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Study Warns That China and India's Planned Biofuel Boost Could Worsen Water Scarcity, Compete with Food Production

Globally, Biofuel Crops Unlikely to Impinge on Food Crops,
But in Water-Scarce Areas, Experts Fear Conflicts

COLOMBO, SRI LANKA (11 OCTOBER 2007)—A new study by researchers with the Consultative Group on International Agricultural Research (CGIAR) warns that ambitious plans in China and India to greatly increase domestic production of biofuels derived from crops will put greater stress on these countries' water supplies, seriously undermining their ability to meet future food and feed demands.

The study, conducted by the CGIAR-supported International Water Management Institute (IWMI) in Sri Lanka, also found, however, that at the global level, the rush to boost production of ethanol from crops like maize and sugarcane will most likely have only a modest impact on water use and food systems. Even so, in many areas where water is already scarce, biofuel production could threaten river and groundwater systems.

"Biofuel production in China and India raises special concerns, because the crops to be used for biofuels—maize in China and sugarcane in India—would rely mainly on irrigation," says Charlotte de Fraiture, an IWMI scientist and lead author of the biofuels study. "Even without increased biofuel production, water scarcity in these countries will worsen, as rising incomes and growing populations boost food demand."

India and China have set ambitious goals for biofuel production to curb their rapidly growing appetites for fossil fuel imports. Together, they account for almost 70 percent of projected worldwide growth in oil demand between now and 2030. Yet, the two countries are already struggling to find enough water to grow the food they need.

China aims to increase biofuel production four-fold, from a 2002 level of 3.6 billion liters of bioethanol to around 15 billion liters by 2020, or 9 percent of the country's projected gasoline demand. India is pursuing a similarly aggressive strategy.

To meet their biofuel targets, IWMI says, China would need to produce 26 percent more maize and India 16 percent more sugarcane. Doing so would require an extra 75 liters of irrigation water per person every day in China and an additional 70 liters per day in India, beyond that needed for food.

"Crop production for biofuels in China and India would likely jeopardize sustainable water use and thus affect irrigated production of food crops, including cereals and vegetables, which would then need to be imported in larger quantities," de Fraiture notes. "Are these countries—

particularly India, which has devoted so much effort to achieving food security—adequately considering the trade-offs involved, especially the prospect of importing food to free up sufficient water and land for production of biofuel crops?"

Over a third of the global population contend with water scarcity, according to the *Comprehensive Assessment of Water Management in Agriculture*, a report prepared in consultation with more than 700 experts on water management in agriculture over the last 50 years. The assessment, which was released earlier this year, shows that to feed another 2 to 3 billion people, with incomes rising and diets diversifying, the demand for water for food would increase between 20 to 55 percent, depending on decisions made about water. This analysis does not take into account water for biofuels, which will put greater stress on water systems and make it more difficult to achieve food security for all.

"Without major changes in water management, how are we going to feed a growing population, satisfy increasing demand for meat, and, on top of that, use crops as a major source of fuel?" asks David Molden, the IWMI scientist who coordinated the *Comprehensive Assessment*. "If you take into account the water it takes to produce our food, most of us already consume about 3,000 liters of water each day."

Water scarcity in India has prompted a controversial multibillion-dollar plan to redistribute water resources within the country. In China, industry-led economic development in the water-rich south has made the country more dependent on food production in the relatively dry north, leaving groundwater resources there "extensively overexploited."

In both countries, the amount of irrigation water required to produce ethanol is high, IWMI scientists point out, compared with water use for this purpose in other regions. In the USA, for example, which relies mainly on rainfed maize for biofuel production, it takes, on average, only about 400 liters of irrigation water to produce a liter of ethanol. For Brazil, where mostly rainfed sugarcane is the chief biofuel crop, the figure is about 90 liters. But in the dry agricultural lands of northern China, the IWMI study notes that producing a liter of maize-based ethanol consumes 2400 liters of irrigation water. In India, the requirement is even higher, at 3500 liters of irrigation water, because ethanol production is dependent on heavily irrigated sugarcane.

According to de Fraiture, governments are showing interest in biofuels production in the hope that it will strengthen energy security, create new opportunities for farmers, and reduce greenhouse gas emissions from fossil fuels. "But they must also take fully into account the potential impacts on water resources. It seems unlikely that China and India, with their rapid economic growth, will be able to meet future demand for food, feed and biofuels without either aggravating water scarcity or importing grain."

The outcome might be quite different, however, de Fraiture adds, if these countries can change the way they produce biofuels, relying more on various alternatives that are now under investigation. One option involves the use of enzymes to convert plant cellulose—of which crops can produce greater quantities than they can sugar—into biofuels. But this technology is not yet in commercial use.

A nearer-term option is to invest in the development of dryland rainfed crops, specifically sweet sorghum for ethanol and species such as *Jatropha and Pongamia* for biodiesel. According to scientists at the CGIAR-supported International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), with headquarters in India, such a strategy could help reduce competition for

scarce water between food, feed and fuel uses of crops like maize and sugarcane, grown on favorable, irrigated lands.

Because the dryland alternatives are cultivated primarily by poor, small-scale farmers, marketing them for biofuels could reduce rural poverty. Sweet sorghum produces both grain and sugar-rich stalks and is thus suited for food, feed and ethanol production. Degraded lands can be rehabilitated with *Jatropha* and *Pongamia* plantations. In collaboration with partners in the private and public sectors, ICRISAT scientists are improving these crops and forging institutional linkages to ensure that biofuels development reduces rural poverty and food insecurity.

Recent analysis by the CGIAR-supported International Food Policy Research Institute (IFPRI) further emphasizes the importance of research and technological innovation to ensure that crop productivity can keep pace with biofuel demand and thus soften its impact on the price of staple foods. Studies have shown that price impacts on grains could be halved if grain-based biofuel production is accompanied by aggressive productivity improvements. The most promising approach, however, is to phase out grain-based biofuel production in favor of second-generation ligno-cellulosic technologies, which use plant parts not needed for food. Pressure on national food systems for biofuel production could also be relieved if the international biofuels trade is allowed to work properly, so that countries with a comparative advantage in biofuel production can specialize in the export of ethanol and biodiesel to those with less-favored environments.

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About IWMI
IWMI is a non-profit, scientific research organization focusing on the sustainable use of water and land resources in agriculture, to benefit poor people in developing countries. IWMI's Mission is 'Improving the management of water and land resources for food, livelihoods and nature.' IWMI has its headquarters in Sri Lanka and regional offices in Africa and Asia. The Institute works in partnership with developing countries, international and national research institutes, universities and other organizations to develop tools and technologies that contribute to poverty reduction as well as food and livelihood security. www.iwmi.org.

About the CGIAR:
The CGIAR, established in 1971, is a strategic partnership of countries, international and regional organizations and private foundations supporting the work of 15 international Centers. In collaboration with national agricultural research systems, civil society and the private sector, the CGIAR fosters sustainable agricultural growth through high-quality science aimed at benefiting the poor through stronger food security, better, human nutrition and health, higher incomes and improved management of natural resources. www.cgiar.org.

Note:
The Comprehensive Assessment of Water Management is cosponsored by CGIAR, FAO, Ramsar and Convention on Biological Diversity. The summary and full report can be found at www.iwmi.org/assessment.