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Commentary on Climate Change involved in Water Resources

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Abstract

The agricultural economy in Colorado is dominated by livestock, which accounts for 67% of total receipts. Crops, including feed grains and forages, account for the remainder. Most agriculture is based on irrigated production, which depends on both groundwater, especially from the Ogallala aquifer, and surface water that comes from runoff derived from snowpack in the Rocky Mountains. The analysis is composed of a Base simulation, designed to represent selected features of the agricultural economy several decades in the future, and then three alternative climatic scenarios are run.

Keywords: Agricultural economy; Livestock; Crops; Grains

Introduction

Colorado agriculture has blossomed with the development of water resources used for growing crops, which, in turn, spurs value added production in the meat and dairy subsectors [1]. Yet, increasing urban development is expected to create a reallocation of 740 million of agricultural water to new municipal and industrial demands by 2030. Another challenge to the agricultural sector is a possible expansion of ethanol production in Colorado. Shifting corn to ethanol use rather than animal feed could place livestock production, Colorado's dominant agriculture industry, at a disadvantage as the key input becomes more expensive, even though dry distillers' grains mitigate some of the constraint. These pressures on agriculture may be exacerbated by the presence of climate change, particularly its effect on water availability and yields [2]. Stakeholders thus seek ways to better understand the implications of climate change on state wide water availability and requirements for crops and livestock, in the presence of a larger population and other new demands such as ethanol production. This research evaluates these issues with illustrations on how resources might be reallocated and how prices respond in the future.

Description

The research uses a positive mathematical programming model specified to represent the Colorado agricultural sector, which is simulated to examine impacts of selected future constraints on water and yields resulting from climate change. First, this model was calibrated to 2007 quantities and prices. Then, a "Base" scenario was constructed, which reflects several future drivers of change affecting the state's agriculture: increasing competition for water due to population growth, especially shifts in the resource from agricultural to municipal uses in the South Platte and Arkansas River basins; and we also add two ethanol plants into the South Platte River Basin [3], which leads to a 75% increase in corn extracted-ethanol production there, and provides competition to the cattle feeding industry's use of a key input, corn for grain.

Using an economic displacement mathematical programming model derived from harrington and dubman of the USDA's Economic Research Service. This study examines the effects of climate change on agriculture in Colorado taking into account of selected features projected several decades into the future. Initially, an overview of agriculture in the state and its dependence on water, a critical input, is described. The overview shows that the agricultural economy in Colorado is dominated by livestock, which accounts for 67% of total receipts. Crops, including feed grains and forages, account for 33% of production [4]. Most of agriculture is based on irrigated production, which depends on both groundwater, especially from the Ogallala aquifer, and surface water that comes from runoff derived from snowpack in the Rocky Mountains. Climate studies point to decline in runoff from 6% to 20% by 2050. The timing of runoff is projected to begin and peak earlier in the spring and late-summer, and overall flows may be reduced. The climate change scenarios evaluated in this pa per include three simulations relative to a Base scenario that reflects some key characteristics with regard to future water and yield effects of climate change. Following SWSI projections, the base reflects demographics and economic changes from the calibrated model for 2007 [5].

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None

Conflicts of Interest

None

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