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1970-71 Report
COMPREHENSIVE RESEARCH ON RICE
December 30, 1971

PROGRAM AREA Engineering

PROJECT NUMBER & TITLE 70-18 Combine Performance Investigations in Rice
Harvesting

PROJECT LEADER J. R. Goss, Department of Agricultural Engineering, UCD

PERSONNEL R. A. Kepner, Department of Agricultural Engineering, UCD

R. G. Curley, Extension Engineer, UCD

M. D. Miller, Agronomy and Range Science Extension, UCD

Staff personnel, Department of Agricultural Engineering, UCD, and

Selected Farm Advisors

OBJECTIVES

1. To reduce harvesting costs, consideration will be given to changes in conventional combines, cultural methods, or plant characteristics that would substantially increase capacity of harvesters. Capacity limitations of some of the newer models of combines would be determined. Harvester performance would be checked with any new rice varieties that are developed.
2. The initial phase will be to determine harvesting losses for a representative sample of rice harvesting operations in California. This work will be started during the 1970 harvest season.
3. Improvement of combine harvester performance and consideration of new harvesting approaches, such as the development of an automatic feed control system, would be included in subsequent phases of this program.
4. A comprehensive Extension program on combine operation and adjustment will be started in 1971-72.

WORK PLANNED

1. Determine the shoe and walker performance for one or two makes of combines with standard and special shoe screens for standing rice. If time and field conditions permit, the same determination will be made for lodged rice.
2. Conduct combine performance and operation schools in cooperation with Extension and Farm Advisors prior to the 1972 harvest season in the several rice production areas throughout the State.

MAJOR ACCOMPLISHMENTS

Of the work planned in the 1970 report only one item was completed. This was complete laboratory work, data analysis, and written report

on the field work (32 combine performance tests conducted during the 1970 harvest season). Each grower, Farm Advisor, and custom operator who cooperated in the field testing received detailed data sheets for each test they participated in and a summary analysis of all tests. None of the other work planned in the 1970 report was undertaken because the test work with the Oregon Mobile sanitizer was given a higher priority and required all available Departmental staff not required for all other Departmental research including several Comprehensive Rice Research Projects.

The 1970 Field (Blanket) Tests are summarized in the attached table and figure. An example of selected performance data for each cooperator is included in the table.

Although the number of combines tested in standing rice is small, the fact that 10 of the 22 tests had total harvesting losses of 6.3 to 10.4 percent of the standing rice yield on a 13.5 percent moisture content basis is a strong indication that excessive losses are occurring on about half of the harvested acreage. Normal harvesting losses should be less than 3.5 to 4.0 percent.

The data plotted in the attached figure indicates that the ASL chaffer has a considerably greater capacity at high feed rates than the standard adjustable chaffer. However, it remains to be determined whether the ASL chaffer can be adjusted to give acceptable losses at above normal feed rates. Experience with this chaffer indicates that it is difficult to adjust to obtain acceptable performance.

IMMEDIATELY APPLICABLE RESEARCH RESULTS

The large proportion of high losses found indicates that an Extension training program for combine owners and operators has a good potential to increase net return per acre for many growers.

EVALUATION OF PROJECT

Harvesting performance data on current makes and models of combines are needed to advise growers and combine operators on optimizing combine operation to maximize net income. All machines now used to combine rice can be readily overloaded resulting in excessive losses that can approach 20 percent in lodged rice. Thus, there is a real need to search for methods of operation and modifications to combines to achieve significantly greater performance.

PUBLICATIONS OR REPORTS

1. Reports on the 1970 field tests were sent to the following grower/combine operators:

William Geer, Woodland
Forest and Herbert Rold, Richvale

Chester, Ernest, and Ray Mattson, Richvale
Norval Davis, Firebaugh
Vern Flemming, Reedley
Roy Baldrige, Firebaugh
Kelly High, Richvale
Bruce McKenzie, Richvale
Jim Jerritt, Williams

2. Performance Characteristics and Operation of Self-Propelled
Combines in California. Goss, J. R. XVI Congress Della
Meccanica Agraria, Bari, Italy, September 18, 1971.

Department of Agricultural Engineering
University of California
Davis, California

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Summary of 1970 Blanket Tests - Rice

	Standing Rice 22 Normal Rate		Grower/Operator*-Paired Test Avg.		
	Avg.	Range	Set 1	Set 2	Set 3
Test Nos. (1)			1 & 2	3 & 4	
Cylinder loss, %	2.45	0.2/5.4	3.1	4.8	
Separation loss, %	2.21	0.3/5.3	2.2	2.4	
Total loss, %	4.67	0.8/10.4	5.3	7.2	
Total loss, lb/A	300	30/570	395.	540.	
Harvest yield, lb/A	5871	4180/7380	7060.	6905	
Field yield, lb/A	6171	4210/7830	7455.	7445.	
Seed/straw ratio	1.29	0.88/2.07	1.21	1.38	
Seed moist. @ harv. %	16.4	13.1/25.8	23.6	23.9	
Swath width, ft.	14.67	13.23/15.10	13.84	14.00	
Forward speed, MPH	1.04	0.53/1.83	0.59	0.80	
Acres/hour	1.97	0.92/3.30	0.98	1.36	
Sacks rice/hour	114.7	62.3/197.5	69.8	94.4	

(1) Reported values are adjusted to 13.5% seed moisture content except seed moist. @ harv.

Distribution of Total Combine Loss

Percent loss range	No. of Tests	Percent of Total (22)	Range Avg.	*Grower/Operator
0 to 2.5	7	32	1.64	Set 1 - M-H 510 Combine A Set 2 - M-H 510 Combine B
2.5 to 5.0	5	23	4.16	
5.0 to 7.5	7	32	6.33	
7.5 to 10.0	2	9	7.90	
10.0 and greater	1	4	10.4	

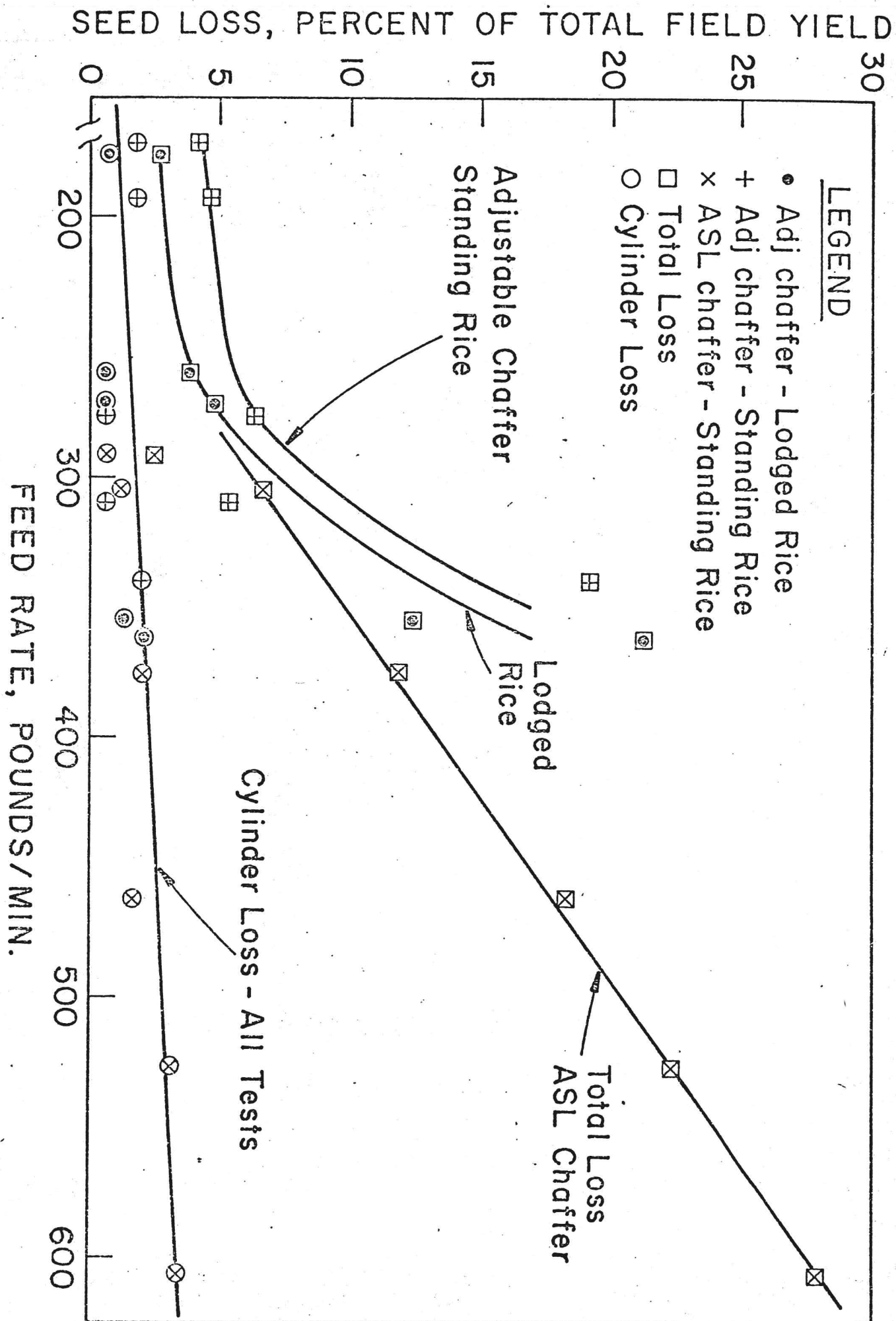


Figure 1. Combine Performance in Rice for Hardy Special Rice Combine. Grain and Feed Rate Weights Adjusted to 13.5% Moisture Content. 1969 and 1970 Tests.