COMPREHENSIVE RESEARCH ON RICE

PROGRAM AREA Engineering

PROJECT NUMBER & TITLE 69-24 & 69-25, Residue Utilization - Packaging Investigations of Rice Straw and Hulls

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OBJECTIVES

1. To determine the optimum conditions for packaging rice straw, including effect of moisture and physical condition of the straw.
2. To determine those binder materials that are most effective, including natural foodstuffs and commercial binders.
3. To determine the packagability of complete rations, containing rice straw as the major ingredient, which are suitable for animal utilization.
4. To determine the economic feasibility of harvesting, packaging, and handling systems as developed.

WORK IN PROGRESS

A comprehensive evaluation of the binding effect of various adhesive materials was started in June, 1970. The laboratory work is completed and a report is being prepared. Several materials were shown to be useful in producing a satisfactory cube from rice straw.

Studies are continuing using the full-scale commercial stationary cuber to process rice straw and rice straw rations into cubes, both on an experimental basis and for use in feeding trials. Since completion of the above-mentioned laboratory study, those findings have been applied where possible, and have proven to have a high correlation with production conditions of operation. A liquid feed supplement containing urea, molasses, and phosphoric acid has given encouraging results. Ammonium lignin sulfonate is a good binder, but

has essentially no value as a feed for livestock. Certain natural animal feed ingredients, such as beet pulp and almond hulls are helpful when used in sufficient quantity. Many combinations of such feedstuffs, plus a minimal amount of commercial binder, show promise for future experiments. Much of this testing is to be done in conjunction with feeding studies, cooperative with the Department of Animal Science.

Economic evaluation of various harvesting, handling and packaging systems was completed during the year, and these systems are continuously under study as experience is gained. In the initial study, certain operations in these systems had to be assumed without the benefit of actual experience. Continuous re-evaluation is necessary as new information and experience becomes available.

EXPERIMENTS COMPLETED

The laboratory study of the bonding effect of various adhesives on rice straw has been completed. A report on this work will be available in January.

An economic analysis of harvesting,handling and packaging rice straw for utilization as animal feed has been completed in report form. The systems studied include field baling, field cubing, stationary cubing, and a concept involving harvesting the grain and straw together and processing both in a stationary plant. These systems should be re-evaluated as more experience becomes available, but the immediate study is completed.

WORK PLANNED

1. Continuation of testing the cubability of rice straw rations with full scale production cubers. Part of this work will be in cooperation with Animal Science Department feeding experiments. Laboratory studies of the bonding effect of various additives have reduced the amount of variables to be tested by eliminating some additives that have little or no binding effect.

2. Cooperative studies with the Western Regional Research Laboratory, Albany and the Animal Science Department involving cubability and animal utilization of treated rice straw. Laboratory treatment with sodium hydroxide and with ammonia have improved digestibility of rice straw. WRRL is building a large scale treater, and the Animal Science Department will perform feeding trials. This project will cooperate on cubing studies with the treated straw.

3. Studies of the system and equipment required to harvest rice straw from the field for processing at a stationary plant. To date, the project has been concerned with the optimum methods of processing, usually cubing, the straw into a form suitable as livestock feed. It has been shown that this is possible and practical, so it is now necessary to develop a workable system to get the straw from the field to the processing plant in a suitable form.

MAJOR ACCOMPLISHMENTS

1. Completion of the economic study of typical harvesting, handling, and processing systems for utilization as a livestock feed.

2. Laboratory studies showing the bonding effect of various additives when mixed with rice straw. Certain binders have good results in the laboratory press, and correlation of these results with full scale cubing operations looks favorable.

EVALUATION OF PROJECT

The Butte County Rice Growers Association have funded additional work, mainly in the form of demonstration feeding trials by a consulting nutritionist. This work has shown encouraging results when 40 to 60 percent of the rice straw is fed in a mixed ration as a maintenance ration for beef cattle or for pregnant cows. Similar results are predicted by UCD animal scientists.

The rice straw cubes appear to make good feed for horses also. The value of rice straw as a livestock feed will be even greater if the WRRL treatment proves economical. There appears to be a potential market for a large portion of the rice straw produced if this feed can be put in a suitable form for transport to a sizeable livestock population, or if the livestock can be brought closer to the source of rice straw.

Long or baled rice straw is unpalatable to animals. Ground rice straw has very low density and is subject to loss by wind. Rice straw rations are consumed better by animals, and are much easier to handle and stockpile if cubed. Therefore, it appears that the work planned in this project is necessary to long term, major utilization of rice straw as livestock feed.

PUBLICATIONS OR REPORTS

1. Palatability of Rice Straw Rations for Beef Steers
   Garrett, W. N., and John Dobie
   Mimeograph, June 1970.

2. Rice Straw Utilization and Disposal, Management and Economic Aspects
   Dobie, John B., Phillip S. Parsons, Robert G. Curley
   Lithoprint, September, 1970.