

DEVELOPMENT AND APPLICATION OF VARIABLE RATE IRRIGATION TECHNIQUES ON NON-UNIFORM SOILS USING CENTER-PIVOT IRRIGATION SYSTEMS

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ABSTRACT

Variable rate irrigation was studied for the production of corn and rice on a non-uniform soil texture using a three tower, conventional, center-pivot irrigation system on the East Marsh Pivot (Marsh Pivot) at the University of Missouri Delta Research Center in Portageville, MO. The soil of the Marsh Pivot is of the Hayti-Portageville-Cooter association. Veris Technologies' Soil Electrical Conductivity (EC) System was used in 2002 to determine the sand content within the soil. The mean sand was calculated from the deep reading of the system because the EC from the deep reading had the better correlation with the calibration soil samples from the Marsh Pivot.

Six irrigation treatments were used for corn irrigation in 2009 and 2010. In 2009, 15 mm was used to produce the maximum yield for corn, but in 2010 46 mm was used to produce the maximum yield for corn on the non-uniform soils. However, for both years 8 mm produced yields equal to or greater than all other irrigation treatments at the 95% confidence interval.

Seven repetitions of six irrigation treatments were studied on the east half of the Marsh Pivot in 2010. The center-pivot irrigation system produced average yields greater than conventional flood irrigation (8970 kg-ha^{-1} vs 7040 kg-ha^{-1} , Vories et al., 2002) while using less applied water for an application depth of at least 11 mm, (790 mm vs 1200-1600 mm)., Jehangir et al., 2004).