AGRONOMY

DEVELOPMENT OF INTERMITTENT FLOOD MANAGEMENT SYSTEM IN THE MISSISSIPPI DELTA

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"OUR DATA INDICATES THAT ALLOWING FLOOD TO SUBSIDE TO FOUR INCHES BELOW THE SOIL SURFACE DOES NOT RESULT IN YIELD LOSS COMPARED TO A CONTINUOUS FLOODED SYSTEM."

Jason Krutz

Rice irrigation currently accounts for the greatest amount of irrigation water applied per acre over corn, soybeans, and cotton in the Mid-South. The alluvial aquifer serves as the major source of irrigation water for rice production in Mississippi; however, it is declining at a rate of 300,000 acre feet per year and has done so for approximately 25 years. Permitted irrigation withdrawals for fields in rice production in Mississippi are limited to 36 acre inches per year. Recent data suggests that rice producers often exceed this permitted value. Wide adoption of water saving irrigation practices by producers must first be validated. This study was conducted to determine whether safe and efficient alternate wetting and drying (AWD) water management can be achieved while maintaining yield and improving overall farm profitability.

A Mississippi Agricultural and Forestry Experiment Station study was conducted at the Delta Research and Extension Center in 2015 and 2016 to evaluate the yield and physiological response of rice to several alternate wetting and drying (AWD) irrigation regimes. Three rice cultivars, CL151, Rex, and XL745 (RiceTec®) were evaluated in six different rice irrigation treatments. Irrigation treatments included: a continuous flood, allowing the flood to recede to the soil surface, four inches below the soil surface, eight inches below the soil surface, 12 inches below the soil surface, and 16 inches below the soil surface. Water level in each paddy was monitored and irrigation events were triggered at each respective threshold back to a four inches flood, then allowed to subside until threshold was reached. Urea (150 pounds nitrogen per acre) was applied at first tiller, and a four inches flood was established and maintained for 14 days on all treatments. Irrigation treatments were then initiated until flowering, at

Figure 1. *Water delivery in rice using poly-pipe allows for simultaneous irrigation of individual paddies, resulting in reduced pumping times and increased irrigation efficiency for rice production.*

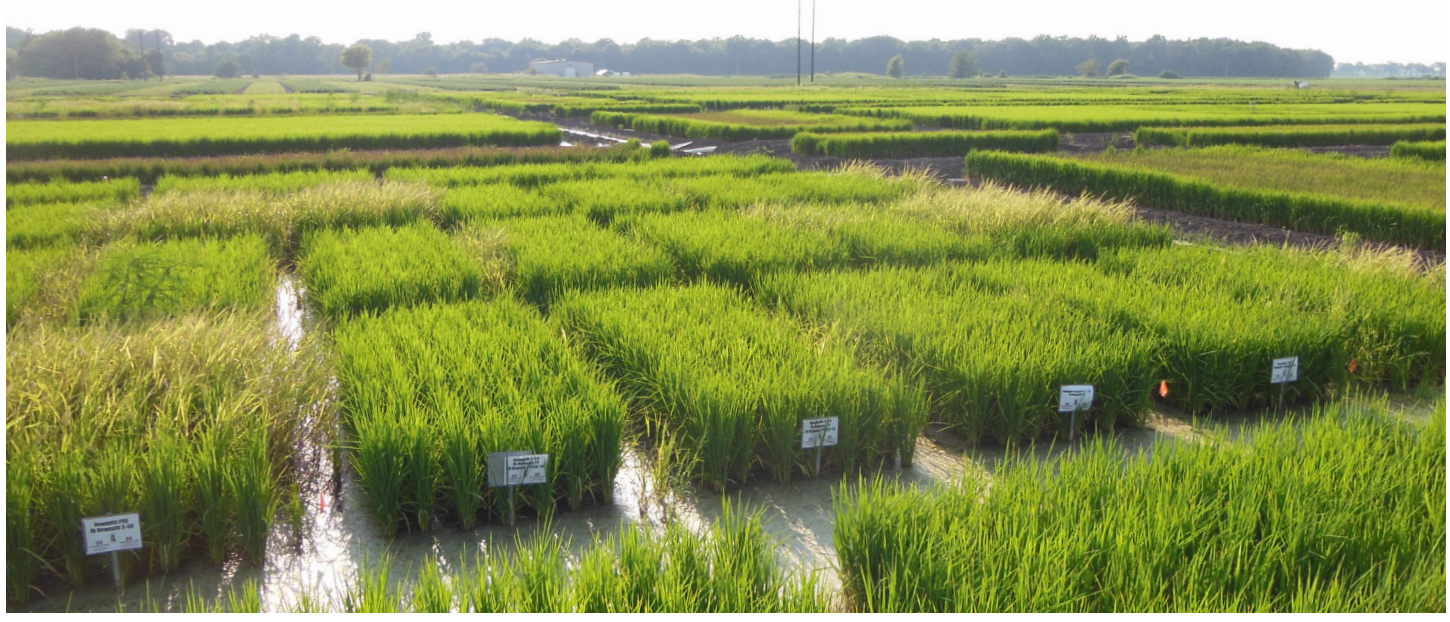

Figure 2. *Weed control plots overseeded with barnyardgrass to evaluate herbicide control for AWD irrigation as compared to continuous rice irrigation.*

which time a our inches depth flood was maintained in all treatments. Water treatments resumed after rice plots reached 100% heading until two weeks prior to harvest. Rice plots were harvested at 18-20% moisture and yields were calculated for rice at 12% moisture content. A conventional herbicide program and Clearfield® herbicide program were also evaluated in AWD irrigation and compared to a continuous flood. Experimental plots were over-seeded with barnyardgrass and were evaluated for barnyardgrass control.

Rice grain yield response of two AWD treatments were equal to rice grown with a continuous flood. A 10 bushel grain yield increase was observed when the flood within a paddy was allowed to recede to the soil surface compared to a continuous flood. Grain yield for continuous flood was equal to rice grown with flood receding to four inches below soil surface. Reduction of grain yield was observed when the flood receded past eight inches below the soil surface as compared to continuous flood. Control of barnyardgrass in experimental plots was not different for rice grown under continuous flood compared to AWD (eight inches below soil surface). Barnyardgrass control for Clearfield® rice herbicide program in AWD and continuously flooded rice was 95% pooled over all herbicide treatments. For conventional rice, barnyardgrass control (pooled over all herbicide treatments) for continuous irrigation averaged 79% control, while AWD irrigation averaged 82% control.

Data from this experiment in 2015 and 2016 suggest that allowing flood to subside to four inches below the soil surface does not result in yield loss compared to a continuous flooded system. Water management practices that reduce groundwater withdrawals are a viable option for rice producers in the Mid-South. Weed control for AWD irrigation is maintained using current herbicide programs for conventional and Clearfield® rice production systems. Rice water management using AWD irrigation reduces cost of fuel for pumping while maintaining yield potential thus improving overall profitability.