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1970-71 Report  
COMPREHENSIVE RESEARCH ON RICE  
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PROGRAM AREA Rice Crop Management

PROJECT NUMBER & TITLE 70-16, Rice Production, Processing and Marketing  
Systems Analysis and Optimization

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OBJECTIVES

The objectives are to cooperate with all other rice research workers in devising improved rice management systems which will reduce production costs, attain maximum yields and will consist of practices designed to fit together with a minimum of scheduling conflicts.

Specific objectives are:

1. To construct models of rice production systems so that pre-research analyses may be made of these systems to test the value and workability of various specialized research objectives;
2. To undertake agronomic research aimed at development of advanced field production systems--starting with programs coordinating all factors in crop establishment and weed and pest control;
3. To construct models of basic systems of management alternatives facing rice growers, and to present the results in such a way that an individual grower may be able to use these models in selecting optimum management alternatives for rice production subsystems on his land.

WORK IN PROGRESS

A survey is in progress of detailed timing and amounts of operational inputs by growers for specific rice fields.

Wind tunnel analysis of the basic principles of airflow resistance of rice kernels is underway. Expenses of this work are not met by project funds but the work is related to the objectives of the project.

Analysis of data on rice planting dates, harvest dates, grain quality and yield is being conducted with the objective of determining economic

timeliness functions for both the planting and harvesting operations of rice.

Nearing completion is a system model of the harvesting operation. It includes data on a) general delay losses in harvested yields, b) losses due to rain as related to the probabilities of rains of various intensities at various dates, c) combine losses at various degrees of combine loading, d) fixed and operating costs of combines and bankout wagons, e) acres harvested per combine per season, f) combine size, g) lodging or non-lodging of grain, h) rice yield levels, i) rice prices, and j) the use of custom harvesters at any point in the season. This model will yield specific management guidelines for combine management and operation to minimize harvest costs to rice growers.

Rain probability functions and combine grain loss functions have been developed for the above model from data supplied by other Rice Research Program participants.

The tractor performance monitor developed last year is under field evaluation at this time.

#### EXPERIMENTS COMPLETED

An assessment of the effects of environmental factors on rice production was completed (see report mentioned below).

Performance and management data on rice combine harvesters, obtained by survey was compiled and is available in report form (see report mentioned below).

Tests of airflow resistance through new rice varieties with a smooth grain exterior were completed. These test results indicated that the new varieties would require about 30 percent more pressure than did the older varieties, to maintain a given rate of airflow through the grain.

#### WORK PLANNED

It is planned to complete the harvesting systems model and to exploit this model in terms of drawing specific conclusions relative to management and operation strategies to minimize harvest costs.

Following development of the two above subsystem models, a planting-harvesting interaction model is to be developed so that the overall effect of any management decision can be assessed.

#### MAJOR ACCOMPLISHMENTS

Four accomplishments were made during the 1970-71 year. These were:

1. Development of combine performance data.
2. Findings on the airflow resistance of new rice varieties.
3. Near completion of data and a model for evaluating harvest variables.
4. Evaluation of rice crop density--drilling vs. air seeding.

### IMMEDIATELY APPLICABLE RESEARCH RESULTS

The findings of higher air pressure requirements for drying the new smooth-exterior varieties will allow drier operators to make appropriate adjustments for these varieties to avoid spoilage during processing and storage.

It was found that there was no basis for expecting more uniform density of stand (an advantage in efficiency of combine operation) due to drill seeding rather than air broadcasting of rice seed.

Preliminary results from 5 years' data on planting dates, harvest dates and crop yield in the Richvale area indicate that the cost of one day's delay in either planting or harvesting results in a loss of approximately \$1.00 per acre in rice yields. This is the factor to be balanced against grower costs in completing these operations more quickly.

Preliminary results from the harvest system model indicate that in terms of minimizing late variety grain losses over the long run, that there is no advantage to operating combine harvesters above their normal level of loading to avoid late season weather losses. There may be some economic advantage to such a procedure under certain circumstances, however, if labor and operating costs for harvest operations are considered.

### EVALUATION OF PROJECT

During this past year data has become available which will permit this research to approach its original objectives. The sources and forms of this data are now known, and analytical procedures for handling these data to obtain information applicable to field conditions are in hand.

### PUBLICATIONS OR REPORTS

1. Performance of Combine Harvesters on Rice Farms in Northern California. Cervinka, V., and W. J. Chancellor, Agricultural Engineering Department, University of California, Davis, February 1971.
2. Operational Analysis of Rice Planting and Harvesting Systems. Cervinka, V., Paper No. 71-23, ASAE Pacific Region (contact Agricultural Engineering Department, University of California, Davis), April 1971.
3. Resistance of Rice Seeds to Air Flow. Cervinka, V., Agricultural Engineering Department, University of California, Davis, May 1971.
4. Engineering Aspects of Rice Environment. Cervinka, V., Agricultural Engineering Department, University of California, Davis, June 1971.