ANNUAL REPORT
COMPREHENSIVE RESEARCH ON RICE
Jan. 1, 2005 to Dec. 31, 2005

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

PROJECT LEADERS:
Randall Mutters, Farm Advisor UCCE Butte Co.
James Thompson, Extension Specialist, Biological & Ag. Engineering, UCD
Richard Plant, Professor, Agronomy & Range Science, UCD

PRINCIPAL INVESTIGATOR:
Claudia Roel, Graduate Student, UCD

COOPERATORS:
Kent McKenzie, Rice Experiment Station

LEVEL OF 2005 FUNDING:
$ 22,520

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.

A small plot at Rice Research Station was divided into three sections. The sections were planted with M202 variety rice at a seeding rate of either 100, 150, or 200 pounds per acre. Cultural practices were identical for the three sections. All sections were harvested on September 28 and October 4, 10, 14, and 19. Each basin was hand harvested in 6 locations and threshed with an Almaco plot thresher. A 1 square meter area was harvested for each replication allow us to track yield and quality. Rice moisture for each harvest location (HMC) was determined with a single grain moisture meter (Kett PQ510, Japan). Samples were room air dried and 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).

We were expecting the low seeding rate sections to have much greater tillering because of the low plant density, but the actual difference between sections was quite small, Table 1. Weather conditions were quite atypical during the growing season, with cool temperatures during the first part of the year. This may have reduced the amount of tillering that would have occurred in a normal year.

Table 1. Effect of seeding rate on plant density and tillers

Seeding rate (lb/ac)	Plants per ft^2	Tillers per ft^2	Tillers per plant
100	23	47	1.96
150	26	50	1.93
200	30	53	1.75

Yield remained constant across all harvests and all seeding rates, Fig.1. This was quite different from our 2004 tests where yield increased from 75 to almost 100 cwt/ac during a similar range of harvest times and moistures. At this time we cannot explain the difference in yield patterns between the two seasons.

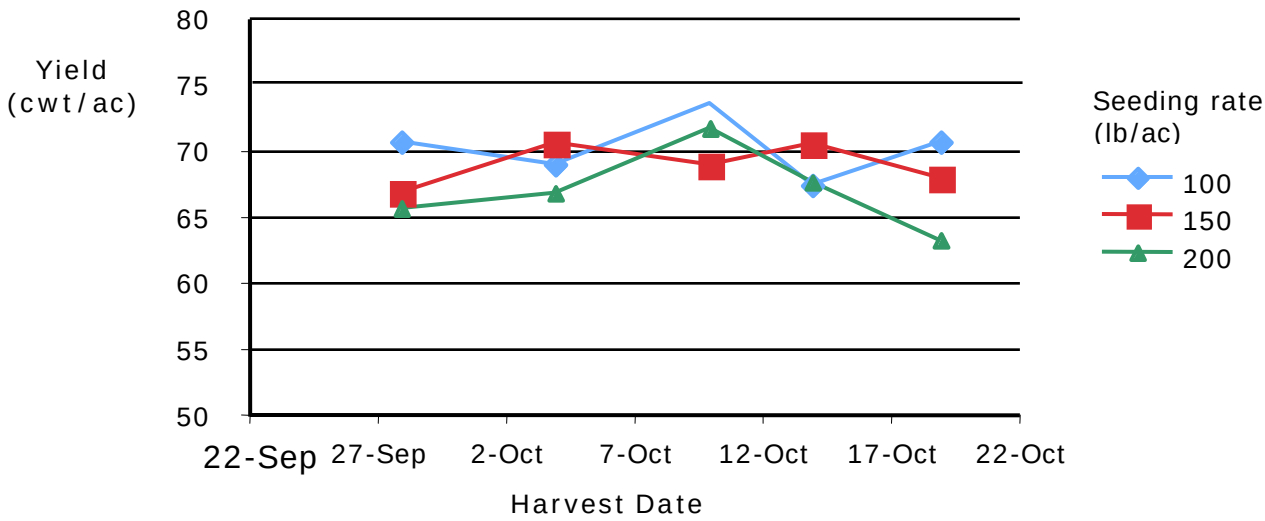

Figure 1. Average yield at 5 harvest dates for three seeding rates

Head rice quality was better for the low seeding rates during the last two harvests. This appeared to be related to the low seeding rates having higher moisture rice during the harvest period. The soil type was the same for the three sections and they were drained at the same time, so there is no reason to believe that soil moisture was different between the sections and might have caused the difference in grain moisture. The difference in quality resulted in large differences in grower return between the seeding rates during the last two harvests, Fig. 3.

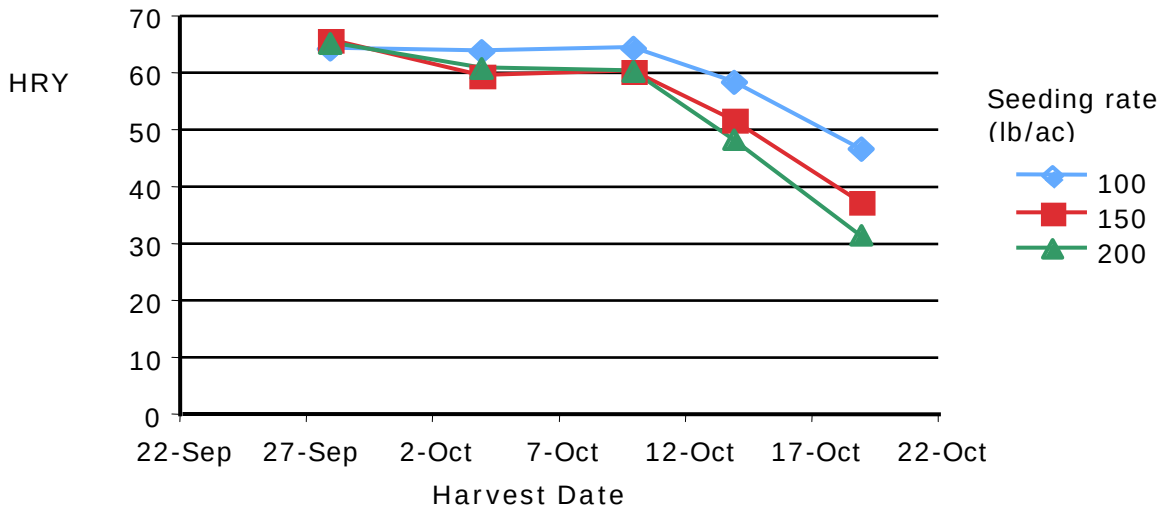

Figure 2. Head rice yield at 5 harvest dates for three seeding rates

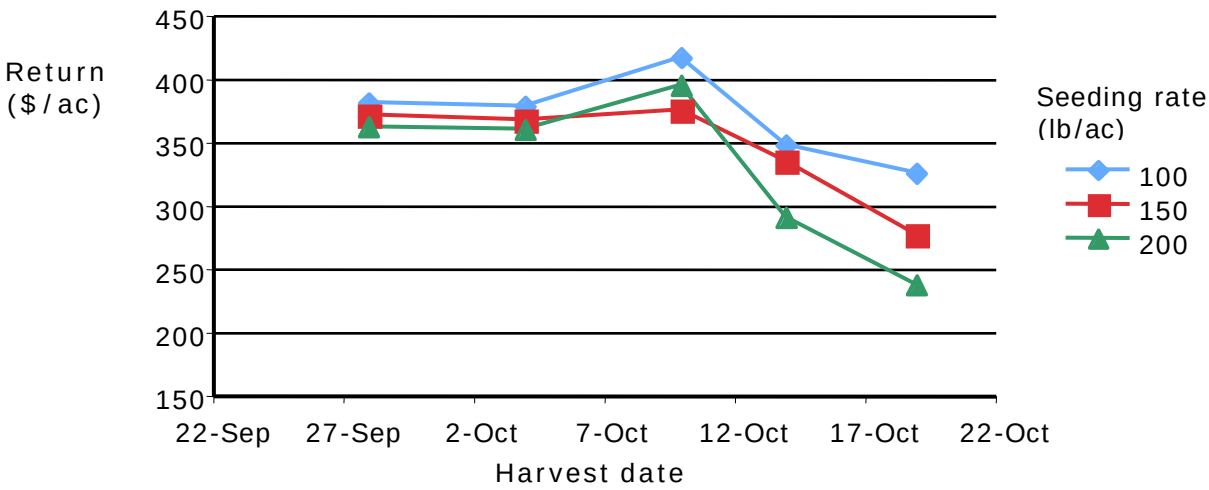

Figure 3. Grower return at 5 harvest dates for three seeding rates

The relationship between head rice yield and rice moisture at harvest followed the same pattern we have observed for the previous two years. Under conditions of high relative humidity at night prior to harvest, HRY begins to drop when harvest moistures drop below about 21% moisture and follow a straight line decrease as moisture drops, Fig 4. Under dry conditions, usually associated with a North wind, rice will have higher than predicted HRY because it does not have a chance to regain moisture at night. We observed this on the Oct 10 and Oct 14 harvest dates, Table 2. Under dry conditions rice can be harvested at moisture below 21% and still have good HRY. Subsequent rehydration will cause rice to return to its normal relationship between harvest moisture and HRY.

Weather conditions have varied greatly during the three years of our tests. In 2003 all but two nights had more than 10 hours of humidity greater than 90%, Table 2. In 2005 no nights had 10 hrs of high humidity. In fact only two nights had more than 7 hrs of humidity greater than 90%. These variations in humidity may be associated with weather differences or microenvironmental differences caused by date of field draining or cultural practices. Practices that foster dry conditions should be associated with good HRY quality, but rice should be harvested at moistures greater than 21% whenever possible. This will prevent the possibility of quality loss caused by high humidity rewetting the rice after it dries below 21% moisture.

Table 2. Daily period where relative humidity at canopy height exceeded 90%. Period begins the evening of the previous day and extends through morning of the date listed in the table.

Date	Daily period with RH > 90% (h)		
	2003	2004	2005
9/26			0.3
9/27			4.5
9/28			0.0*
9/29			0.0
9/30			0.3
10/1			0.0
10/2			3.0
10/3			6.0
10/4	12.5	9.5*	2.0*
10/5	15.5	9.0	0.0
10/6	15.8*	13.0	0.0
10/7	14.8	7.0	0.3
10/8	15.8	7.0	0.0
10/9	13.8	8.0	3.0
11/10	1.3	0	0.0*
10/11	11.8	0*	0.0
10/12	15.3	0	0.0
10/13	3.3*	0	0.0
10/14	15.0	4.0	1.5*
10/15	15.5	7.5*	7.5
10/16	15.5*	14.5	0.0
10/17			0.0
10/18			0.0
10/19			7.8*

* harvest date

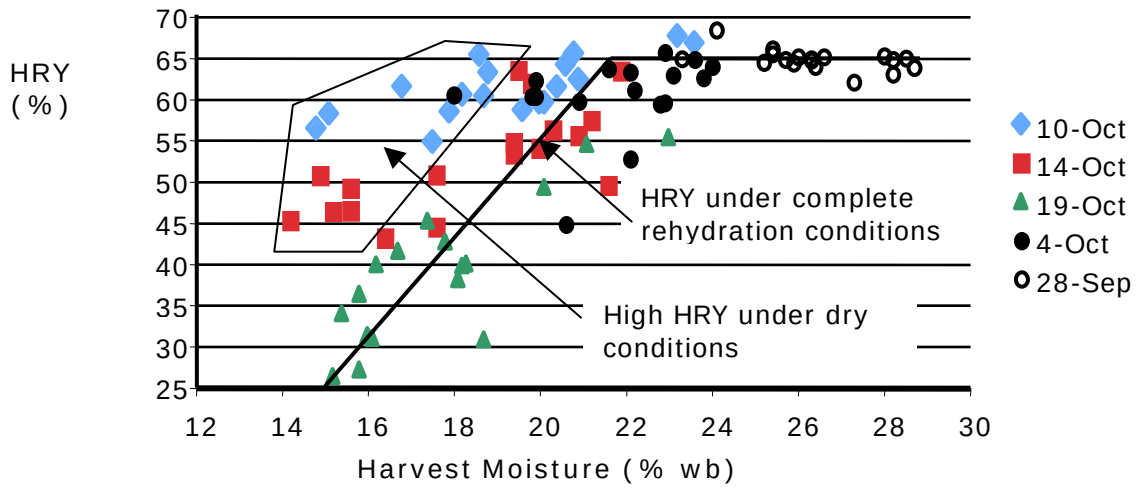

Figure 4. Head rice yield versus rice moisture at harvest

SUMMARY OF 2005 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 growing conditions of the 2005 season, M202 rice no change in yield at harvest moistures ranging from 26% to 17% and no differences in yield associated with seeding rate. Head rice yield was high when rice was harvested at greater than 21% moisture. Under dry night conditions with relative humidity less than 90% rice quality was higher than it would be under high humidity conditions at night.

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

Findings for this objective must be postponed until next year when yields may differ with harvest date.

PUBLICATIONS AND REPORTS:

Champagne, E. T., K. L. Bett-Garber, J. Thompson, R. Mutters, C. C. Grimm, A. M. McClung. 2005. Effects of drain and harvest dates on rice sensory and physiochemical properties. Cereal Chem. 82(4): 369-374.

CONCISE GENERAL SUMARY OF CURRENT YEAR'S RESULTS:

During the 2005 season yield was not influenced by seeding rates from 100 to 200 lb/ac or by harvest date. Head rice quality was high during dry conditions where there was no dew at night. Under high humidity conditions head rice quality followed a typical pattern where best quality is obtained when harvest moistures exceed 21%.