CURRENT YEAR'S RESULTS:

In the regional variety testing program nine uniform trials were conducted in several rice growing regions in cooperation with the Rice Experiment Station, USDA and proprietary plant breeders. Four nearly similar tests were conducted by the plant breeders on the Rice Experiment Station. Two smaller variety tests containing only commercially available varieties were conducted in Fresno and San Joaquin counties.

In the Very Early Maturity test, Cal Pearl and M-9 were the leading entries. A number of experimental cultivars yielded equally as well. One experimental cultivar, 81-y-124, showed considerable promise for the second year as a potential medium grain variety. In the Early Maturity test, Cal Pearl was the leading variety in the off-station sites where it was included, followed by M-9 and S-201. California Belle was the lowest producing commercial variety in all tests. An experimental long grain cultivar, 81-y-295 (82-y-21), produced yields equivalent to the leading commercial varieties. This entry is a candidate to become a new publicly developed long grain variety, L-202. A number of other experimental cultivars show considerable promise to replace existing varieties and/or for special needs of the rice industry. In the Late Maturity test, M-401 was the highest yielding commercial variety. This variety has out-yielded M-7 in every year but 1982 where cool weather and high fertility caused M-401 to lodge severely. No experimental cultivars in the late group are currently under consideration for varietal release, however, many of them are improved types.

A number of experiments on the techniques of rice culture were established in various locations throughout the rice growing areas. Some of these tests are summarized in detail in this report whereas others are in the first year of study and only preliminary information has been obtained.

Objective III

Other rice project leaders continued to receive technical support from this project on planting, fertilizing, harvesting and other aspects of field plot work. The total number of tests has previously been described in the "objectives and experiments by location" section of this report.

Table 1. 1983 Very Early Rice Variety Trial - Two Location Summary

1982 entry no.	Cultivar description	Grain[1] type	Grain yield @ 14% moisture (lbs/acre)	Grain moisture @ harvest (%)	Duncan's test	Seedling[2] vigor (1-5)	Days to 50% heading	Plant height (cm)	Lodging[3] (1-99)
10	81-y-124	M	10980(1)	20.9(15)	a	4.5(11)	85(10)	86(15)	1(22)
14	82-y-14	S	10560(2)	22.8(6)	ab	4.9(5)	88(6)	91(5)	7(16)
3	82-y-122	S	10560(3)	22.0(11)	ab	5.0(1)	89(5)	89(10)	7(17)
20	83-y-20	M	10500(4)	17.6(24)	abc	4.8(6)	82(17)	94(2)	13(13)
25	Cal Pearl	S	10490(5)	16.3(25)	abcd	5.0(2)	83(15)	86(13)	3(19)
2	M-9	M	10490(6)	22.9(5)	abcd	4.5(12)	88(7)	93(3)	17(11)
12	82-y-162	M	10360(7)	18.3(22)	abcde	4.8(8)	84(14)	90(7)	21(7)
17	82-y-17	S	10350(8)	23.1(4)	abcde	4.9(4)	89(4)	89(11)	18(10)
6	82-y-130	S	10340(9)	23.7(1)	abcde	4.9(5)	96(1)	84(17)	2(21)
15	82-y-15	S	10310(10)	22.7(7)	abcde	4.9(5)	90(3)	91(6)	11(14)
9	82-y-138	S	10280(11)	23.1(3)	bcde	4.6(10)	92(2)	86(14)	1(22)
13	81-y-35	M	10240(12)	22.7(8)	bcde	4.7(9)	88(8)	84(18)	1(22)
4	80-y-24-B	S	10240(13)	21.3(12)	bcde	4.6(10)	83(15)	84(16)	19(8)
11	81-y-154	S	10230(14)	22.3(9)	bcde	4.8(8)	89(4)	84(18)	1(22)
21	82-y-126	Wxy	10190(15)	18.8(21)	bcde	4.8(7)	80(21)	83(20)	24(6)
23	82-y-172	M	10160(16)	21.3(13)	bcde	4.8(8)	85(11)	84(18)	2(20)
24	83-y-24	M	10020(17)	19.4(20)	bcdef	4.8(8)	81(19)	88(12)	9(15)
8	82-y-166	M	9980(18)	22.2(10)	bcdef	5.0(1)	84(12)	90(8)	4(18)
7	82-y-168	M	9930(19)	20.2(16)	bcdef	4.9(4)	83(16)	90(9)	19(9)
19	82-y-19	M	9850(20)	21.0(14)	bcdef	5.0(1)	84(14)	96(1)	45(2)
5	80-y-138A	S	9800(21)	19.6(18)	cdef	5.0(1)	84(13)	84(19)	16(12)
18	82-y-18	M	9780(22)	23.1(2)	def	4.5(12)	86(9)	92(4)	32(5)
22	82-y-182	M	9660(23)	20.2(17)	ef	4.8(8)	83(16)	91(6)	38(3)
1	M-101	M	9460(24)	19.4(19)	f	4.8(8)	81(18)	89(11)	35(4)
16	82-y-104	Wxy	9380(25)	17.9(23)	f	5.0(3)	80(20)	80(21)	60(1)
GRAND MEAN			10170	20.9		4.8	85	88	16
CV			5.7	5.7		6.8	2.2	4.1	114.5
LSD (.05)			578	1.2		0.32	1.9	3.5	18.2

[1]S = short; M = medium; L = long; Wxy = waxy.
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence at 28 days after planting.
[3]Subjective rating of 1-99 where 1 = 1% lodging and 99 = 99% lodging.

Table 2a. 1983 Early Rice Variety Trial - Five Location Summary

1982 entry no.	Cultivar description	Grain[1] type	Grain yield @ 14% moisture (lbs/acre)	Grain moisture @ harvest (%)	Duncan's test	Seedling[2] vigor (1-5)	Days to 50% heading	Plant height (cm)	Lodging[3] (1-99)
36	81-y-124	M	9500(1)	21.2(15)	a	4.2(5)	89(19)	93(10)	16(13)
52	82-y-52	L	9390(2)	20.0(17)	ab	3.8(14)	93(6)	86(22)	2(20)
45	83-y-45	L	9360(3)	18.5(21)	ab	4.0(11)	86(24)	89(20)	10(14)
42	81-y-215	M	9350(4)	21.7(11)	ab	4.2(8)	93(7)	90(15)	21(9)
31	S-201	S	9310(5)	21.7(12)	ab	4.3(2)	93(4)	91(14)	21(10)
40	82-y-270	M	9300(6)	21.8(10)	ab	4.3(2)	92(9)	93(10)	21(8)
41	81-y-35	M	9260(7)	22.5(6)	abc	4.3(4)	91(17)	89(19)	24(6)
35	80-y-136	S	9230(8)	21.6(13)	abcd	4.3(3)	92(11)	91(12)	23(7)
29	M-9	M	9200(9)	22.9(3)	abcd	4.1(10)	91(18)	94(8)	33(3)
44	81-y-295	L	9130(10)	19.3(19)	abcd	3.8(16)	92(14)	81(23)	1(21)
30	M-201	M	8940(11)	22.7(5)	bcde	4.2(6)	91(15)	89(18)	1(21)
37	82-y-251	M	8930(12)	22.5(7)	bcde	4.2(7)	93(5)	91(13)	7(15)
51	82-y-448	L	8930(13)	20.0(16)	bcde	3.8(15)	92(12)	86(21)	1(21)
47	82-y-311	L	8880(14)	16.0(25)	bcde	4.5(1)	87(23)	104(1)	3(18)
38	81-y-110	S	8760(15)	22.2(8)	cdef	4.1(9)	92(8)	93(10)	19(12)
34	82-y-257	M	8720(16)	21.5(14)	def	4.2(6)	89(20)	98(4)	37(1)
50	82-y-396	L	8570(17)	19.6(18)	efg	3.1(18)	91(16)	89(16)	3(19)
39	82-y-280	M	8430(18)	23.2(2)	efg	4.3(4)	96(2)	96(6)	5(16)
43	83-y-43	M	8410(19)	21.9(9)	efg	4.1(10)	92(13)	89(17)	5(17)
48	82-y-386	L	8340(20)	19.1(20)	fg	4.0(12)	92(10)	93(11)	1(21)
33	82-y-33	Wxy	8250(21)	22.8(4)	fg	3.8(13)	95(3)	94(9)	26(5)
32	Calmochi 202	Wxy	8050(22)	23.7(1)	gh	4.2(7)	96(1)	97(5)	19(11)
46	82-y-297	L	7760(23)	18.2(23)	h	4.0(12)	89(21)	98(3)	1(21)
49	82-y-394	L	7640(24)	18.2(22)	h	4.2(8)	82(25)	95(7)	33(2)
53	Calif. Belle	L	7570(25)	17.3(24)	h	3.2(17)	87(22)	102(2)	27(4)
GRAND MEAN			8770	20.8		4.0		93	14
CV			8.3	5.8		7.5		4.8	72.1
LSD (.05)			455	0.8		0.19		2.8	6.4

[1]S = short; M = medium; L = long; Wxy = waxy.
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence at 28 days after planting.
[3]Subjective rating of 1-99 where 1 = 1% lodging and 99 = 99% lodging.

Table 2b. 1983 Four Location Summary of Public and Proprietary Varieties in the Early Test

1983 entry no.	Cultivar description	Grain type[1]	Grain yield @ 14% moisture (lbs/acre)	Grain moisture @ harvest (%)	Seedling vigor (1-5)[2]	Days to 50% heading[4]	Plant height (cm)	Lodging (1-99)[3]
54	Cal Pearl	S	9330	18.2	3.9	85	94	6
29	M-9	M	8950	23.5	3.9	91	96	38
31	S-201	S	8860	21.8	4.2	93	93	25
30	M-201	M	8670	23.4	4.0	91	91	1
55	M-101	M	8190	20.4	4.0	83	96	55
56	M-302	M	7590	23.6	3.9	97	96	25
32	Calmochi 202	S	7500	24.1	4.0	96	98	24
53	California Belle	L	7240	17.8	2.9	87	103	33
CV			9.6	6.4	8.8	1.5	4.9	65.9
LSD (.05)			560	0.9	0.2	1	3	8

[1]S = short; M = medium; L = long.
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence at 28 days after planting.
[3]Subjective rating of 1-99 where 1 = 1% lodging and 99 = 99% lodging.
[4]Based on three location summary.

Table 3. 1983 Late Variety Trial - Three Location Summary

1982 entry no.	Cultivar description	Grain[1] type	Grain yield @ 14% moisture (lbs/acre)	Grain moisture @ harvest (%)	Duncan's test	Seedling[2] vigor (1-5)	Days to 50% heading	Plant height (cm)	Lodging[3] (1-99)
72	82-y-608	M	9780(1)	24.1(2)	a	4.5(3)	100(6)	93(4)	1(12)
61	M-401	M	9660(2)	22.7(11)	ab	4.0(14)	98(18)	90(13)	11(1)
82	82-y-567	M	9620(3)	22.9(8)	ab	4.4(7)	99(9)	91(11)	1(12)
67	80-y-426	M	9610(4)	22.0(18)	ab	4.5(6)	98(17)	92(5)	8(2)
66	80-y-393	M	9590(5)	22.7(10)	ab	4.5(5)	98(16)	92(5)	3(5)
68	82-y-570	M	9540(6)	22.3(14)	abc	4.3(9)	98(19)	88(17)	2(8)
80	82-y-599	M	9500(7)	24.4(1)	abc	4.5(6)	103(1)	91(9)	1(12)
71	82-y-544	M	9470(8)	22.9(8)	abc	4.3(9)	98(13)	93(3)	1(9)
69	82-y-550	M	9430(9)	22.1(16)	abcd	4.4(7)	98(17)	92(8)	3(4)
70	82-y-578	M	9430(10)	22.9(9)	abcd	4.4(7)	99(10)	85(21)	1(10)
81	82-y-587	M	9340(11)	23.0(7)	abcd	4.5(3)	98(13)	90(14)	1(12)
75	81-y-411	M	9280(12)	22.1(16)	abcd	4.5(3)	100(8)	91(10)	1(12)
64	82-y-502	S	9270(13)	21.3(20)	abcd	3.8(15)	98(12)	81(24)	2(7)
73	82-y-495	M	9270(14)	22.3(15)	abcd	4.6(1)	98(15)	92(7)	1(12)
78	82-y-78	M	9240(15)	23.8(3)	abcd	4.5(3)	100(7)	90(15)	1(12)
74	81-y-407	M	9180(16)	23.6(5)	abcd	4.5(3)	100(5)	92(6)	5(3)
79	82-y-79	M	9040(17)	22.6(12)	abcd	4.6(2)	100(5)	87(18)	1(12)
62	M-302	M	9000(18)	21.1(21)	bcd	4.5(4)	96(20)	91(12)	2(6)
85	Calrose 76	M	8820(19)	22.0(17)	cd	4.1(12)	102(2)	90(16)	1(10)
65	79-y-438	S	8810(20)	23.7(4)	cd	4.3(9)	102(4)	86(20)	1(12)
77	82-y-77	M	8800(21)	22.6(13)	cd	4.5(6)	98(14)	94(1)	1(11)
76	83-y-76	M	8780(22)	21.6(19)	cd	4.3(10)	96(21)	84(22)	1(12)
63	M-7	M	8660(23)	23.5(6)	d	4.4(8)	102(3)	87(19)	1(12)
84	82-y-649	L	7380(24)	19.2(22)	e	4.1(11)	99(11)	93(2)	1(12)
83	82-y-645	L	7020(25)	18.6(23)	e	4.0(13)	100(5)	83(23)	1(12)
GRAND MEAN			9100	22.4		4.4	99	89	2
CV			8.7	6.3		6.3	1.7	6.2	317.2
LSD (.05)			634	1.1		0.22	1.4	4.5	5.5

[1]S = short; M = medium; L = long; Wxy = waxy.
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence at 28 days after planting.
[3]Subjective rating of 1-99 where 1 = 1% lodging and 99 = 99% lodging.

Table 4. 1983 Long Grain Variety Trial - Two Location Summary

1982 entry no.	Grain yield @ 14% moisture (lbs/acre)	Grain moisture @ harvest (%)	Duncan's test	Seedling[1] vigor (1-5)	Days to 50% heading	Plant height (cm)	Lodging[2] (1-99)
470	11390(1)	20.7(2)	a	4.4(2)	92(7)	102(5)	4(12)
454	10970(2)	19.0(5)	ab	4.1(11)	90(10)	87(19)	1(16)
458	10710(3)	16.5(16)	bc	4.4(2)	88(16)	93(12)	1(15)
452	10550(4)	18.0(7)	bcd	3.9(16)	90(9)	86(20)	1(16)
455	10330(5)	19.6(3)	cde	4.5(1)	90(11)	91(18)	1(14)
468	10320(6)	16.8(13)	cde	4.0(15)	89(13)	91(17)	15(7)
453	10310(7)	16.8(14)	cde	4.3(6)	88(15)	91(16)	13(8)
460	10110(8)	13.9(22)	cdef	4.1(10)	85(21)	93(13)	1(15)
466	10080(9)	15.2(18)	cdef	4.2(9)	86(19)	97(9)	2(13)
463	10050(10)	16.6(15)	def	4.3(5)	88(14)	93(11)	33(5)
471	9990(11)	17.9(8)	defg	4.0(14)	93(6)	82(22)	1(16)
472	9960(12)	13.2(24)	defgh	4.3(6)	84(22)	83(21)	1(16)
464	9880(13)	13.0(25)	efgh	4.3(4)	83(23)	83(21)	1(15)
459	9820(14)	17.3(11)	efgh	4.2(8)	91(8)	91(18)	50(2)
462	9670(15)	17.8(9)	efghi	4.4(2)	94(4)	93(14)	1(16)
456	9560(16)	21.3(1)	fghi	4.2(8)	98(3)	98(8)	45(3)
450	9510(17)	17.7(10)	fghi	3.1(17)	94(5)	107(1)	9(9)
457	9490(18)	14.3(20)	fghi	4.4(3)	80(25)	80(23)	1(16)
465	9370(19)	15.3(17)	ghi	4.3(6)	85(20)	99(7)	27(6)
467	9330(20)	13.4(23)	ghi	4.0(13)	81(24)	100(6)	5(10)
469	9330(21)	16.9(12)	ghi	4.2(7)	89(12)	103(4)	74(1)
461	9310(22)	19.1(4)	hi	4.3(4)	98(2)	104(3)	5(11)
473	9040(23)	14.3(21)	i	4.3(6)	87(18)	92(15)	1(16)
451	8460(24)	15.0(19)	j	4.0(12)	87(17)	105(2)	44(4)
474	6660(25)	18.7(6)	k	4.4(2)	99(1)	94(10)	1(16)
GRAND MEAN	9770	16.7		4.2	89	93	14
CV	5.8	7.9		5.5	1.6	4.6	67.2
LSD (.05)	557	1.3		0.23	1.4	4.2	9.0

[1]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence at 28 days after planting.
[2]Subjective rating of 1-99 where 1 = 1% lodging and 99 = 99% lodging.

Table 5 A-E. 1983 Commercial Variety X Nitrogen Test

Table A - Yield

N	Cal Pearl	M-101	S-201	Earlirose
0	8670	7930	7515	9005
50	9840	8225	8045	8540
100	10940	10150	8430	8230
150	10425	8975	8310	6535
200	10445	8795	7915	5535
Grand Mean	10065	8815	8040	7570
CV	7.5			
LSD (.05)	915			

Table B - Heading

N	Cal Pearl	M-101	S-201	Earlirose
0	97	95	105	102
50	97	94	105	103
100	99	97	107	102
150	100	98	108	105
200	104	101	111	106
Grand Mean	99	97	107	104
CV	1.8			
LSD (.05)	1.5			

Table C - Grain Moisture

N	Cal Pearl	M-101	S-201	Earlirose
0	19.4	22.8	23.7	19.0
50	20.3	22.1	22.8	21.5
100	20.7	23.3	23.0	22.7
150	20.3	23.0	24.3	24.5
200	20.5	24.0	25.5	23.8
Grand Mean	20.2	23.0	23.8	22.3
CV	6.2			
LSD (.05)	2.0			

Table D - Lodging[1]

N	Cal Pearl	M-101	S-201	Earlirose
0	1	1	1	20
50	1	6	1	45
100	1	6	1	85
150	11	21	1	99
200	38	87	1	99
Grand Mean	10	24	1	70
CV	49.8			
LSD (.05)	18			

Table E - Seedling Vigor[2]

N	Cal Pearl	M-101	S-201	Earlirose
0	4.5	4.8	4.3	5.0
50	5.0	5.0	4.8	5.0
100	5.0	5.0	4.8	4.8
150	5.0	4.8	4.8	5.0
200	5.0	5.0	4.8	4.8
Grand Mean				
CV	6.4			
LSD (.05)	ns			

[1]Subjective rating of 1-99 where 1 = 1% lodging and 99 = 99% lodging
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent emergence at 28 days after planting.

TABLE 6.-- EFFECT OF VARIOUS STARTER FERTILIZERS AT DIFFERENT RATES ON YIELD AND OTHER AGRONOMIC CHARACTERS OF RICE

	RATE (LBS/A)											
FERTILIZER	N	P	ZN	GRAIN YIELD (LBS/ACRE)	% GRAIN MOISTURE	DAYS TO 50% HEADING	PLANT HEIGHT (CM)	SEEDLING DRY WT. (GM/25 PLANT)	%N	%P	%K	ZN (PPM)
16-20-0	20	20	4	8520	22.6	88	83	5.5	4.38	0.24	1.84	70
16-20-0	20	20	0	8360	23.5	88	86	5.2	4.26	0.24	1.71	42
16-20-0	20	40	0	8310	22.0	88	86	5.5	3.98	0.27	1.68	38
US18-18	20	20	4	8280	22.0	88	84	5.0	4.16	0.23	1.66	70
US18-18	20	20	0	8220	21.4	88	84	4.3	4.08	0.21	1.50	55
US18-18	20	40	0	8180	21.9	89	86	5.6	4.41	0.25	1.63	45
US28	20	0	0	7650	22.5	88	83	2.7	3.85	0.18	1.70	70
Untreated	0	0	0	7270	21.8	89	83	3.1	3.57	0.18	1.41	45
GRAND MEAN				8100	22.2	86	84	4.6	4.08	0.22	1.64	54
CV				4.4	5.5	0.7	2.5	20.1	5.8	6.6	15.2	25.1
LSD(.05)				530	NS	NS	NS	1.4	0.35	0.02	NS	20
LSD(.01)				720	NS	NS	NS	1.9	0.48	0.03	NS	27