

PROCEEDINGS...

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The Agricultural Experiment Stations and Agricultural Extension Services of Arkansas, California, Florida, Louisiana, Mississippi, Missouri, and Texas; and the Agricultural Research Service, the Economic Research Service, the Cooperative State Research, Education, and Extension Service, and other participating agencies of the U.S. Department of Agriculture; and cooperating rice industry agencies

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Minimum tillage techniques created negative effects in both cropping systems. Crop residue remaining on the soil surface in continuous cropping retained moisture and delayed planting. In the rotational cropping system, aquatic vegetation in the previous year's reservoir kept the soil too wet and delayed planting. Overwintering rice in the continuous system was not controlled by the burn-down herbicides resulting in rice at different growth stages throughout the growing season.

Results from these studies illustrate that moisture conservation by surface residue, while beneficial to dry areas, may delay planting on poorly drained soils in high rainfall areas. The data also show the strong possibilities of using rain and runoff water to meet rice water requirements in high rainfall areas.

### Water Balance of Pin-Point and Flush-Flood Irrigated Rice

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Appearance of red rice (*Oryza Sativa* L.) as the main weed problem in rice production has forced producers and researchers to develop new irrigation techniques to control the weed. The Pin-Point (PP) irrigation method is one of these newer techniques. Little is known about the water balance of the PP method in comparison to the conventional Flush Flood (FF) technique. The general belief is that, while PP method controls red rice, it requires more water than the conventional method. If PP uses more water than FF, it may not be economically feasible.

The water balance of PP and FF were studied during the 1994 and 1995 growing season at the Texas A&M University System Agricultural Research and Extension Center near Beaumont, Texas. The objectives of this research were to: (1) Define the differences in the water balance between the PP and the FF irrigation management system, (2) Evaluate plant behavior under PP and FF conditions and the consequences on final yield, and (3) determine the water use efficiency of the PP and FF irrigation methods. Three plots were subjected to the PP irrigation technique and three more to the FF method. Nine non-weighing lysimeters per plot were installed to measure infiltration (I), transpiration (T), and evapotranspiration (ET). Six pots containing soil and six pots containing soil and plants were also installed in each conventional irrigation plot and weighed periodically, using an electronic load cell to measure ET during the drained period. Stomatal resistance was measured every two to three hours during daytime using a steady-state porometer. Canopy temperature, soil surface temperature and water temperature was measured with an infrared thermometer. For a better understanding of the energy available for evaporation and transpiration, a net radiometer was installed in each plot to measure net radiation. An automatic weather station was installed near the plots to measure global irradiance, temperature, humidity, wind speed and rainfall. Measurements were taken every 15 seconds and averages recorded every 30 minutes using a digital data system.

The PP method used significantly less water than the FF method. The average total water use for both years were 6286 m<sup>3</sup> ha<sup>-1</sup> and 7408 m<sup>3</sup> ha<sup>-1</sup> for PP and FF, respectively. There were no significant yield differences between the two methods. The water use efficiency (WUE), defined as: (Evapotranspiration + Infiltration) / (Irrigation + Rainfall), was higher in the PP method in both years. The ratio of dry matter produced to water supplied was also higher in the PP method. The PP method produced earlier maturity of the crop and suppressed weed development. No herbicide was necessary in the PP plots. During the period when the FF plots were drained, the net radiation was slightly lower than in the PP plots, and the stomatal resistance was always higher. Also the canopy temperature was higher in the FF plots compared to the PP plots during the drained period.

These results suggest that the PP method can be useful not only to suppress red rice, but also to save water. Also the earlier maturity of the crop under the PP irrigation regimen increases the probability of a good harvest in the ratoon crop.