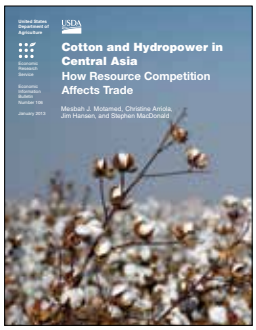
ERS Report Summary

Economic Research Service | January 2013 | U.S. Department of Agriculture



This is a summary of an ERS report.

Find the full report at ***www.ers.usda.gov/publications/eib-economic-information-bulletin/eib106.aspx***

Cotton and Hydropower in Central Asia

How Resource Competition Affects Trade

Mesbah J. Motamed, Christine Arriola, Jim Hansen, and Stephen MacDonald

What Is the Issue?

As growing populations demand more electric power and the need for low-emission energy sources intensifies, interest has risen in hydroelectric power (hydropower) as an alternative to carbon-based sources. However, hydropower's demand for water resources has pushed up against the needs of irrigated production agriculture. Hydropower is a feasible energy source only in certain regions of the world, and it accounts for only about 2 percent of the world's energy supply. But its interaction with irrigated agriculture—for instance, through competition for water or resource-sharing agreements—can generate large effects, from local to international. In this paper, we introduce the topic of water competition between the energy and agriculture sectors from a global perspective. To show why this perspective should matter to policymakers, we present a case study of cotton production in Central Asia in which we combine high-resolution geographic information system (GIS) data covering crops and river basins with a partial equilibrium agricultural trade model to simulate the international trade effects of different water policy scenarios.

What Did the Study Find?

We identified regions of the world where agriculture and hydropower energy sectors compete for the same water resources. Much of the world's hydropower and irrigated agriculture overlap in South and East Asia. As an illustrative case study of this competition's effects on world production and trade outcomes, we selected one region—the Syr Darya river basin in Uzbekistan—as the basis for three scenarios in which irrigated agricultural land is reduced by increasing amounts (10, 25, and 50 percent) due to heightened hydropower demands in the neighboring Kyrgyz Republic. According to our model results:

- For Uzbekistan, all three area-diminishing shocks lead to large reductions in cotton production as well as production of its closest economic substitute, wheat.
- In the most extreme area-reduction scenario (50 percent), Uzbek cotton production falls by 17 percent and cotton exports drop by approximately 21 percent relative to baseline projections.
- These impacts are felt only modestly in international markets, as major producers—the United States, Brazil, and Australia—adjust their production and exports slightly upward in response to higher prices resulting from the reduction in Uzbek cotton exports.

- The results of the simulation, which confirm that world cotton prices barely budge in response to the small shock to world supply, nonetheless illustrate how high-resolution GIS data sets and partial equilibrium trade models can be combined to address new questions concerning natural resource management and market behavior.

How Was the Study Conducted?

This study used the USDA-ERS Country-Commodity Linked System (CCLS), a large-scale dynamic partial equilibrium simulation system consisting of 43 country and regional models. For the analysis, the authors created a country model for Uzbekistan. They confined their analysis to the Syr Darya river basin, using GIS to overlay high-resolution production data onto a map of the basin to accurately capture the area of production subject to the water shock. To simulate the heightened energy demands placed on the Kyrgyz Republic's Toktogul hydropower reservoir, we reduced Uzbekistan's area in cotton by 10, 25, and 50 percent and observed domestic and international outcomes in production, prices, and trade for each level of reduction.