ANNUAL REPORT
COMPREHENSIVE RESEARCH ON RICE
Jan. 1, 2004 to Dec. 31, 2004

PROJECT TITLE: Drain Time and Crop Management Effects on Rice Milling Quality and Yield.

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LEVEL OF 2003 FUNDING:
$ 25,890

OBJECTIVES AND EXPERIMENTS

Experiment 1

Objective 1. Investigate the crop-environmental interactions affecting head yields at a range of soil moisture levels during grain maturation.

Three basins in the tillage study at the Rice Research Station were selected for the experiment. Basin 1 was a conventional water seeded treatment, planted on May 17; basin 2 was a spring and fall tilled with stale seed bed, water seeded treatment, planted on June 4; and basin 3 was a fall tillage with no-till stale seed-bed, water seeded treatment, planted on June 4. All basins were planted with M202 rice. Basin 1 was drained on Sept. 7 and basins 2 & 3 were drained on Sept. 15. All basins were harvested on September 22, 27, 30 and October 4, 11, and 15. Each basin was hand harvested in 6 locations and threshed with a small plot thresher. A 1 square meter area was harvested for each replication allow us to track yield. 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 by the California Department of Food & Agriculture Grain Quality Inspection Lab.

Paddy moisture at remained consistently high, above 23%, during the first 12 days of the test and head rice yield also remained high during this period, figure 1. A North wind

period from October 8 through 13 caused a drop in average moisture to 11.8% but only an 8 percentage points reduction in HRY. Rice value (loan value minus drying and receiving costs) relatively constant during the North wind period because the paddy was harvested at a low moisture. After the North wind period ended night dew returned and after two days of rewetting the HRY plummeted to 26% and rice value dropped from $5.60/cwt on October 4 to $3.90/cwt on Oct. 16. As we observed in 2003, North wind conditions cause a slight drop in HRY but the dew associated with calm conditions after the wind causes a great deal of HRY loss and increases rice moisture and drying cost.

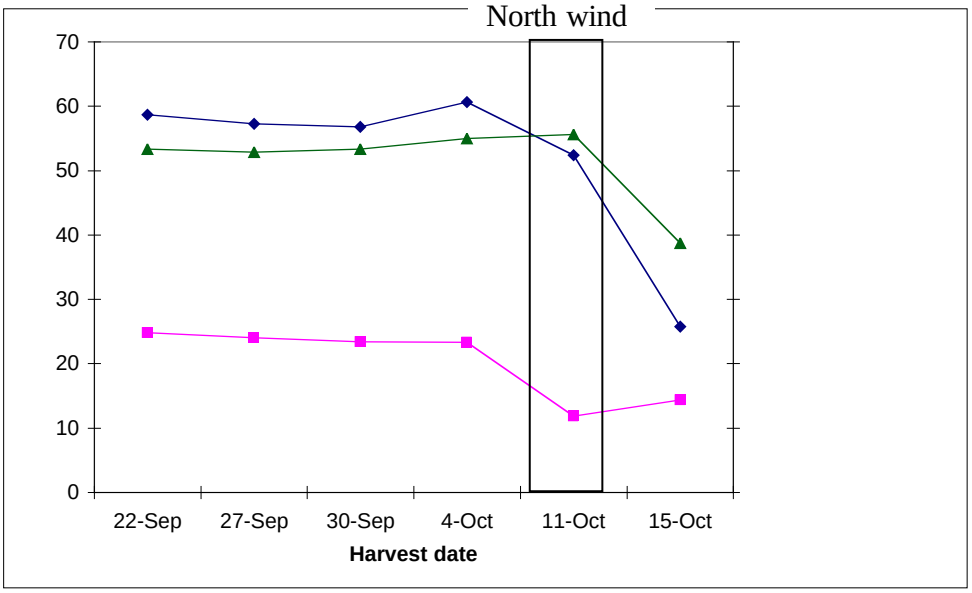

Figure 1. Harvest date harvest versus moisture content, head rice yield and rice value. Data are cumulative average values for all three basins

The yield increased from 74 cwt/ac on Sept. 22 to 98 cwt/ac on October 4, figure 2. This is quite surprising considering that the moisture changed very little during this period. Moisture is not a good indicator of yield, at least under the circumstances of this test. Yield is correlated with the number of high moisture kernels in a harvested sample, figure 3. It appears that some measure of the amount of high moisture kernels or number of green kernels is a better indicator of yield than average rice moisture. Based on one year of data for M202 rice, high yields are obtained when a sample has less than 5% of kernels with moisture greater than 30%.

The difference in flowering date along a panicle and differences in heading dates between panicles may allow the most mature kernels to be at harvestable moistures while later maturing kernels are not yet filled. Yield and head rice quality would both be improved if all kernels matured within a narrower range of time.

Combining the yield data with the rice value produces grower return in dollars per acre. This increased from $395/ac on the first harvest to $540/ac on the fourth harvest. We did

not collect yield data for the last two harvests, but if the yield had remained constant after Oct 4, return increased during the North wind to $557/ac. After the wind stopped the loss in head rice reduced return to $389/ac. Growers need to harvest as much rice as possible during North wind periods. In 2003 we observed that a high HRY was possible after a North wind period if the rice did not dry below 20% to 24% moisture. In 2004 all of the rice dried well below this range and HRY dropped significantly after the wind stopped and dew returned.

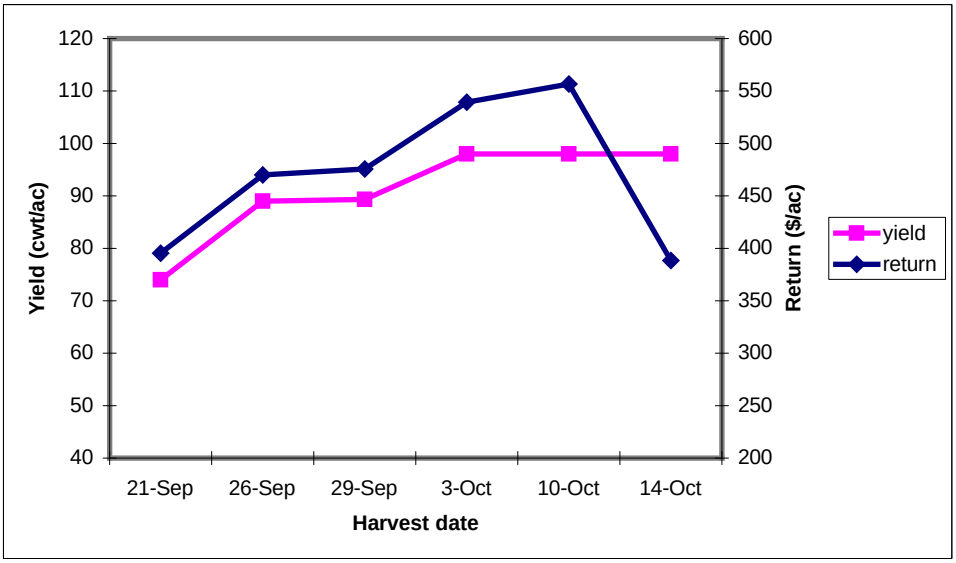

Figure 2. Harvest date versus yield and crop value. Yield data were not collected on the last two harvest dates and are assumed to be equal to the yield on October 4

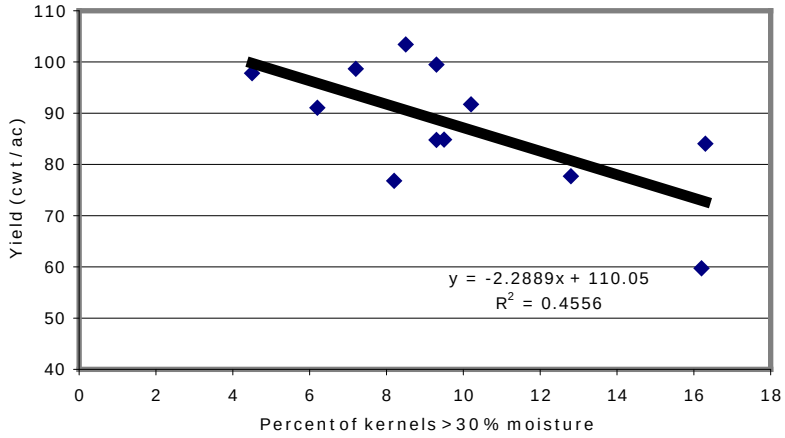

Figure 3. Proportion of kernels less than 30% at a range of average harvest moistures

Conclusions

1. Head rice yield drops slightly during dry North wind periods.
2. Rice value remains relatively constant during North wind periods compared with rice value just before the North wind because of decreased drying costs.
3. For M202 rice, yield increases significantly after rice moisture initially drops to harvestable levels and because of this moisture is not a good indicator of yield.

The practical implications of these observations are that harvest should proceed at maximum possible rates during dry meteorological conditions. Growers receive the greatest value for their crop under these conditions. After the return of dew forming conditions, head rice yield, rice value, and grower return decrease dramatically.

Future research should confirm the pattern of increased yield after rice drops to harvestable moisture, especially for varieties with a large range of flowering and heading dates. The industry needs an indicator of agronomic maturity because rice moisture is not a good predictor of yield.

Objective 2. Evaluate out door short-term storage of rice with HMC < 18%.

We were not able to locate a cooperator who was interested in temporarily storing rice outside.

Objective 3. Study changes in physicochemical properties associated with environmental conditions and their relation to grain fissuring.

Final analysis of the quality data from the 2003 harvest (completed in early 2004) indicated that there were no meaningful differences in apparent amylose, protein, RVA paste viscosity, or taste panel evaluation of sensory quality associated with drain time or harvest date for M202 rice. Because of these results we did not replicate this testing for the 2004 crop.

Experiment 2

Research was carried out in two fields, one located on the Schohr Ranch in Gridley, and the other on the Mathews Ranch in Marysville. At both locations we took geo-referenced soil samples prior to planting to characterize the texture (particle size) and chemical properties (OM, P-Bray, S-SO4, X-K, Zn, pH, CEC). Different N applications were applied at seeding, using variable application rates based on the previous year's yield results in the Schohr field, and strips with fixed rates in the Mathews field. Tissue analysis (Total N) was done at PI, at the same. Aerial photos were taken on two different days, one at the vegetative stage and the second near harvest, to calculate NDVI and other indices for biomass. After draining we took daily grain moisture samples from two

different zones, usually high and low yield ones, until harvest. At the same time weather parameters were registered. At harvest we took grain samples directly from the combine, along the N stripes and in the same points than soil and tissue samples were taken. Grain moisture was registered; grain samples were dried and milled, and % head rice was measured. Yield monitor data of the whole fields were obtained (yield and grain moisture), to relate with all the others parameters measured. After harvest, EC measurements were done in the same points. Data are currently being analyzed.

SUMMARY OF 2004 RESEARCH BY OBJECTIVE:
Investigate the crop-environmental interactions affecting yield and head rice quality at a range of soil and grain moisture levels during grain maturation.

A controlled field experiment showed that head rice yield (HRY) can be kept high even at low harvest moistures if the rice is not subjected to rehydration from dew. North wind conditions in the Valley cause rapid rice drying in the field and prevent dew formation, allowing rice to be harvested with only small reductions in head rice quality. In spite of the some loss of HRY, rice value ($/cwt) remains relatively constant during North wind periods because of reduce drying costs. For M202 rice yield increases by more than 30% after it reaches moistures that are typically considered suitable for harvest. Rice moisture is not a good indicator of when to harvest rice and the industry needs a better index of yield.

PUBLICATIONS AND REPORTS:
An article titled: 'Effects of drain and harvest times on rice sensory and physiochemical properties' has been submitted for publication.

CONCISE GENERAL SUMARY OF CURRENT YEAR'S RESULTS:
A controlled field experiment showed that head rice yield (HRY) can be kept high even at low harvest moistures if the rice is not subjected to rehydration from dew. North wind conditions in the Valley cause rapid rice drying in the field and prevent dew formation, allowing rice to be harvested with only small reductions in head rice quality. In spite of the some loss of HRY, rice value ($/cwt) remains relatively constant during North wind periods because of reduce drying costs. For M202 rice yield increases by more than 30% after it reaches moistures that are typically considered suitable for harvest. Rice moisture is not a good indicator of when to harvest rice and the industry needs a better index of yield.