CARBON SEQUESTRATION AND CARBON MANAGEMENT POLICY EFFECTS ON PRODUCTION AGRICULTURE IN THE TEXAS HIGH PLAINS

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Abstract

Increased concentration of greenhouse gases in the atmosphere (ex., carbon dioxide) has led to attempts to implement carbon policies in order to limit and stabilize their emission at acceptable levels. Although agricultural activities increase greenhouse gases in the atmosphere, they can also mitigate concentration of carbon dioxide by sequestering carbon. This study evaluated carbon emissions and sequestration from crop production in 41 counties in the Texas High Plains (THP) and examined the impacts of payments for sequestration and taxes on carbon emissions on cropping choices, profitability, and water consumption. For each of these counties, a representative farm was established where corn, cotton, peanuts, sorghum, and wheat were grown. This study utilized model for carbon sequestration calculation and a non-linear programming model to maximize net revenue for each county. In order to obtain results from the baseline the model without any constraint was estimated without introducing net revenue from sequestration. The model was used to maximize net revenue from production, finding optimal planted acres and water usage for each crop and county. The results showed that total carbon emission reduction of 15% from a baseline resulted in water consumption reduction by 20%. After imposing taxes on carbon emissions, water consumption decreased by 16%. Looking at the alternative carbon management policies, carbon payment for sequestration did not affect reduction of carbon emissions, water use nor the product mix. Tax, on the other hand, achieves the goal of carbon reduction and intensely reduces the water use.