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1970-71 Report  
COMPREHENSIVE RESEARCH ON RICE  
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PROGRAM AREA Engineering

PROJECT NUMBER & TITLE 70-24 Crop Residue Management - Field Hulling of  
Paddy Rice

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OBJECTIVES

The research intends to determine the feasibility of hulling the wet rough rice in the combine in order to leave the hulls in the field and thus eliminate the cost of hull disposal at the mill and improve the mechanics of the soil by their incorporation. If a hulling procedure appears feasible, pilot equipment design will be considered.

WORK IN PROGRESS

Last year's studies indicated that wet rice, 21-26 percent moisture content, can be hulled satisfactorily and that rubber rolled hullers are superior to stone hullers. The studies also confirmed published reports that stored brown rice tends to rancify at a faster rate than stored rough rice.

The current year's work intended to evaluate cracking resulting from drying brown rice which was reported by millers to be excessive.

EXPERIMENTS COMPLETED

The evaluation of checking or cracking of the kernels of brown rice compared to rough rice during drying was completed. The study included drying rates of brown and rough rice.

WORK PLANNED

Treated under "Evaluation of Project".

MAJOR ACCOMPLISHMENTS

A sample of Calrose rice (25.8 percent moisture content) was secured from the Pacific International Rice Mill, Woodland, on October 4. A quantity was hulled in a Sataka rubber roll laboratory drier. A sample of rough and one of hulled rice were dried in screen wire cloth bottom trays with approximate dimensions, 16 in. square, rice

one in. deep. Unheated laboratory air at 78°F and 35 percent relative humidity, approximately, with a vertical rate of 110 cfm/ft.<sup>2</sup> through the tray was used for drying. Drying rate, observed by weighing the trays at intervals of time is shown in the attached figure.

The rough rice was then hulled on the previously mentioned huller and checks were counted by end lighting the kernels with a microscope light. Internal shadows indicated breaks. The pertinent observations are:

Completely hulled kernels	51.6%
Partially hulled kernels	37.2%
Unhulled kernels	11.2%

Many of the kernels were scratched or scarfed during hulling and 27.3 percent of the kernels had a greenish cast. The 1971 crop was reported to be unevenly mature which is assumed to be responsible for the low hulling percentage, the scratching of kernels, and the green rice.

Whole kernels that were checked:

Hulled before drying	54.2%
Hulled after drying	12.7%

#### IMMEDIATELY APPLICABLE RESEARCH RESULTS

None.

#### EVALUATION OF PROJECT

Results of three years of work and a review of relevant publications permit observations that:

1. Field harvested wet rice can be hulled with a rubber faced huller with an effectiveness equivalent to that of in-mill dry rice hulling.
2. Brown (hulled) rice tends to rancify at a faster rate when stored than does rough rice.
3. Checking is a serious problem when drying brown rice.
4. Brown rice dries at approximately twice the rate of rough rice.

The rancifying problem could, no doubt, be solved by storage in an O<sub>2</sub> free gas and/or by heating the rice to inactivate the enzymes that aid in the formation of the free fatty acids that in turn permit a rancid condition. Checking could be reduced by drying the brown rice in stages at lower than usual temperature. However, the complications involved in the two procedures noted above plus the management complications that would occur by the addition of another component to the

combine are believed of adequate magnitude to negate the benefits that could result from in-combine hulling.

No additional work on the project is proposed as regards the mission related objectives. Disciplinary work related to brown rice storage and drying of brown rice appears potentially useful, but such investigations are not proposed at this time.

#### PUBLICATIONS OR REPORTS

Hulling Wet Paddy Rice - Advantages, Problems and Accomplishments. S. M. Henderson. A paper to be presented at the International Conference on Tropical and Sub-Tropical Agriculture and ASAE Pacific Region Golden Anniversary Meeting, Honolulu, Hawaii, April 11-13, 1972.

