

NEWS NOTES — NEWS

Science and society

Agriculture consuming world's water

Amid all the talk about climate change, a more immediate issue can be forgotten — how land-use changes can affect the quantity and quality of water supplies. A recent study aims to throw this issue into the spotlight, with a call to land-use managers and legislators to consider how decisions such as growing more corn for biofuels or sequestering carbon might affect the ability to meet the water supply needs of Earth's expanding population.

The impacts of land-use changes on water resources depend on many factors, wrote Bridget Scanlon, a hydrogeologist at the Bureau of Economic Geology at the University of Texas at Austin, and colleagues in *Water Resources Research* March 27. These factors range from the type of vegetation involved and whether the change is permanent or temporary to variations in land management practices, such as whether the land is allowed fallow periods or how much fertilizer is applied. Although the team reported that the worldwide impacts from land-use changes are significant, the full impacts may not be known for decades because of natural lag times between ecosystem changes and water resource responses.

In the last 100 years, irrigated agriculture expanded globally by 480 percent, and it is projected to increase another 20 percent by 2030 in developing countries, Scanlon and colleagues reported. Furthermore, since the 1900s, global irrigated agriculture has accounted for almost 90 percent of global freshwater consumption, despite representing only 18 percent of global cropland, Scanlon says. In countries such as China and India, irrigation is expanding even faster, she says: "It's a huge issue and will become even more of a problem over time." Water requirements will no doubt increase during the next 50 years, as the global population is expected to increase from 6 billion to 9 billion people.

Agriculture is not only water intensive, it also degrades water quality, as salts in soils are mobilized, and as fertilizers and pesticides leach into aquifers and streams. "The type of crop really does matter," says William Simpkins, a hydrogeology professor at Iowa State University in Ames. Some crops, like corn, use far more fertilizers and water than others, such as soybeans or alfalfa, Simpkins says. The recommended amount of fertilizer for corn in Iowa, for example, varies from 125 to 175 pounds of nitrogen per acre, based on whether the crops on the land are alternated year to year, he says. Alfalfa and soybeans, by contrast, require far less nitrogen, as they absorb it from the air, he says.

In terms of water, to produce ethanol from corn requires at least 4 gallons of water for every gallon of ethanol, Simpkins adds. Today, farmers routinely alternate crops to preserve topsoil and nutrients and protect water resources, Simpkins says. But the ethanol boom is causing corn prices to skyrocket, and farmers are now considering producing corn each year on the same ground or devoting more land to corn, which is a system that cannot be sustained for the long term and still preserve water and soil quality, he says. "It doesn't seem like a lot of people have been considering water use and the other effects of ethanol production on our water resources," he says.

With the repeated calls by Congress and President George Bush to increase the biofuels production in the United States, the National Academy of Sciences (NAS) will hold a colloquium in July to learn more about the effects of biofuels expansion on the nation's water resources. "It's a good first step," Simpkins says. Such land-use changes need to be addressed, Scanlon adds.

Another good step, Scanlon says, is the new assessment of the world's water resources by the Consultative Group on International Agricultural Research's International Water Management Institute (IWMI). Published in March, the report details how land-use changes affect water resources, shows where problems are greatest now, and projects where problems are likely to grow, says David Molden of IWMI. Researchers have known for quite awhile that agriculture causes both water quantity and quality issues, he says, but "it is an issue we have to watch very carefully." Indeed, Scanlon says, future land-use changes need to take into consideration all the trade-offs. "Sustainable water resources can be developed by focusing on rainfed (nonirrigated) agriculture," she says, "and greatly decreasing dependence on irrigated agriculture."

Megan Sever



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