COMPREHENSIVE RESEARCH ON RICE
ANNUAL REPORT
January 1, 1991 - December 31, 1991

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

PROJECT LEADER AND PRINCIPAL UC INVESTIGATORS:

J. E. Hill, Extension Agronomist, UC Davis
J. R. Webster, Staff Research Associate, UC Davis
C. M. Canevari, Farm Advisor, San Joaquin County
S. C. Scardaci, Farm Advisor, Colusa/Glenn/Yolo Counties
B. L. Weir, Farm Advisor, Merced/Fresno Counties
C. M. Wick, Farm Advisor, Butte County
J. F. Williams, Farm Advisor, Sutter/Yuba Counties

LEVEL OF 1990 FUNDING: $60,900

OBJECTIVES AND EXPERIMENTS CONDUCTED BY LOCATION TO ACCOMPLISH OBJECTIVES:

Objective I

To evaluate experimental cultivars in cooperation with public and private plant breeders for the purpose of new variety development, the following statewide uniform evaluation tests were conducted:

Very Early Maturity Group - Two uniform trials were conducted at each of the following on-farm sites: the Skinner Ranch (Butte County), the Lauppe Ranch (Sutter County), and the Brumley Ranch (San Joaquin County). Two additional tests were conducted by the plant breeders at the Rice Experiment Station (RES, Butte County). The first trial at each site consisted of eleven commercial cultivars and eleven advanced breeding lines in four replications; and the second consisted of sixteen preliminary breeding lines in two replications.

Early Maturity Group - Two uniform trials were conducted at each of the following on-farm sites: the Lovelace Ranch (Colusa County), the Rieke Ranch (Merced County), Geer and Son's (District 108, Yolo County), and the Mohammed Ranch (District 10, Yuba County). Two

additional trials were conducted by the plant breeders at the RES. The first trial at each site consisted of ten commercial standards and twelve advanced breeding lines in four replications; and the second consisted of sixteen preliminary breeding lines in two replications.

Late Maturity Group - Two uniform trials were conducted at each of the following on-farm sites: the Wylie Ranch (Glenn County) and the Shannon Ranch (Sutter County). Two additional trials were conducted by the plant breeders at the RES. The first trial at each site consisted of six commercial standards and twelve advanced breeding lines in four replications; and the second consisted of twelve preliminary breeding lines in two replications.

Objective II

To provide research on new and improved cultural practices, several experiments were conducted.

Fertility Management - Two fertility experiments were conducted in cooperation with the RES to study the nitrogen response of commercial cultivars and advanced lines. The first trial consisted of five commercial standards and one advanced line grown at seven fertilizer-N levels; and the second consisted of two commercial standards and one premium quality Japanese cultivar ('Akitakomachi') grown at six fertilizer-N levels.

Drill-Seeding of Rice - Two experiments were conducted at the Thompson Ranch (Glenn/Butte County) in cooperation with the RES and Cooperative Extension personnel. The first trial consisted of six commercial standards and two Japanese cultivars ('Akitakomachi' and 'Koshihikari') drill-seeded at two planting depths and two planting densities with and without treatment with gibberelic acid. The second consisted of two commercial standards and the above mentioned Japanese cultivars drill-seeded at two planting depths with and without treatment with gibberelic acid. Results from these experiments will be reported elsewhere.

Water Management - A field scale water management study was initiated in 1989 to evaluate the effects of water depth on rice growth, weed control, and herbicide effectiveness. The 3-year demonstration project consisted of twelve experiments conducted in cooperation with growers in Colusa, Glenn, and Sutter counties. At each location, 4-5 water/herbicide treatments were evaluated, each in a separate basin within a field. Treatments included shallow (2-3 inches), moderate (4-5 inches), and deep (7-8 inches) water with Ordram and Londax and deep water with Londax, but no Ordram. Weed control and grain yield data were collected at four locations each year except in 1989 when the yield data at one site was lost.

Objective III

This project maintains an equipment pool to provide service to other principal investigators funded by the Rice Research Board.

SUMMARY OF 1991 RESEARCH OBJECTIVES

Objective I. Rice Varieties

Statewide Evaluation of Advanced Breeding Lines

Nine uniform statewide advanced breeding line trials and nine preliminary breeding line trials were conducted in the locations and maturity groups previously described. Six additional tests, including two from each maturity group, were conducted by the rice breeders at the RES. Several advanced lines had been tested in previous years. Seed for these tests were provided by the RES or in the case of proprietary cultivars, by their respective owners. The following analysis provides over-location summaries and the respective tables show averages for each maturity group. An Agronomy Progress Report, to be published later, will provide the results from individual locations.

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

Eleven advanced breeding lines, and eleven commercial cultivars were compared in four very early tests. Sixteen preliminary breeding lines were also evaluated at each location. Commercial cultivars at all locations included S-101, S-201, Calmochi-101, Valencia 87, Akitakomachi (entry 91-y-005), M-103, M-201, M-202, M-203, L-202, and L-203.

The four location summary for agronomic performance of the advanced breeding lines and commercial cultivars is shown in Table 1 and for the preliminary breeding lines in Table 2. Average yields in the advanced tests were high, averaging 11600 lb/A at Sutter, 9500 lb/A at Biggs, 9400 lb/A at San Joaquin, and 7800 lb/A at Butte. Over all locations, the highest yielding entry in the advanced test was 88-y-317. 88-y-317 is an early maturing, medium grain, Calrose type proposed for release as M-204. The highest yielding commercial cultivar was M-202 followed by the advanced medium grain lines, 89-y-190 and 90-y-280. The Japanese cultivar Akitakomachi, a short grain included as entry 91-y-005, was lowest yielding due to severe lodging at all four locations. In general, early cultivars produced higher yields than the very early standards in these tests. A comparison of the grain yields of commercial varieties across maturity groups is shown in Table 7.

Several preliminary lines produced high yields and showed improvement in other plant characteristics. Entry 89-y-103, a short grain cultivar, yielded a remarkable 13010 lb/A at Sutter and was the highest yielding entry in the four location summary.

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

Twelve advanced breeding lines, and ten commercial cultivars were compared in five early tests. Sixteen preliminary lines were also evaluated at each location. Commercial standards at all locations included S-101, S-201, Calmochi-101, Valencia 87, M-103, M-201, M-202, M-203, L-202 and L-203. Unfortunately, the trial in Merced County was lost due to water availability problems. Thus, a four location summary for agronomic performance of the advanced lines is shown in Table 3 and for the preliminary breeding lines in Table 4.

Grain yields in the advanced line tests averaged 10940 lb/A at Yolo, 10130 lb/A at Yuba, 9180 lb/A at Colusa, and 9130 lb/A at Biggs. As in the very early tests, entry 88-y-317 ranked 1st in yield averaging 10700 lb/A over the four locations. 88-y-317 was the highest yielding advanced line at Yuba (11170 lb/A) and Colusa (10390 lb/A) and ranked 3rd and 5th at Yolo (11300 lb/A) and Biggs (9940 lb/A), respectively. Entry 89-y-292 was the highest yielding advanced line at Biggs (10390 lb/A) and ranked 5th, 7th, and 9th at Colusa, Yuba, and Yolo, respectively. M-201 was the highest yielding commercial cultivar over locations, followed by M-202 and S-201. L-203, released in 1991, produced higher yields than L-202 at three of the four locations. A comparison of the yields of commercial varieties across maturity groups is shown in Table 7.

Of the preliminary lines, 90-y-210 (a medium grain) was the highest yielding entry averaging 10040 lb/A over locations (Table 4). Several entries produced yields in excess of 10000 lb/A at Yolo, Yuba, and Colusa, and showed improvement in other plant characteristics.

Summary of the Intermediate and Late Rice Variety Tests (more than 97 days to 50% heading at Biggs)

Six commercial cultivars A-301, S-301, M-201, M-203, L-202, and M-401, and twelve advanced breeding lines were compared in three intermediate-late tests. Twelve preliminary breeding lines were also evaluated at each location.

Average yields in the advanced line tests were 8390 lb/A at Sutter, 9560 lb/A at Biggs, and 11460 lb/A at Glenn. Over locations, entry 88-y-271 (a medium grain) produced the highest yields, ranking 1st, 3rd, and 5th at Sutter, Glenn, and Biggs, respectively. Of the intermediate and late maturing commercial standards, M-401, S-301, and A-301 ranked 6th, 7th, and 17th, respectively, in the three location summary, while the early cultivars M-201, L-202, and M-203 ranked 3rd, 13th, and 16th, respectively (Table 5). In the Glenn county trial, M-201 yielded 12910 lb/A, a record yield in Cooperative Extension four-replication rice variety trials. The preliminary entries 90-y-655 and 91-y-702 averaged over 10000 lb/A over locations (Table 6) and produced yields over 11000 lb/A in the Glenn County trial.

Objective II. Cultural Practices

Two experiments were conducted at the RES to evaluate cultivar response to nitrogen fertilization. The first experiment was planted on May 20 and consisted of five commercial cultivars (M-201, M-202, L-202, L-203, and S-301) and the advanced line 88-y-317 evaluated at seven fertilizer-N levels ranging from 0-180 lb N/A in four replications. The second trial was planted on May 6 and consisted of three cultivars (M-202, M-203, and Akitakomachi) evaluated at six fertilizer-N levels ranging from 0-150 lb N/A in three replications. Performance data from these trials is presented in Tables 8 and 9.

In the first trial, average yields increased with increasing levels of applied N with most cultivars producing their highest yields at 150 lb N/A. Yields tended to decline at 180 lb N/A

and for one cultivar (entry 88-y-317), yields were significantly reduced at 180 lb N/A (Table 8). Heading dates for most cultivars were delayed at the higher N levels, while heading dates for S-301, an intermediate maturity cultivar, varied to a lesser extent. Average grain moisture at harvest was increased 2.5% between N levels of 0 and 180 lb/A. The relationship between plant height, lodging, and applied N was fairly consistent between cultivars. As N level increased, plant height and lodging increased. Moderate lodging of M-202 and 88-y-317 at 0 applied N was attributed to weak and spindly stems which resulted from poor nitrogen nutrition.

Mean grain yields in the second trial were much lower due to severe lodging of all cultivars in the early-medium stages of grain-fill. Under these conditions, M-202 produced its highest yields at 120 lb N/A. The highest yields of M-203 were achieved at 30 lb N/A and yields declined steadily as N levels increased. Akitakomachi, which has proven to be extremely sensitive to lodging under typical water-seeded conditions in California, produced its highest yield with 0 applied nitrogen and did not respond to increased N fertility in this experiment.

Results from a 3-year field scale water management demonstration project showed that rice could be successfully grown in deep water (7-8 inches) with little or no loss in yield (Figure 1). The experiments have also shown that deep water can improve grass control (Table 10) and that under certain circumstances, grass herbicides can be eliminated without sacrificing weed control. It is interesting to note that grass control was better with deep water alone than with shallow water and a grass herbicide. Part of the success in using deep water with no grass herbicide can be attributed to Londax which has some limited activity on grasses and was used in all water depth treatments. Low grass populations at the field sites also contributed to this response.

These studies have also shown that early season rice growth and stand establishment are slowed by deep water compared to shallow or moderate water depth. This delay, however, usually disappears by mid to late season and does not reduce stand density or delay crop maturity. Nevertheless, these early season growth differences can not be ignored since they indicate that deep water is stressing the crop and that pests, abiotic disorders, or poor weather may interact to adversely affect the crop.

Objective III. Assistance to Other Projects

The rice equipment pool, including a precision fertilizer applicator, plot harvester, moisture meters, backpack CO_2 sprayers, a LICOR photosynthesis and CO_2 analyzer and other equipment were used with labor and technical assistance in approximately thirty-three field experiments in 1991.

The precision fertilizer applicator was used to establish two nitrogen by variety trials, a nitrogen by seeding rate trial, and a nitrogen by green manure trial. The plot combine was used to harvest sixteen variety experiments, all of the nitrogen and weed control trials, the drilled rice experiments and four water management trials.

The backpack sprayers were used to make precision applications of herbicides and growth regulators in numerous experiments. The backpack sprayers were also used to provide weed control on levees during the growing season.

In addition to assisting in the above, labor from this project is used to plant, collect samples, and monitor growth in many trials. This project also provides support in designing and analyzing rice field experiments.

PUBLICATIONS OR REPORTS

Hill, J. E., S. R. Roberts, J. R. Webster, S. C. Scardaci, J. F. Williams, C. M. Wick, W. M. Canevari, and B. L. Weir. 1990. Cooperative Extension rice variety adaptation and cultural practice research. Annual Report. Comprehensive Rice Research. p. 16-33.

Hill, J. E., S. R. Roberts, J. R. Webster, S. C. Scardaci, J. F. Williams, C. M. Wick, W. M. Canevari, and B. L. Weir. 1991. California rice varieties: description and performance summary of the 1990 and multi-year statewide rice variety tests in California. Agronomy Progress Report No.225. March, 1991.

Miller, B. C., J. E. Hill, and S. R. Roberts. 1991. Plant population effects on growth and yield in water-seeded rice. Agron. J. 83:291-297.

Williams, J. F., S. R. Roberts, J. E. Hill, S. C. Scardaci, and G. Tibbits. 1990. Managing water for weed control in rice. California Agriculture 44:6-10.

CONCISE GENERAL SUMMARY OF CURRENT YEAR'S RESULTS:

Eighteen rice variety evaluation trials were conducted on farm sites throughout the rice growing regions of California. Six similar tests were conducted on the Rice Experiment Station at Biggs, California. Several variety trials produced average yields of 10,000 lb/A or more, with some experimental and commercial cultivars producing over 12,000 lb/A. This project continues to support the breeding program at the RES by evaluating, comparing and identifying potentially new rice varieties for the different rice producing areas of California.

Numerous experiments conducted in cooperation with other projects received assistance with planting, fertilizing, herbicide application, harvesting, and data analysis from investigators on this project. These experiments included work on nitrogen fertility, drill-seeding of rice, herbicide and water depth interactions, and green manure.

Table 1. 1991 Very Early Variety Trials (Advanced Lines and Commercial Standards) - Four Location Summary.

	Entry	Grain[1] Type	Grain Yield at 14% Moisture (lbs/a)	Grain Moisture at Harvest (%)	Seedling[2] Vigor (1-5)	Days to 50% Heading	Lodging[3] (1-99)	Plant Height (inches)
13	88Y317	M	10340	19.8	3.8	98	2	34.3
11	M-202	M	10290	19.3	4.1	95	3	35.5
16	89Y190	M	10210	18.5	3.9	91	10	34.7
14	90Y280	M	10200	19.4	4.1	91	21	36.8
10	M-201	M	10050	20.8	3.4	98	1	34.5
6	89Y121	S	10010	18.2	3.8	94	2	34.5
22	90Y479	L	9940	17.5	3.6	95	1	33.8
8	89Y124	S	9790	18.4	3.3	92	7	33.4
15	89Y196	M	9700	17.0	4.0	91	7	33.6
4	S-201	S	9690	21.5	4.2	100	14	35.1
18	L-203	L	9560	17.6	3.7	98	1	31.6
1	S-101	S	9550	17.4	4.0	93	12	33.3
19	89Y37	L	9510	16.6	3.7	96	1	33.0
21	89Y422	L	9500	17.6	3.5	95	1	35.3
9	M-203	M	9490	20.5	4.2	95	63	36.7
12	M-103	M	9440	18.1	3.8	89	40	33.8
3	VAL.87	S	9330	15.6	4.1	92	4	32.7
20	89Y375	L	9310	16.1	3.6	95	1	32.2
7	90Y170	S	9300	17.0	4.1	94	3	35.5
2	CM-101	W	9250	16.5	3.9	89	38	34.1
17	L-202	L	8900	18.1	3.3	99	1	32.0
5	91Y005	S	7350	18.6	3.3	90	86	37.8
Mean			9580	18.2	3.8	94	14	34.3
CV			6.7	5.9	13.4	1.2	61.9	4.3
LSD (.05)			450	0.7	0.4	1	6	1.0

[1]S = short; M = medium; L = long; W = waxy.
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence.
[3]Subjective rating of 1-99 where 1 = none and 99 = completely lodged.

Table 2. 1991 Very Early Variety Trials (Preliminary Lines) - Four Location Summary.

	Entry	Grain[1] Type	Grain Yield at 14% Moisture (lbs/a)	Grain Moisture at Harvest (%)	Seedling[2] Vigor (1-5)	Days to 50% Heading	Lodging[3] (1-99)	Plant Height (inches)
24	89Y103	S	10190	17.0	4.0	92	3	33.0
33	90Y284	M	9950	17.8	4.2	93	3	36.7
26	90Y150	S	9890	15.6	4.1	91	3	36.0
32	90Y281	M	9770	15.9	4.0	90	5	34.0
29	90Y233	M	9760	16.0	4.4	93	3	32.1
34	90Y415	M	9690	17.9	3.9	93	1	36.3
27	89Y115	S	9680	18.1	3.9	89	8	35.2
30	90Y273	M	9630	17.0	4.3	89	11	35.8
25	91Y025	S	9490	18.6	3.8	94	2	32.0
31	90Y220	M	9480	17.1	4.0	88	1	33.5
36	90Y475	L	9370	16.8	4.1	92	1	34.8
37	91Y37	L	9320	15.5	3.7	91	2	32.9
35	90Y468	L	9230	15.8	3.7	94	1	33.2
23	89Y235	S	8940	16.2	4.1	90	4	36.3
38	91Y38	L	8940	15.4	4.0	91	1	31.9
28	90Y196	W	8830	17.8	3.8	90	16	36.1
Mean			9510	16.8	4.0	91	4	34.4
CV			5.5	5.4	12.0	1.6	145.1	5.2
LSD (.05)			460	0.8	0.4	1	5	1.6

[1]S = short; M = medium; L = long; W = waxy.
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence.
[3]Subjective rating of 1-99 where 1 = none and 99 = completely lodged.

Table 3. 1991 Early Variety Trials (Advanced Lines and Commercial Standards) - Four Location Summary.

	Entry	Grain[1] Type	Grain Yield at 14% Moisture (lbs/a)	Grain Moisture at Harvest (%)	Seedling[2] Vigor (1-5)	Days to 50% Heading	Lodging[3] (1-99)	Plant Height (inches)
64	88Y317	M	10700	18.9	3.6	93	17	35.7
66	88Y292	M	10470	18.7	3.2	93	11	36.4
62	M-201	M	10460	18.8	3.8	94	10	36.8
58	89Y238	S	10430	19.5	4.1	96	24	36.4
72	90Y563	L	10410	18.2	3.7	96	21	34.8
63	M-202	M	10300	19.0	3.9	91	27	38.5
65	88Y230	M	10250	18.9	4.0	91	4	34.5
55	89Y246	S	10180	20.1	3.8	97	29	37.5
57	90Y299	S	10070	18.8	4.0	92	13	34.2
67	90Y824	M	10040	17.1	3.7	88	17	34.3
54	S-201	S	9960	19.9	4.1	98	26	38.5
56	88Y240	S	9940	19.4	3.7	94	9	35.7
59	89Y66	M	9740	18.5	4.1	90	39	37.7
69	L-203	L	9660	16.5	3.6	93	1	32.8
53	VAL.87	S	9660	15.9	3.9	90	21	35.9
61	M-103	M	9410	17.7	3.6	87	4	36.7
60	M-203	M	9360	19.9	4.1	91	80	39.3
68	L-202	L	9360	17.3	3.3	97	2	33.4
51	S-101	S	9350	16.6	4.0	90	26	36.3
70	91Y70	L	9040	17.5	3.1	97	4	35.3
71	91Y71	L	9020	16.7	3.5	97	5	32.6
52	CM-101	W	8810	16.5	4.0	85	44	36.3
Mean			9850	18.2	3.8	93	22	35.9
CV			5.3	5.7	12.8	1.2	54.0	4.5
LSD (.05)			360	0.7	0.3	1	8	1.1

[1]S = short; M = medium; L = long; W = waxy.
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence.
[3]Subjective rating of 1-99 where 1 = none and 99 = completely lodged.

Table 4. 1991 Early Variety Trials (Preliminary Lines) - Four Location Summary.

	Entry	Grain[1] Type	Grain Yield at 14% Moisture (lbs/a)	Grain Moisture at Harvest (%)	Seedling[2] Vigor (1-5)	Days to 50% Heading	Lodging[3] (1-99)	Plant Height (inches)
77	90Y210	M	10040	17.0	4.2	89	7	35.0
79	89Y325	M	9960	18.9	4.1	95	2	36.6
84	90Y501	M	9930	15.7	4.1	91	4	37.5
75	90Y355	S	9920	18.4	4.1	96	7	36.8
74	90Y341	S	9880	17.1	4.2	93	4	37.7
76	90Y358	S	9800	18.7	4.0	95	2	37.4
78	90Y263	M	9790	16.3	4.2	87	17	33.8
83	90Y524	L	9690	16.4	3.7	93	17	34.0
81	90Y412	M	9550	17.0	4.2	90	3	37.0
80	90Y396	M	9540	16.4	3.9	89	4	35.7
82	90Y420	M	9460	16.8	3.8	90	2	37.8
87	91Y87	L	9370	15.2	3.4	91	5	33.7
85	90Y601	L	9150	16.1	3.6	95	1	30.4
88	91Y88	L	8750	15.5	3.9	94	4	39.7
86	90Y571	L	8010	15.3	3.8	94	1	34.5
73	91Y73	S	6590	18.9	3.5	87	96	40.4
Mean			9340	16.9	3.9	92	11	36.1
CV			4.5	4.6	8.4	1.4	52.6	3.9
LSD (.05)			380	0.7	0.3	1	5	1.3

[1]S = short; M = medium; L = long; W = waxy.
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence.
[3]Subjective rating of 1-99 where 1 = none and 99 = completely lodged.

Table 5. 1991 Late Variety Trials (Advanced Lines and Commercial Standards - Three Location Summary.

Entry	Grain[1] Type	Grain Yield at 14% Moisture (lbs/a)	Grain Moisture at Harvest (%)	Seedling[2] Vigor (1-5)	Days to 50% Heading	Lodging[3] (1-99)	Plant Height (inches)
109 88Y271	M	10710	15.9	3.5	100	3	37.3
108 90Y643	M	10690	15.7	3.9	100	3	37.3
107 M-201	M	10670	16.6	3.7	99	2	37.3
112 89Y296	M	10410	15.7	3.7	101	2	36.9
102 89Y510	S	10180	18.0	3.8	102	3	36.7
106 M-401	M	10150	19.1	4.2	113	4	40.5
101 S-301	S	10150	17.8	4.3	105	2	39.1
110 88Y206	M	10100	15.2	3.6	97	2	36.6
111 88Y277	M	10020	15.8	4.0	101	5	40.0
104 90Y627	S	9970	17.6	4.1	101	1	35.9
103 89Y506	S	9890	18.5	4.3	106	3	39.4
113 89Y537	M	9680	16.6	4.1	101	1	37.6
115 L-202	L	9640	14.8	3.2	100	1	32.1
105 88Y560	M	9010	16.7	4.3	111	1	38.0
117 90Y722	L	8970	14.6	3.4	100	1	32.3
116 M-203	M	8960	16.3	3.8	94	77	39.1
114 A-301	L	8920	16.1	2.5	106	1	33.3
118 90Y723	L	8350	14.9	3.1	101	1	31.5
Mean		9800	16.4	3.7	102	6	36.7
CV	4.6		5.2	9.8	1.0	120.9	3.9
LSD (.05)		360	0.7	0.3	1	6	1.2

[1]S = short; M = medium; L = long; W = waxy.
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence.
[3]Subjective rating of 1-99 where 1 = none and 99 = completely lodged.

Table 6. 1991 Late Variety Trials (Preliminary Lines) - Three Location Summary.

Entry	Grain[1] Type	Grain Yield at 14% Moisture (lbs/a)	Grain Moisture at Harvest (%)	Seedling[2] Vigor (1-5)	Days to 50% Heading	Lodging[3] (1-99)	Plant Height (inches)
126 90Y655	M	10120	16.4	4.2	99	2	37.1
130 91Y702	L	10020	14.6	3.5	102	1	33.4
121 90Y117	S	9990	16.1	4.2	99	16	37.1
123 90Y123	M	9840	17.1	4.3	106	15	39.6
125 90Y654	M	9720	16.0	3.8	100	1	37.3
124 90Y646	M	9670	15.4	4.3	98	1	36.2
119 90Y724	L	9370	14.7	3.6	102	1	31.5
129 91Y129	L	9200	13.7	3.8	101	1	35.5
128 91Y128	L	9170	13.1	4.1	98	2	35.3
122 90Y677	M	9060	16.9	4.5	111	3	38.4
127 91Y127	L	8770	13.5	4.0	100	1	34.0
120 90Y18	S	5910	18.3	4.4	105	99	45.9
Mean		9240	15.5	4.1	102	12	36.8
CV		4.0	4.8	7.6	1.2	39.5	3.7
LSD (.05)		370	0.7	0.3	1	5	1.3

[1]S = short; M = medium; L = long; W = waxy.
[2]Subjective rating of 1-5 where 1 = poor and 5 = excellent seedling emergence.
[3]Subjective rating of 1-99 where 1 = none and 99 = completely lodged.

Table 7. A comparison of commercial standards, across maturity groups. (1991)

	S-101	S-201	CM-101	Valencia 87	M-103	M-201	M-202	M-203	L-202	L-203
Very Early										
Biggs	9530	9930	8180	9330	8700	10350	10260	8890	9430	9970
Butte	7290	7750	7280	7570	8050	9140	7860	7460	7400	7760
S. Joaquin	9870	9680	10120	8770	9630	8900	10320	10890	8090	8520
Sutter	11530	11380	11430	11650	11370	11810	12650	10700	10690	11980
Average	9560	9680	9250	9330	9440	10050	10270	9480	8900	9560
Early										
Biggs	7680	9030	7520	8860	8140	10280	9490	8570	9330	8830
Colusa	8190	9020	8350	9640	8890	9850	9130	7790	8490	9680
Yolo	11270	11240	9820	10640	10610	11020	11500	10570	10480	10780
Yuba	10250	10540	9560	9500	9990	10700	11070	10530	9130	9350
Average	9350	9960	8810	9660	9410	10460	10300	9360	9360	9660
Overall Average	9450	9820	9030	9500	9420	10260	10280	9420	9130	9610
STD	1494	1148	1341	1153	1113	898	1393	1316	1053	1245

Table 8. The effects of applied nitrogen on performance of early rice varieties, Biggs RES, 1991.

Variety	N-rate	Grain yield at 14% moisture	Moisture at harvest	Days to 50% heading	Plant height	Lodging
	(lb/A)	(lb/A)	(%)		(inches)	(1-99)
88-y-317	0	5720	16.9	84	29.4	39
	30	6360	16.4	82	31.7	21
	60	7950	17.0	83	32.8	19
	90	8390	17.4	86	34.2	26
	120	8970	18.2	85	34.5	34
	150	9570	18.8	88	35.6	50
	180	8940	19.1	92	36.5	81
M-201	0	5490	16.9	85	28.7	8
	30	6270	16.8	82	31.4	3
	60	7880	17.4	83	32.4	3
	90	8460	18.0	84	33.0	4
	120	9130	19.5	90	35.0	4
	150	9230	20.2	87	37.9	24
	180	9160	20.7	86	37.4	20
M-202	0	5360	17.3	82	32.0	35
	30	6240	17.1	81	32.8	15
	60	7390	17.1	82	34.2	16
	90	8200	17.4	82	34.6	33
	120	8840	18.4	85	35.8	50
	150	9180	19.1	88	38.1	78
	180	8780	19.6	90	36.7	86
L-203	0	5350	15.4	82	28.7	1
	30	6770	15.8	82	28.5	1
	60	7440	15.0	81	31.9	1
	90	7960	15.2	82	31.8	2
	120	8930	15.7	86	34.0	2
	150	9460	16.6	91	36.1	3
	180	9510	16.8	87	36.2	5
L-202	0	5390	15.4	84	28.0	1
	30	6500	15.8	84	28.6	1
	60	7590	16.1	88	30.1	1
	90	7320	15.8	88	31.8	1
	120	8460	16.6	86	32.5	1
	150	8800	16.4	88	34.2	1
	180	8530	17.4	88	34.5	1

Table 8. Continued

Variety	N-rate	Grain yield at 14% moisture	Moisture at harvest	Days to 50% heading	Plant height	Lodging
	(lb/A)	(lb/A)	(%)		(inches)	(1-99)
S-301	0	5740	17.7	90	30.9	1
	30	6350	18.0	93	32.9	1
	60	7230	17.9	92	34.8	1
	90	7640	17.8	92	35.5	1
	120	8360	18.9	90	36.3	1
	150	9200	20.5	90	39.4	15
	180	9050	21.0	93	39.7	31
N-rate	0	5510	16.6	84	29.6	14
	30	6420	16.6	84	31.0	7
	60	7580	16.8	85	32.7	7
	90	8000	16.9	85	33.5	11
	120	8780	17.9	87	34.7	15
	150	9240	18.6	89	36.9	29
	180	9000	19.1	89	36.8	37
Variety						
88-y-317		7980	17.7	86	33.5	39
M-201		7950	18.5	85	33.7	9
M-202		7710	18.0	84	34.9	45
L-203		7920	15.8	84	32.5	2
L-202		7520	16.2	87	31.4	1
S-301		7650	18.8	91	35.7	7
CV %		4.3	2.9	4.5	4.3	67.9
LSD (0.05)						
N-rate (N)		430	0.4	1	1.2	8
Variety (V)		180	0.3	2	0.8	6
N x V		470	0.7	ns	ns	16

ns= not significantly different at $P < 0.05$.

Table 9. The effects of applied nitrogen on grain yield and harvest moisture of premium quality rice varieties, Biggs, 1991.

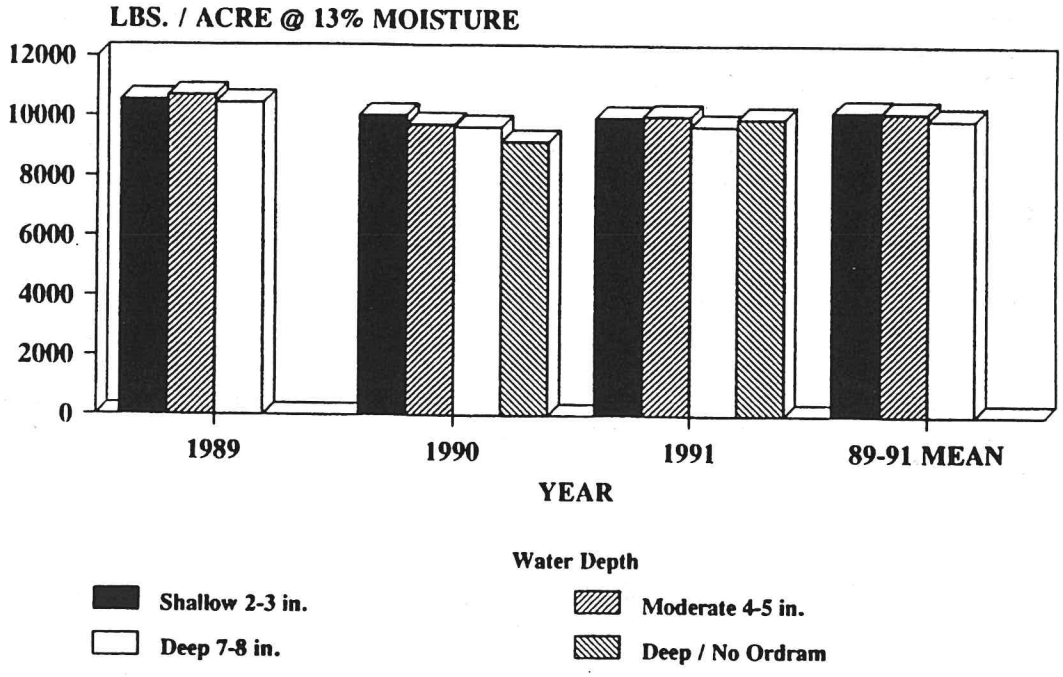
Variety	N-rate	Grain yield at 14% moisture	Moisture at harvest
	(lb/A)	(lb/A)	(%)
M-202	0	7300	18.0
	30	7090	17.7
	60	7920	17.1
	90	8200	16.8
	120	8330	16.5
	150	7100	16.7
M-203	0	6190	17.2
	30	7550	18.1
	60	7510	17.9
	90	6780	15.7
	120	6350	17.5
	150	5880	16.4
Akitakomachi	0	5610	17.9
	30	5010	17.9
	60	4800	17.7
	90	4920	16.9
	120	4990	16.9
	150	5300	17.1
N-rate	0	6370	17.7
	30	6550	17.9
	60	6740	17.6
	90	6630	16.5
	120	6560	17.0
	150	6090	16.7
Variety	M-202	7660	17.1
	M-203	6710	17.1
	Akitakomachi	5110	17.4
CV %		11.5	6.9
LSD (0.05)	N-rate (N)	ns	ns
	Variety (V)	510	ns
	N x V	1260	ns

ns = not significantly different at $P < 0.05$.

Table 10. Multi-year water depth and herbicide effects on Watergrass/Barnyardgrass control in rice.

Water Depth/ Herbicide Treatment	Weed Control Rating[1]			
	1989	1990	1991	89-91
Shallow	9.5	8.1	9.3	9.0
Moderate	9.7	9.2	9.4	9.5
Deep	9.9	9.9	9.9	9.9
Deep/No Ordram	-	9.5	9.7	-
CV %	3.1	8.2	8.6	
LSD (.05)	NS	1.2	NS	

[1]Weed control is rated on a scale of 1-10 with 1= no control and 10= complete control. Ratings for each year are based on the average of four locations.



1989 3 locations,1990 & 1991 4 locations

Figure 1. Grain yields as influenced by water depth/herbicide treatment.