

**EVALUATION OF SUBSURFACE IRRIGATION WITH CBM PRODUCED WATER:
RESULTS AFTER TWO YEARS OF OPERATION**

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This study evaluates how subsurface drip irrigation utilizing coalbed methane produced water impacts crop yield, soil properties, and groundwater quality. In 2008, almost 2000 coalbed methane wells in the Powder River Basin were shut-in because there was no permitted use or discharge for produced water. In the semi-arid Powder River Basin, irrigation would be a desired use for produced water except that the water contains elevated concentrations of sodium (110-800 mg/L) and a high sodium absorption ratio (6.1-29), which can adversely impact soil permeability and plant survival if applied at the surface. However, if produced water is introduced into the soil at root depth, theoretically there is sufficient calcium and magnesium present to offset the deleterious effects of sodium. Also, root penetrations from the vigorous growth of well watered plants would further enhance soil permeability. The U.S. Geological Survey and the National Energy Technology Laboratory are collaborating with BeneTerra LLC to comprehensively monitor a 200-acre subsurface drip irrigation site near Arvada, Wyoming that is receiving coalbed methane produced water. The presentation will include results from the first two years of operation.

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