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Biofuels Boom, Aquifer's Doom?

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As the biofuel industry continues to inflate, largely due to government subsidies, the demand for high energy grain crops has amplified. This demand shift has caused global crop producers to switch production from many traditional crops, such as wheat and grain sorghum, to high energy crops, most notably water- and input-intensive corn, which are more suitable for biofuel production. While this substitution has created volatility in commodity markets, it has also created an additional strain on water resources in many irrigated agricultural regions. This strain will have potentially long-term consequences on water resources that are already stressed, such as the declining High Plains aquifer. The High Plains aquifer is the chief water source for much of eastern Colorado, western Kansas, central and western Nebraska, northeastern New Mexico, and the Oklahoma and Texas panhandles. The economic value of the aquifer in these regions, especially to agriculture, is significant. The mass water resource has enabled many agricultural industries, such as irrigated crops and feed lots, to establish themselves in areas that would not be possible without the aquifer. However, continued overdrafts of the aquifer have caused a long-term drop in water levels; some areas have now reached effective depletion. This paper seeks to estimate the impact of the emerging biofuels sector on groundwater consumption and cropping patterns in the Kansas portion of the High Plains Aquifer. Three case counties in western Kansas have been selected for analysis, which vary in their groundwater availability and historical cropping patterns. To understand the spatial variability of impacts within and across counties, each county will be subdivided into smaller spatial units for analysis. High-resolution spatial data for this task is available in Kansas due to a unique database that compiles individual water use reports, which all water right holders in the state are required to file annually. A positive Mathematical Programming model will be developed and calibrated to land- and water-use data areas in each spatial unit in the base period of 1993-2003. The models will then be run for higher grain prices, reflecting the recent spike in grain prices from the extra energy demand. The PMP model will predict changes in land and water use patterns due to biofuel production. Spatial mapping of the results will reveal areas of the aquifer where the strain from energy crop production is most acute, and where policies might be effectively targeted to change cropping patterns. It is expected that the impacts will be the small in water-plentiful regions of the aquifer, as corn was already the crop of choice in those areas. However, the impact is expected to be larger in areas with small or intermediate levels of saturated thickness, where there is greater opportunity to substitute to corn from other crops.