ANNUAL REPORT
COMPREHENSIVE RESEARCH ON RICE
Jan. 1, 2006 to Dec. 31, 2006

PROJECT TITLE: Crop Management and Environmental Effects on Rice Milling Quality and Yield. (RP-13)

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LEVEL OF 2006 FUNDING:
$ 19,040

OBJECTIVES AND EXPERIMENTS

1. Investigate the crop-environmental interactions affecting yield and quality at a range of soil and grain moisture levels during grain maturation.

2. Establish practical in-field criteria for determining grain maturation to optimize yield, quality, and grower return.

3. Evaluate milling quality stability of prominent California public varieties.

A plot at Rice Research Station was subdivided into a series of 2m x 3m sections and each dry seeded with M201, M202, or M206 variety rice. Each variety was at seeded at a rate of either 75, 150, or 225 pounds per acre. The 9 variety by seeding rate treatments were replicated to allow 4 replications to be harvest at each of 5 harvest dates. Cultural practices were identical for all treatments. A one square meter area of each treatment was harvested on October 3, 10, 13, 20, and 27. Each treatment was hand harvested between 11:00 and 13:00 hours and threshed with an Almaco plot thresher. Rice moisture for each harvested treatment (HMC) was determined with a single kernel moisture meter (Kett PQ510, Japan). Samples were room air dried and a 500g subsample was husked (Yamamoto FC-2K, Japan) and milled (Yamamoto VP-32T, Japan) and whole kernel determinations were determined using a machine grader (Foss Tectator Graincheck, Sweden).

Head rice yield was high even as harvest moisture decreased below 21%, the typical minimum moisture for high head rice yields, figure 1. Weather conditions were quite dry during harvest, with little nighttime dew. The limited rehydration periods allowed head rice yield to remain high

because there was little rewetting of kernels that dropped below the critical 15% threshold where rewetting causes kernel fissuring. Seeding rate did not appear to have a noticeable effect on head rice quality.

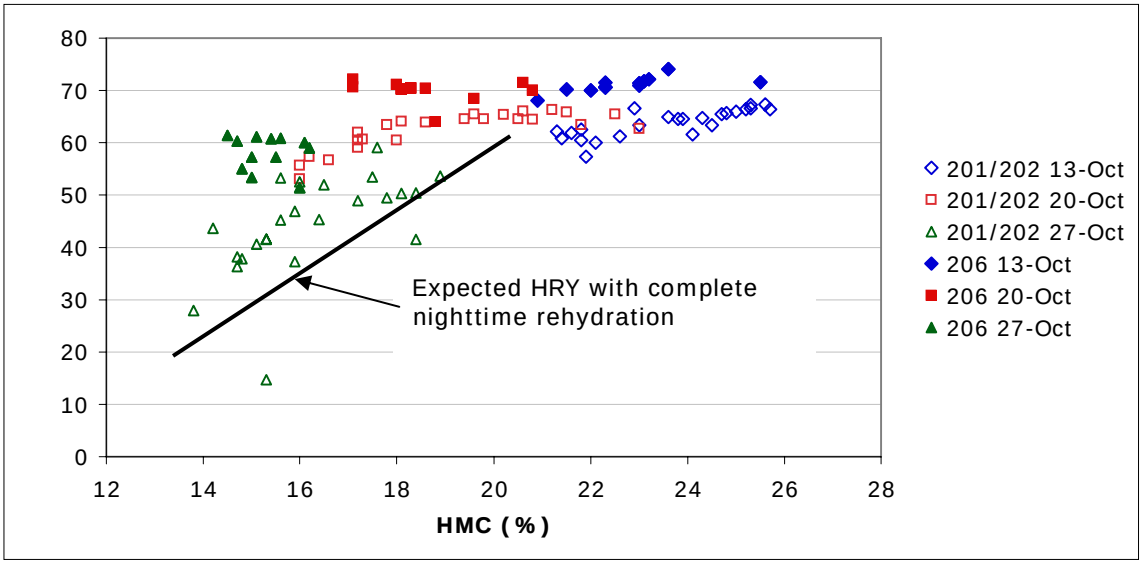

Figure 1. Relationship between rice moisture at harvest and head rice yield for all treatments harvested on Oct 13, 20, and 27.

The head rice data also show that the M206 variety had higher quality than M201 or M202. Part of the higher head rice yield was caused by M206 having a 3.7 percentage point higher total rice yield (TRY) than the older varieties, Table 1. M206 also had fewer broken kernels, Table 1, under the dry conditions experienced in 2006. The higher TRY and fissure resistance were especially noticeable in the last harvest where M206 had above 50% head rice yield at 14 to 16% HMC, while the other two varieties had HR yields in the range of 35% to 50% in the same moisture range, Figure 1.

Table 1. Average rice quality for the Oct 13, 20, and 27 harvest dates.

Variety	Head rice yield	Total rice yield	% Whole kernel
201	60.3	68.2	88.3
202	53.4	68.2	77.4
206	66.4	71.9	92.2

The dry conditions during the harvest season were not caused by a great deal of north wind but rather a generally low dew point temperature this year, Table 2. Weather data for the four years of this project show that humidity conditions varied significantly. In 2003 and 2004 there were many days with humidity greater than 90%, an estimate of hours of dew. The following two

years were much dryer and they were considered by the industry as years with good rice quality. Growers can predict if they can harvest rice at moistures below the critical average moisture of 21% if there is little chance of dew at night. Our previous studies suggest that more than 11 hours of dew conditions are required for complete rehydration. Days with low nighttime relative humidity and little dew typically have low daytime dew point temperatures. Days with daytime dew point temperatures less than about 55°F or so generally have little dew. In 2003 daytime dew point temperatures during harvest were often above 65°F and some days approached 80°F.

Table 2. Hours per day with relative humidity greater than 90% at Rice Research Station, Biggs, CA. Sensor located at 2m height.

	Year			
Date	2003	2004	2005	2006
Sept 17	7		3	0
18	15		6	0
19	16		2	0
20	15		2	0
21	16	14	2	0
22	16	14	4	0
23	14	14	0	0
24	11	14	0	2
25	16	15	0	0
26	16	11	0	0
27	16	14	5	2
28	11	12	0	5
29	17	11	0	0
30	16	14	0	3
Oct 1	17	14	0	5
2	16	14	3	6
3	14	14	6	7
4	13	12	2	0
5	16	10	0	0
6	16	14	0	13
7	15	8	0	11
8	16	10	0	0
9	14	0	3	0
10	1	0	0	0
11	12	0	0	2
12	15	0	0	1
13	3	5	0	4
14	15	8	2	8
15	16	0	8	10
16	16	0	0	5

< 5 hr/day
> 5 hr/day
> 10 hr/day
> 15 hr/day

Yield was fairly constant, with no trend of increasing yield for the three varieties harvested beginning on October 6 through October 27, Figure 2. This replicated the pattern we observed in

2005. The conditions that caused yield increase in 2004 have not been repeated in two of the last three years. Lowest seeding rate, 75 lb/ac, had the highest yield, Table 3. This agrees with much previous work on seeding rate.

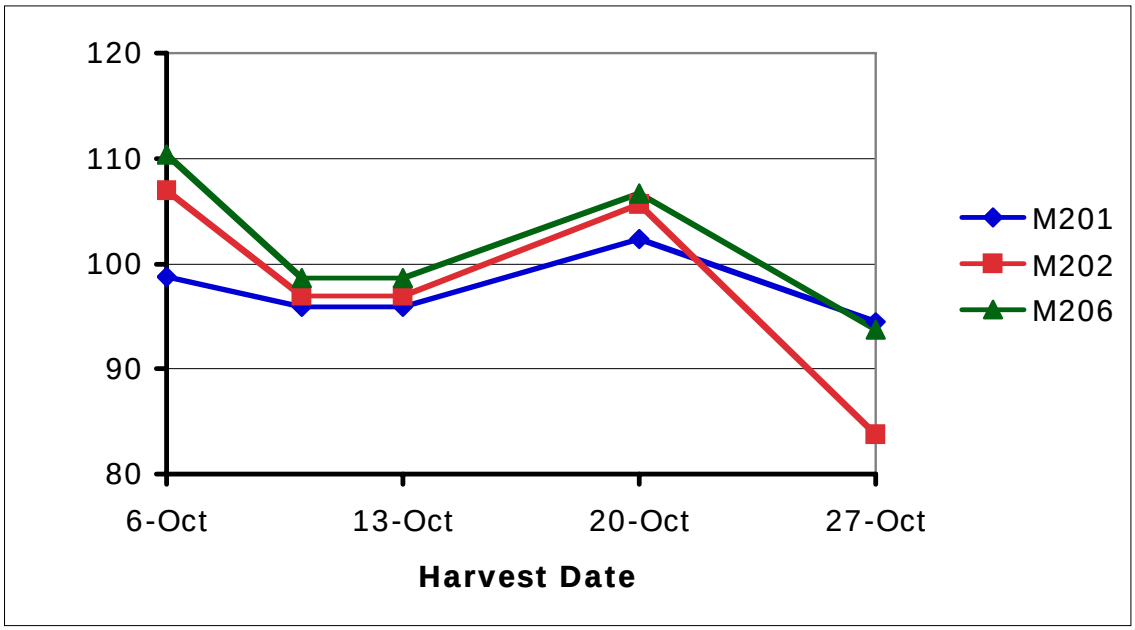

Figure 2. Yield for three varieties during the 2006 season. Harvest moisture was in the range of 27 -28% on the first harvest and decreased to less than 18% on the last.

Table 3. Effect of seeding rate on yield averaged over last three harvest dates and all three varieties.

Seeding rate (lb/ac)	Yield (cwt/ac)
75	110
150	102
225	96

SUMMARY OF 2006 RESEARCH BY OBJECTIVE:

1. Investigate the crop-environmental interactions affecting yield and quality at a range of soil and grain moisture levels during grain maturation.

Under the low humidity conditions during the 2006 harvest, head rice quality of M201, M202, and M206 at all seeding rates and all harvest dates was high because of low humidity during harvest.

2. Establish practical in-field criteria for determining grain maturation to optimize yield, quality, and grower return.

For the second year out of three, yield did not increase when rice was at commercial harvest moisture contents. It appears growers can use predicted daytime dew point temperature to predict kernel fissuring. Dew point temperature below the mid 50°F will allow rice to dry below the critical 21% average HMC threshold with little loss in head rice yield.

3. Evaluate milling quality stability of prominent California public varieties.

The M206 variety compared with M201 and M202 varieties grown at Biggs, CA had a consistently higher total rice yield, higher head rice yield and higher whole kernel percentage.

PUBLICATIONS AND REPORTS:
None

CONCISE GENERAL SUMARY OF CURRENT YEAR'S RESULTS:
Under the low humidity conditions during the 2006 harvest, head rice quality of M201, M202, and M206 at 75, 150, and 225 lbs/ac seeding rates and all harvest dates was high because of low humidity during harvest. Daytime dew point temperature is a good indicator of dew formation at night and may be a good predictor of rewetting potential and the ability of rice to dry to low moistures in the field with limited loss of head rice yield. The M206 variety compared with M201 and M202 varieties grown at Biggs, CA had a consistently higher total rice yield and higher milled whole kernel percentage causing it to have a higher head rice yield.