



# BIOFUELS AND FOOD SECURITY

## Balancing Needs for Food, Feed, and Fuel

*There is enough alcohol in one year's yield of a hectare of potatoes to drive the machinery necessary to cultivate the field for a hundred years. And it remains for someone to find out how this fuel can be produced commercially—better fuel at a cheaper price than we know now.*

—Henry Ford, 1925

### BACKGROUND

Biofuel demand is increasing because of a combination of growing energy needs; rising oil costs; the pursuit of clean, renewable sources of energy; and the desire to boost farm incomes in developed countries. In turn, the need for crops—such as maize and sugarcane—to be used as feedstocks for biofuels has increased dramatically. That demand has had a significant and increasing impact on global food systems.

The effects of growing biofuel demand are interwoven with tightening grain markets, which reflect demographic shifts and improved diets. In developing countries, as populations grow and incomes rise, diet preferences are shifting from staple crops to higher-value products like meat and dairy. As a result, the demand for grain- and protein-based animal feed is soaring and competing with food needs. These changes have led to increasing pressures on global agricultural markets and higher food costs.

Poor people in both rural and urban areas are disproportionately vulnerable to these forces because they spend a large share of their incomes on food. Biofuels subsidies in developed countries tend to drive up food prices, thus reducing consumption and nutritional well-being for net buyers. The higher prices for commodities resulting from biofuel feedstock production can mean higher incomes for some farmers in developing countries and better agricultural wages for laborers, although the question of distribution among winners and losers remains. Another outcome for developing countries could be increased pressure on fragile natural resources on which poor farmers depend, potentially further degrading land and stressing limited water supplies.

Over the coming decades, global food and agricultural systems not only will continue to come under the strain of providing for the competing needs of food, feed, and fuel, but will also face greater pressure from climatic and other economic changes. Urgent research is needed now to address these trends and



protect the livelihoods of poor people. IFPRI uses innovative quantitative and analytical techniques to help policymakers and international institutions assess the potential benefits and risks of biofuels and explore ways to provide income-generating opportunities for the world's farmers while minimizing resource degradation and food insecurity. Critical questions include how global food systems can meet growing food, feed, and fuel needs while contributing to the reduction of poverty and hunger.

IFPRI links food systems and their supporting ecosystems to the global energy economy and the processes of global change. Quantitative analysis connects the growing demand for renewable energy to policy-driven patterns of biofuel production and trade. The goal is to understand the implications for agricultural land and water use and the availability and price of food and feed commodities. Energy-use trends are examined along with other important drivers of global change, such as climate and socioeconomic growth, to better understand their environmental and economic consequences. These trends are also analyzed to target and design policy reforms and strategic investments in order to alleviate poverty and malnutrition and improve rural livelihoods more effectively.

IFPRI's work on biofuels falls under the Institute's priority research area on global and national food and agriculture systems. This research area also supports the priorities of the Consultative Group on International Agricultural Research (CGIAR) regarding science and technology policies and institutions, as well as pro-poor international and domestic markets.

## BIOFUELS RESEARCH AREAS

### *Global Scenario Analysis and Tools*

Scenario-based analysis improves understanding of biofuel growth within the wider context of global environmental and economic changes. By considering alternative trajectories of the key socioeconomic drivers that determine the growth of income, population, and energy demand, IFPRI evaluates the range of possible outcomes that might arise as the demands for food, feed, and fuel products compete for available supply. A range of policy recommendations can then be made on the basis of this analysis, and important sources of uncertainty can be identified.

Since the early 1990s, IFPRI has used the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) to examine the effects of water availability and climate change on the global food supply, demand, trade, prices, and food security. IMPACT is a key component in IFPRI's scenario analysis of biofuels but will also be coupled with other global and country-level market and land-use models to evaluate important economywide and environmental linkages.

Several models have been used together with IMPACT in developing and analyzing projections, and land-use models are being developed to examine the trade-offs between agricultural and nonagricultural land-use activities. Researchers are also using IFPRI's global general equilibrium model, MIRAGE, to analyze biofuel policies and will look at the structure of ethanol and biodiesel trade regimes, as well as the implications for land markets and other sectors of the global economy.

### *Country-Level Analysis*

Drawing on an array of household-level data for various countries, IFPRI is looking at the microlevel impacts of biofuels. This includes the effects that changes in food prices have on household food consumption and nutrition, as well as the implications that cheaper, cleaner forms of energy have for household welfare.

In collaboration with the Program on Food Security and the Environment at Stanford University's Freeman Spogli Institute for International Studies and the Center for Chinese Agricultural Policy, IFPRI is studying the potential for biofuels production in India, Mozambique, and Senegal, as well as the pathways through which rapid growth in biofuels and changes in related markets might affect household welfare. This project connects detailed, global-level scenarios of energy and agricultural markets with country-level agricultural and development policies to better understand their implications for human well-being and environmental sustainability.

An ongoing study in Southeast Asia is examining the likely impact of biofuel expansion on forest resources in order to provide advice on necessary policy interventions. In Latin America, a regional IFPRI study has derived indicators of biofuel production potential and future impacts.

### *Linkages with Food Systems Analysis*

IFPRI's global change research team seeks to improve the analysis of global food systems to better characterize the drivers of food demand and the constraints faced by food production systems. The desired result of the research is an improved understanding of the scope for technological and policy interventions to improve human welfare. This analytical framework highlights important links between food systems and the environment and accounts for nonagricultural land uses and other sources of external stress on natural resources. By creating links to innovative science and policy programs and research networks, this research program seeks to improve the science behind the analysis of food systems and their functioning.

## CGIAR-WIDE BIOENERGY ALLIANCE

IFPRI is part of an alliance of CGIAR centers that are combining their strengths and expertise to address more rigorously the issues of biofuels, agriculture, and food security. Together with IFPRI, the founding members of the Alliance Bioenergy Platform are the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the International Maize and Wheat Improvement Center (CIMMYT). These institutes and other CG centers will jointly coordinate collaborative activities on the topic in the coming years.

IFPRI's bioenergy work is led by the global change research team within the Environment and Production Technology Division: [www.ifpri.org/themes/bioenergy/bioenergy.asp](http://www.ifpri.org/themes/bioenergy/bioenergy.asp).

#### **Related Links:**

Global Change site: [www.ifpri.org/themes/grp38/grp38.asp](http://www.ifpri.org/themes/grp38/grp38.asp)

IMPACT: [www.ifpri.org/themes/impact.htm](http://www.ifpri.org/themes/impact.htm)

For additional information, please contact [ifpri-ept@cgiar.org](mailto:ifpri-ept@cgiar.org).

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IFPRI is one of 15 agricultural research centers that receive principal funding from governments, private foundations, and international and regional organizations, most of which are members of the Consultative Group on International Agricultural Research (CGIAR).