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

PROGRAM AREA Engineering

PROJECT NUMBER & TITLE 70-19 Machinery and Costs for Soil Incorporation of Rice Straw and Stubble

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Note: Work funded under 70-19 and done during Fall 1970 was reported in the 1970 Report - Comprehensive Rice Research Program, January 4, 1971. This report covers work done under RM-11 in Fall 1971.

OBJECTIVES

1. To continue investigation of the use of forage choppers and rotary tillers in soil-incorporation systems, with follow-up through all tillage operations to planting time, using an area of at least 5 to 10 acres for each treatment.
2. To obtain data on performance rates, fuel requirements, and other factors affecting costs, for all operations from straw treatment through seedbed preparation.
3. To investigate any other devices that come to our attention and seem promising.

WORK IN PROGRESS

Cooperative experiments were initiated in October, 1971, with two growers, one in Sacramento County and one in Colusa County. Attempts to find a cooperator in Butte County were not successful. Each experiment contains the following four treatments:

1. Chop from combine windrow with a forage chopper and disk once, in the Fall.
2. Rotary till in Fall, partly after chopping and partly with straw spread but not chopped.
3. Chop in Fall but no fall tillage.
4. Burn and disk in the Fall in the conventional manner.

Each treatment in the Sacramento experiment consists of one contour check. The checks are long and narrow and are irregular-shaped. The area of each treatment is about 15 to 20 acres. In the Colusa experiment, each treatment contains about 5 1/2 acres and is half of a rectangular check. Soil types are Freeport clay in Sacramento County and Sacramento clay in Colusa County.

Chopping was done with the same Allis-Chalmers Model 782 PTO field chopper used in 1970. There was no change in the homemade spreading deflector used in place of the conventional discharge spout in 1970. For 1971, the Department of Agricultural Engineering added two specially built gathering wheels on the pickup, similar to rake wheels but smaller. These practically eliminated clogging of the pickup unit when the straw was dry. However, when the straw was moist from dew or rain, material wedged into the rear portions of the slots between pickup-cylinder stripper plates and had to be removed by hand at frequent intervals. Forward speeds were usually about 3 1/2 mph but when the straw was dry (in the afternoon), a speed of 4.8 mph did not cause problems. A Ford model 8000 tractor (105 PTO horsepower) was used but was larger than necessary.

Rotary tillage in the Sacramento experiment was done at 4 mph with a 130-in. Howard Rotovator on a Versatile Model 185 tractor (180 PTO horsepower). The operating depth was about 4 in. and the calculated bite length (forward travel per cut) was 10.4 in. Chopped straw was mixed into the soil better than straw that had been spread but not chopped. The Rotovator required noticeably more power in unchopped straw than in chopped straw.

An 80-in. Rotovator on the Ford 8000 tractor was used in the Colusa experiment. Half of the rotary-tilled treatment was done with a bite length of 11.5 in. and half with a bite length of 7.7 in. (all straw chopped).

Disking was done with a 12-ft. or a 14-ft. stubble disk. Operating needs, total time, and total fuel consumption were observed for each operation in each experiment.

Apart from the experiments described above, the performance of a modified flail shredder was observed in spread rice straw. This machine is an experimental modification of a standard shredder and is being developed by the Mathews Company. Slots cut in 5 3/4-in.-wide flail knives straddle stationary sickle sections attached to the under side of the top hood. The experimental machine covers a 12-ft. width. The results in fairly dry straw looked promising. Reduced straw lengths were greater than with the forage chopper, but seemed short enough to cause little trouble in plowing or disking. An advantage of the flail shredder is that the tall stubble is chopped in addition to the straw. This development will be followed closely during the coming year. The new model is expected to be in production by next summer.

EXPERIMENTS COMPLETED

None.

WORK PLANNED

Data on the tillage operations required during Spring of 1972 to obtain a satisfactory seedbed for each treatment will be obtained.

This will include the kinds and number of operations, fuel consumption, performance rates, etc. A cost comparison will then be made for the four systems.

MAJOR ACCOMPLISHMENTS

No experiments completed.

IMMEDIATELY APPLICABLE RESEARCH RESULTS

No experiments completed.

EVALUATION OF PROJECT

Upon completion of the Spring 1972 tillage operations and analyses of the collected data, project accomplishments and application of results can be evaluated.

The increased restrictions on agricultural burning during the 1971 season emphasize the need and urgency for finding alternate methods of managing rice-straw and stubble residues.

PUBLICATIONS OR REPORTS

Soil Incorporation of Rice Straw. Miller, G. E., and R. A. Kepner. ASAE Paper 71-28, presented at ASAE Pacific Region Annual Meeting, March 1971.