

Authors: Laura Christianson, Karina Crosignani, Angie Gumm, Jennifer Himmelsbach, Becky Rasmussen, Elisa Regen, Michael Stanfield, Diego Thompson

Availability of adequate and affordable energy is one of the basic requirements for sustaining wellbeing and functionality of a society. Surging oil prices over the last 5 years, and record levels of oil consumption have encouraged research in alternative, sustainable fuels sources. The resulting emerging biofuels market created significant demand for agricultural commodities such as sugar, corn, soybean, cassava, oilseeds and palm oil. Some believe that increased demand for these commodities may be a leading factor behind the increase in food prices in the United States and worldwide.

Food prices have increased by approximately 6% in the United States, and significantly more throughout the world. Food supply and market situation differs from country to country but projections suggest that food prices will remain high in the next few years and some contribute this increase to the use of commodity crops for biofuels. This conflicting interest has created controversy in the area of biofuels production.

Activity: The United States Senate Committee on Agriculture, Nutrition, and Forestry is holding a hearing on Food and Fuel Production in hopes of educating its members for an upcoming vote on policy involving the continued funding of biofuels. The Renewable Fuels Association, International Food Research Institute, United Nations Food and Agricultural Organization, and a group of researchers in the biofuels area are invited to speak in support or opposition of continued funding for biofuels research. At the conclusion of the presentations from each group, the senators will vote either 'yes' or 'no' for continued funding of biofuels research.

Groups:



Renewable Fuel Association

The Renewable Fuel Association is the national trade association for the US ethanol industry. Though you are primarily interested in ethanol, you also work with other groups (i.e. National Biodiesel Board) to further the agenda of biofuels in general. In your view, biofuels are a way to reduce air pollution, increase energy security, provide lower fuel prices to consumers and boost the US economy. You will argue that biofuels are beneficial to society as a whole and do not negatively affect food prices. Biofuel production should be continued and increased to lead to a more sustainable energy future. (pg. 3-7)



Food and Agriculture Organization of the United Nations

According to the United Nations, "Biofuel policies have generally been designed within a national framework with little regard for unintended consequences at the national and international levels. This new source of demand for agricultural commodities creates opportunities, but also risks, for the food and agriculture sectors. Increasing demand for biofuels may offer opportunities for farmers and rural communities in developing countries and thus contribute to rural development. At the same time, there is a risk that higher food prices could threaten the food security of the world's poorest people, many of whom spend more than half of their household incomes on food." Accordingly, this team will argue against biofuel funding. (pg 8-12)

Research Representatives

In the coming years, there is no doubt that both industry and growers will be pursuing technology and profit in the field of biofuels. The biofuel subsidies provided in the 2008 Farm Bill insure this. The university research community is aware of and accepts many of the drawbacks associated with biofuel technology, including the risk of increased food prices. It is our belief, however, that these risks are comparable to those involved with any energy policy, and more importantly, that the risks entailed in biofuels can be minimized with proper government funding of research. Furthermore, we acknowledge that biofuels are a necessary component of any current energy policy. Based on experience we know that we cannot expect industry to have the will or farmers to have the capability to develop and utilize this promising technology in a way that will promote the most sustainable use of our resources. Continued funding of biofuel research will allow the United States to remain technologically competitive with the rest of the world, and most importantly it will allow us to embark on this still-burgeoning new energy endeavor in a purposeful way that is both socially and environmentally responsible. (pg 13-15)



International Food Policy Research Institute

Sustainable solutions for ending hunger and poverty

“The International Food Policy Research Institute (IFPRI) seeks sustainable solutions for ending hunger and poverty. IFPRI is one of 15 centers supported by the Consultative Group on International Agricultural Research, an alliance of 64 governments, private foundations, and international and regional organizations... [IFPRI’s] vision is based on the human right to adequate food and freedom from hunger, and the recognition of the dignity inherent in all human beings. It is a vision of a world where every person has secure access to sufficient and safe food to sustain a healthy and productive life and where food-related policy decisions are made transparently and include the participation of consumers and producers.” For more information on IFPRI, we invite you to visit: <http://www.ifpri.org/>. You will argue that biofuels are hurting society as a whole via their negative effect on food price and food availability. (pg 16-22)

Assigned Groups:

Renewable Fuel

Assoc.
Anette
Claudia
Betty
Andrea
Nikki

Int'l Food Policy

Res. Institute
Phil
Meghann
Drake
Nick
Gretchen

FAO - U.N.

Stefans
Michael
Pete
Mae Rose
Rob
Jessica

Researchers

Amy
Joseph
Andy
Matthew
Clark
Lisa



Renewable Fuel Association

Ethanol Facts: Food vs. Fuel (excerpts)

As the U.S. ethanol industry continues to expand, the amount of corn used for ethanol production is increasing dramatically. Critics question whether corn growers can satisfy demand for both renewable fuels and traditional uses like livestock and poultry feed, food processing and exports, and the contrived food vs. fuel debate has reared its ugly head once again.

Starting around January 2007, food price increases have occurred seemingly in tandem with advancing corn prices and growth in U.S. ethanol production. The concurrence of these events has led to speculation that increased ethanol production is a major driving factor of higher corn prices, and in turn, higher food prices. While the case can be made that expanded ethanol production is a minor factor in increased spending on food, additional food spending increases are more than offset by savings resulting from the inclusion of more ethanol in the U.S. gasoline supply. As **this analysis**

(<http://www.ethanolrfa.org/resource/facts/food/documents/EthanolandHouseholdSpending.pdf>) of data from government, academic and financial sources demonstrates, the average U.S. household saved between \$100.44 and \$510.72 between March 2007 and March 2008 as a result of increasing ethanol production.

Numerous statistical analyses have demonstrated that the price of oil - not corn prices or ethanol production - has the greatest impact on consumer food prices because is integral to virtually every phase of food production, from processing to packaging to transportation.

A **February 2008** report by the Federal Reserve Bank of Kansas City cites robust food demand, record high crop prices, and accelerating costs for labor and energy for the sharp gains in retail food prices in 2007.

(<http://www.ethanolrfa.org/resource/facts/food/documents/KCFEDFoodPriceInflation2008.pdf>)

A **December 2007** report by Informa Economics, Inc., "Marketing Costs and Surging Global Demand for Commodities are Key Drivers of Food Price Inflation," found "the so-called 'marketing bill'—the portion of final food costs that excludes grains or other raw materials—as a key driver of the consumer price index (CPI) for food, largely due to rising energy and transportation costs. Another significant factor in consumers' food bills is surging global demand for commodities... The report finds a comparatively 'weak correlation' between corn prices and overall food costs. In fact, just four percent of the change in the food CPI could be attributed to fluctuations in the price of corn. Simply put, the growing U.S. ethanol industry is not the cause of food price inflation."

(http://www.ethanolrfa.org/resource/facts/food/documents/Informa_Renew_Fuels_Study_Dec_2007.pdf)

According to a **June 2007** analysis of food, energy and corn prices conducted by John Urbanchuk of LECG, LLC, "rising energy prices had a more significant impact on food prices than did corn." In fact, the report notes rising energy prices have twice the impact on the Consumer Price Index (CPI) for food than does the price of corn. "Energy costs have a much greater impact on consumer food costs as they impact every single food product on the shelf," said Urbanchuk. "Energy is required to produce, process, package and ship each food item. Conversely, corn prices impact just a small segment of the food market as not all products rely

on corn for production. While it may be more sensational to lay the blame for rising food costs on corn prices, the facts don't support that conclusion. By a factor of two-to-one, energy prices are the chief factor determining what American families pay at the grocery store." According to the study, "Increasing petroleum prices have about twice the impact on consumer food prices as equivalent increases in corn prices. A 33 percent increase in crude oil prices – the equivalent of \$1.00 per gallon over current levels of retail gasoline prices – would increase retail food prices measured by the CPI for food by 0.6 to 0.9 percent. An equivalent increase in corn prices – about \$1.00 per bushel over current levels – would increase consumer food prices only 0.3 percent."

Clearly, while ethanol demand is providing American farmers a better value for their grain, it is not the sole culprit or even a major reason for rising food prices. Factors like \$100 for a barrel of oil, record global demand for food and feed grains, and a weak U.S. dollar play more significant roles in determining consumer food prices than the price of corn or the growth of the U.S. ethanol industry.

Corn demand for ethanol has no noticeable impact on retail food prices. A central theme in the "food versus fuel" myth is the false assertion that moderately higher corn prices, spurred by ethanol demand, are leading to higher retail food prices for consumers. Yet the truth is numerous cost factors contribute to retail food prices. According to USDA, labor costs account for 38 cents of every dollar a consumer spends on food. Packaging, transportation, energy, advertising and profits account for 24 cents of the consumer food dollar. In fact, just 19 cents of every consumer dollar can be attributed to the actual cost of food inputs like grains and oilseeds.

Retail food products such as cereals, snack foods, and beverages sweetened with corn sweeteners contain very little corn. Therefore, fluctuations in the price of corn are not often reflected in the retail prices for these items. As an example, a standard box of corn flakes contains approximately 10 ounces of corn, or about 1/90th of a bushel. Even when corn is priced at \$4 per bushel, a box of corn flakes contains less than a nickel's worth of corn.

Retail food price data from the Bureau of Labor Statistics further demonstrates that increased demand for corn for ethanol production has not dramatically increased consumer food prices. While the cash price of No. 2 Yellow Corn has increased from \$2.18/bushel in April 2006 to \$3.36/bushel in April 2007, consider the change in price in the following grocery items:

ITEM	QTY	APRIL 06 PRICE	APRIL 07 PRICE
Milk	1 gal.	\$3.12	\$3.14
American Cheese	1 lb.	\$3.81	\$3.73
Butter	½ lb.	\$1.40	\$1.43
Ice cream	½ gal.	\$3.62	\$3.79
Turkey	2 lbs.	\$2.22	\$2.16
Chicken breast	2 lbs.	\$6.62	\$6.74
Eggs	1 dz.	\$1.28	\$1.62
Pork Chops	2 lbs.	\$6.34	\$6.30
Bacon	2 lbs.	\$6.68	\$7.00
Ground beef	1 lbs.	\$2.74	\$2.82
Beef steak	2 lbs.	\$10.18	\$10.82
Cola, non-diet	2 ltrs.	\$1.10	\$1.20
Malt Beverage	72 ozs.	\$5.00	\$5.00
TOTAL		\$54.11	\$55.75

As the above chart demonstrates, the aggregate increase for these food items from April 2006 to April 2007 is just 3%. For perspective, the 25-year average annual food inflation is 2.9%.

Ethanol production does not reduce the amount of food available for human consumption. Ethanol is produced from field corn which is primarily fed to livestock and is undigestible by humans in its raw form. The ethanol production process produces not only fuel but valuable livestock feed products.

Every 56-pound bushel of corn used in the dry mill ethanol process yields 18 pounds of distillers grains, a good source of energy and protein for livestock and poultry. Similarly, a bushel of corn in the wet mill ethanol process creates 13.5 pounds of corn gluten feed and 2.6 pounds of high-protein corn gluten meal, as well as corn oil used in food processing. Importantly, ethanol production utilizes only the starch portion of the corn kernel, which is abundant and of low value. While the starch is converted to ethanol, the protein, vitamins, minerals and fiber are sold as high-value livestock feed (distillers grains). Protein, which is left intact by the ethanol process, is a highly valued product in world food and feed markets. Aside from preserving the protein, a considerable portion of the corn's original digestible energy is also preserved in the distillers grains. Distillers grains have an average protein content (28 to 30%) that is typically at least three times higher than that of corn, making it a valuable ingredient in livestock and poultry diets. In 2006/07, more than 12 million metric tons of distillers grains were produced by ethanol biorefineries and fed to livestock and poultry. It is estimated that distillers grains displaced more than 500 million bushels of corn from feed rations last year, allowing that corn to be used in other markets.

Corn growers are responding to increased corn demand. Corn growers make their planting decisions based on signals from the marketplace. If demand for corn is high and projected revenue-per-acre is strong relative to other crops, farmers will plant more corn. And they have. U.S. corn growers have produced the three largest corn crops in history in the past three years. In 2007, corn producers harvested a record 13 billion bushels of corn. Data from ProExporter Network suggests that while total corn demand in 2007/08 will be about 900 million bushels higher than in 2006/07, total supply will be about 1.6 billion bushels higher.

At the same time, corn yields have increased by about 3.5 bushels per acre per year since the 1995-1996 crop year. Increased yields, together with improved farming practices, seed technology developments, and increasing ethanol processing efficiency ensure that the American farmer will continue to meet the world's needs for food, feed, fuel and other uses.

Ethanol production from other nontraditional sources continues to grow. An increasing amount of ethanol is produced from nontraditional feedstocks such as waste products from the beverage, food and forestry industries. In the very near future we will also produce ethanol from agricultural residues such as rice straw, sugar cane bagasse and corn stover, municipal solid waste, and energy crops such as switchgrass.

Sources: RFA, National Corn Growers Association and LECG, LLC
This text available at: <http://www.ethanolrfa.org/resource/facts/food/>

National Biodiesel Board
FOR IMMEDIATE RELEASE (May 19, 2008)

USDA Shows High Oil Prices, Other Factors Drive up Food Prices

Affirms Wisdom of U.S. Biofuels Policy

WASHINGTON, D.C.—Today, the U.S. Department of Agriculture released economic analysis that shows high energy prices, increasing global demand, drought and other factors – not biofuels—are the primary drivers of higher food costs. U.S. Agriculture Secretary Ed Schafer pointed to the fact that oil prices have broken through a series of price ceilings this year.

“Developing diversity in our portfolio of fuels is if anything an even more urgent matter than it has been in the past. And it is one that remains central to our energy security and our national security,” Schafer said. “The policy choices we have made on biofuels will deliver long-term benefits.”

Schafer pointed to International Energy Agency data that show global biofuels production has cut consumption of crude oil by 1 million barrels a day, offering savings of \$120 million dollars a day.

The National Biodiesel Board praised the Secretary for speaking out on the recent attacks on biofuels. “There has been a feeding frenzy on biofuels as the reason for higher food prices, and those accusations are unfounded,” said Joe Jobe, CEO of the NBB. “It is encouraging to see USDA documenting some of the real reasons for increased food prices. The American public is being duped on this issue.”

Last week, Sen. Charles Grassley (R-IA) released a plan by the Grocery Manufacturers Association to discredit biofuels, calling their attempts to blame biofuels for food price increases “outrageous and misplaced.” He blasted the plan as an “effort to undermine and denigrate the patriotic achievement of America’s farmers to reduce our dependence on foreign oil while also providing safe and affordable food.”

USDA has posted economic analysis and charts (www.usda.gov) that document that “even with the current uptick in food price inflation, it is much lower than it was in the 1970s and early 1980.”

Schafer criticized efforts to repeal biofuels policy but urged the focus to stay on long-term solutions. He pointed to the benefits of work to increase global agricultural productivity, which is important to developing countries food and energy needs. “The need for food and fuel is only going to grow,” Schafer said.

The NBB is the national trade association of the biodiesel industry and is the coordinating body for biodiesel research and development in the U.S. Its membership is comprised of biodiesel producers, state, national, and international feedstock and feedstock processor organizations, fuel marketers and distributors, and technology providers.

###

For more details on biodiesel, visit biodiesel.org.

This text available at:

http://www.biodiesel.org/resources/pressreleases/gen/20080520_usdaoilnotbiofuelsnrjh.pdf

LETTER: Ethanol isn’t increasing food costs

By Ron L. Schultz/Fremont

Tuesday, Aug 26, 2008 - 11:04:40 am CDT

There is a lot of talk of higher food prices, and some people are trying to blame corn ethanol. I thought it would be a good idea to share some information comparing food and fuel prices.

Americans pay about \$1.10 per gallon more for gas this year than last year at this time, and \$2.60 per gallon more than we paid five years ago. That means an average family is paying about \$4,300 per year for gas now. Just five years ago we paid about \$1,200. It wasn't that long ago a \$20 bill would fill the car. Now it takes three \$20 bills.

Now let's look at food prices. In early 2002, the average family paid \$102 a week for food, including eating out, and \$25 a week for gas. This summer were spending \$124 a week on food, or about 23 percent more. But were paying \$83 a week for gas, an increase of 335 percent. If gas prices increased by the same amount as food, we would only be paying \$1.39 a gallon today.

We need to remember that even though gas prices are high, corn ethanol is helping them from being even higher. Because ethanol increases fuel supplies, it is saving us about 60 cents a gallon at the pump, or more than \$600 per family this year. And since gas prices have three times the impact on food prices as corn, ethanol helps keep food prices lower, too. A 12-ounce box of corn flakes contains less than 7 cents worth of corn, but takes 21 cents of fuel to get it delivered (the average of 1,500 miles food items travel to consumers).



Food and Agriculture Organization of the United Nations

Reviewing biofuel policies and subsidies: Annual report weighs opportunities and risks of biofuels

7 October 2008, Rome - Biofuel policies and subsidies should be urgently reviewed in order to preserve the goal of world food security, protect poor farmers, promote broad-based rural development and ensure environmental sustainability, FAO said today in a new edition of its annual flagship publication *The State of Food and Agriculture (SOFA) 2008*.

“Biofuels present both opportunities and risks. The outcome would depend on the specific context of the country and the policies adopted,” said FAO Director-General Jacques Diouf today. “Current policies tend to favour producers in some developed countries over producers in most developing countries. The challenge is to reduce or manage the risks while sharing the opportunities more widely.”

Biofuel production based on agricultural commodities increased more than threefold from 2000 to 2007, and now covers nearly two percent of the world’s consumption of transport fuels. The growth is expected to continue, but the contribution of liquid biofuels (mostly ethanol and biodiesel) to transport energy, and even more so, to global energy use will remain limited.

Despite the limited importance of liquid biofuels in terms of global energy supply, the demand for agricultural feedstocks (sugar, maize, oilseeds) for liquid biofuels will continue to grow over the next decade and perhaps beyond, putting upward pressure on food prices.

Opportunities for the poor

If developing countries can reap the benefits of biofuel production, and if those benefits reach the poor, higher demand for biofuels could contribute to rural development.

“Opportunities for developing countries to take advantage of biofuel demand would be greatly advanced by the removal of the agricultural and biofuel subsidies and trade barriers that create an artificial market and currently benefit producers in OECD countries at the expense of producers in developing countries,” Diouf said.

Other policy measures driving the rush to liquid biofuels, such as mandated blending of biofuels with fossil fuels, as well as tax incentives, have created an artificially rapid growth in biofuel production. These measures have high economic, social and environmental costs and should also be reviewed, according to the report.

Food security

Growing demand for biofuels and the resulting higher agricultural commodity prices offer important opportunities for some developing countries. Agriculture could become the growth engine for hunger reduction and poverty alleviation.

Production of biofuel feedstocks may create income and employment, if particularly poor small farmers receive support to expand their production and gain access to markets. Promoting smallholder participation in crop production, including for biofuel, requires investment in infrastructure, research, rural finance, market information and institutions and legal systems.

Among the risks, however, food security concerns loom large. High agricultural commodity prices are already having a negative impact on developing countries that are highly dependent on imports to meet their food requirements.

Particularly at risk are poor urban consumers and poor net food buyers in rural areas. Many of the world's poor spend more than half of their incomes on food. "Decisions about biofuels should take into consideration the food security situation but also the availability of land and water," Diouf said. "All efforts should aim at preserving the utmost goal of freeing humanity from the scourge of hunger," he stressed.

Facts on biofuels

- Global primary energy demand will remain overwhelmingly dominated by fossil fuels, with coal, oil and gas accounting for 82 percent in 2030 (currently 81 percent). Liquid biofuels are projected at 3-3.5 percent of global transport energy consumption in 2030.
- Total support to biodiesel and ethanol in OECD countries in 2006 amounted to over \$10 billion.
- Currently **22 countries are considered especially vulnerable** due to high levels of chronic hunger and high dependency on fuel and cereal imports.

[<http://www.fao.org/newsroom/en/news/2008/1000928/index.html>]

Excerpts from 2008 FAO report, *The State of Food and Agriculture: Biofuels: prospects, risks and opportunities*

Introduction and key messages (p.3)

When the initial preparations for the 2008 issue of *The State of Food and Agriculture* began, two years ago, there were high expectations surrounding liquid biofuels as a resource that could potentially mitigate global climate change, contribute to energy security and support agricultural producers around the world. Many governments cited these goals as justification for implementing policies promoting the production and use of liquid biofuels based on agricultural commodities.

Since then, there has been a marked change in perceptions of biofuels. Recent analysis has raised serious questions regarding the full environmental impacts of producing biofuels from an already stressed agricultural resource base. The costs of policies aimed at promoting liquid biofuels – and their possible unintended consequences – are beginning to attract scrutiny. Food prices have risen rapidly, sparking protests in many countries and giving rise to major concerns over the food security of the world's most vulnerable people.

Opportunities and risks for liquid biofuels (p.5-6)

Notwithstanding the limited importance of liquid biofuels in terms of global energy supply, also compared with that of solid biofuels, their direct and significant effects on global agricultural markets, on the environment and on food security are already generating debate and controversy.

This new source of demand for agricultural commodities creates opportunities, but also risks, for the food and agriculture sectors. Indeed, the demand for biofuels could reverse the declining trend in real commodity prices that has depressed agricultural growth in much of the developing world over recent decades. As such, biofuels may offer an opportunity for developing countries - where 75 percent of the world's poor depend on agriculture for their livelihoods – to harness agricultural growth for broader rural development and poverty reduction.

A stronger link between agriculture and the demand for energy could result in higher agricultural prices, output and gross domestic product (GDP). The development of biofuels could also promote access to energy in rural areas, further supporting economic growth and long-term improvements in food security. At the same time, there is a risk that higher food prices could threaten the food security of the world's poorest people, many of whom spend more than half of their household incomes on food. Moreover, demand for biofuels could place additional pressure on the natural resource base, with potentially harmful environmental and social consequences, particularly for people who already lack access to energy, food, land and water.

Given current agronomic and conversion technologies, the economic viability of most liquid biofuels in many, but not all, countries is tenuous without support and subsidies. However, improved crop yields, area expansion and intensification could expand feedstock production significantly and reduce costs. Technological innovation in biofuel processing could also lower costs dramatically, potentially bringing second-generation biofuels derived from cellulosic feedstocks into commercial production, thereby reducing competition with agricultural crops and the pressure on commodity prices.

Biofuel policies and objectives: is there a mismatch? (p. 6-8)

Most recent growth in biofuel production has occurred in the Organisation for Economic Co-operation and Development (OECD) countries, predominantly the United States of America and the European Union (EU) countries. An exception is Brazil, which has pioneered the development of an economically competitive national biofuel sector based largely on sugar cane. In the OECD countries, biofuels have been promoted by policies supporting and subsidizing production and consumption; such policies are now being introduced in a number of developing countries.

The main drivers behind OECD country policies have been the objectives of energy security and climate-change mitigation through reduced greenhouse gas emissions combined with a desire to support agriculture and promote rural development. These concerns are not diminishing; indeed, climate change and future energy security continue to move higher up the international policy agenda. However, the role of biofuels in addressing these concerns, including the appropriate policies to be applied, is now coming under closer scrutiny. Questions are being asked about the coherence of current policies and some of the underlying assumptions, and new concerns are coming to the forefront.

First of all, the policies being pursued are costly. Indeed, estimates of prevailing biofuel subsidies are high considering the still relatively limited role of biofuels in world energy supply. Estimates by the Global Subsidies Initiative for the EU, the United States of America and three other OECD countries (see Chapter 3) suggest a total level of support to biodiesel and ethanol in 2006 of around US\$11–12 billion (Steenblik, 2007). On a per-litre basis, support ranges between US\$0.20 and US\$1.00. With increasing levels of biofuel production and support, costs could escalate. While it can be claimed that subsidies are only intended to be temporary, whether this will be the case will obviously hinge on the long-term economic viability of biofuels. This, in turn, will depend on the cost of other energy sources, whether they be fossil fuels or, in the longer term, alternative sources of renewable energy. Even taking into account recent rises in oil prices, among the major producers only Brazilian sugar-cane ethanol currently appears to be competitive with fossil fuel counterparts without subsidies.

Direct subsidies, however, represent only the most obvious cost; other hidden costs are the outcome of distorted resource allocation resulting from selective support to biofuels and quantitative tools such as blending mandates. For decades, agricultural subsidies and protectionism in numerous OECD countries have led to major misallocation of resources at the international level, with heavy costs both to consumers in the OECD countries and to developing countries. Such misallocation risks being perpetuated and exacerbated by current biofuel policies in OECD countries...

At the same time, increasing demand for biofuels may offer opportunities for farmers and rural communities in developing countries and thus contribute to rural development. However, their capacity to take advantage of these opportunities depends on the existence of an enabling environment. At the global level, current trade policies – characterized by high degrees of support and protection – do not favour developing country participation or an efficient international pattern of biofuel production. At the domestic level, farmers depend critically on the existence of an appropriate policy framework and the necessary physical and institutional infrastructure.

Food-security impacts at the household level – short-run effects (p.75-76)

Access to food

At the household level, a critical factor for food security is access to food. Access to food refers to the ability of households to produce or purchase sufficient food for their needs. Two key indicators can help assess the impact of biofuel developments on food security: food prices and household incomes. The more income a household or individual has, the more food (and of better quality) can be purchased. The precise effects of food prices on household food security are more complex. Higher food prices are expected to make net food-buying households in both urban and rural areas worse off, while better-endowed rural households, who are net sellers of food, stand to gain from the increased incomes resulting from the higher prices.

Higher world food prices do not necessarily affect household food security: the impact will depend on the extent to which international prices pass through to domestic markets. The depreciation of the United States dollar against many currencies (for example the euro and the CFA [Communauté financière africaine] franc) and government policies designed to avoid large domestic price shocks tend to reduce the transmission of world market prices to domestic markets. Sharma (2002), in a study of eight Asian countries in the 1990s, found that price transmission was strongest for maize, followed by wheat, and least for rice, which is the staple food for most of Asia's poor. The degree of transmission is always stronger over the longer term.

Impacts on net food buyers and net food sellers

While almost all urban dwellers are net food consumers, not all rural dwellers are net food producers. Many smallholders and agricultural labourers are net purchasers of food, as they do not own sufficient land to produce enough food for their families. Empirical evidence from a number of sub-Saharan African countries, compiled in Barrett (forthcoming) in no case finds a majority of farmers or rural households (depending on the survey definition) to be net food sellers.

Even in rural areas, where agriculture and staple food production is an important occupation for the majority of the poor, a vast share of the poor are net food buyers (Figure 28) and thus stand to lose, or at least not gain, from an increase in the price of tradable staple foods. The proportion of poor smallholders that are also net sellers never exceeds 37 percent and for four of the seven countries is 13 percent or less. The proportion of poor that are net buyers ranges from 45.7 percent in Cambodia to over 87 percent in Bolivia, and for five of the seven countries the proportion is over 50 percent.

Poverty impacts of higher food prices

For the poorest households, food typically accounts for half, and often more, of their total expenditure. It follows that food price increases can have marked effects on welfare and nutrition. As an example, Block et al. (2004) found that when rice prices increased in Indonesia in the late 1990s, mothers in poor families responded by reducing their caloric intake in order to

feed their children better, leading to an increase in maternal wasting. Furthermore, purchases of more nutritious foods were reduced in order to afford the more expensive rice. This led to a measurable decline in blood haemoglobin levels in young children (and in their mothers), increasing the probability of developmental damage.

...the poorest expenditure quintiles are worst affected in both urban and rural areas – they experience either the largest decline or the smallest increase in welfare. Even in some of the countries where rural households gain on average, for example Pakistan and Viet Nam, the poorest quintiles in the rural areas still face a negative change in welfare as a result of the staple price increase. Unsurprisingly, all urban households are expected to lose in all countries, but to varying degrees, with the poorest experiencing the largest decline.

...While higher food prices will tend to have a negative impact on the purchasing power of the rural poor, there is also the potential for benefits to this group as a result of increased demand for agricultural labour, which is a prime source of income for the poor. Indeed, poor and landless families typically rely disproportionately on unskilled wage labour for their income (World Bank, 2007). Higher agricultural prices, by stimulating the demand for unskilled labour in rural areas, can lead to a long-run increase in rural wages, thereby benefiting wage-labour households as well as selfemployed farmers. (p.77)

On balance, at the global level, the immediate net effect of higher food prices on food security is likely to be negative. For example, Senauer and Sur (2001) estimated that a 20 percent increase in food prices in 2025 relative to a baseline will lead to an increase of 440 million in the number of undernourished people in the world (195 million of whom live in sub-Saharan Africa and 158 million in South and East Asia). The International Food Policy Research Institute (IFPRI) estimated that biofuel expansion based on actual national expansion plans would raise the prices of maize, oilseeds, cassava and wheat by 26, 18, 11 and 8 percent, respectively, leading to a decrease in calorie intake of between 2 and 5 percent and an increase in child malnutrition of 4 percent, on average (Msangi, 2008). These, however, are global figures, and the outcome will vary across countries and regions within countries.

Biofuels and agriculture as engines of growth

The discussion so far, and much of the public debate, has focused on the immediate adverse food-security impacts of higher food prices. Over the medium-to-longer term, however, there could be a positive supply response not only from smallholders who are net sellers but also from those on the margin and those who are net buyers who are able to react to the price incentives. The emergence of biofuels as a major new source of demand for agricultural commodities could thus help revitalize agriculture in developing countries, with potentially positive implications for economic growth, poverty reduction and food security. (p.79)

Research Representatives

Challenge of biofuel: filling the tank without emptying the stomach?

Authors: D. Rajagopal, S.E. Sexton, D. Roland-Holstad D. Zilberman
From Environmental Research Letters 2 (2007) Edited.

Biofuels can play an important role in our energy future, but there are several basic lessons to be learned from the accumulated experience to date. First, unlike other alternative energy technologies, the impact of biofuels will be greater on food prices than energy prices. This is evident from the percentage change in prices for corn and gasoline shown in table The effect of rising grain prices will be felt most acutely in developing countries, where grain comprises a larger share of the food budget. Simulation of scenarios involving successful commercialization of cellulosic technologies reveal that there is still likely to be a negative impact on food price, hunger and malnutrition especially in developing countries. Without adequate safeguards, further expansion of biofuels will mean an unpalatable trade-off between cars for the rich and starvation for the poor. The use of marginal lands for biofuel plantations may mean greater insecurity for the landless poor in developing countries who presently depend on low quality lands for their fuel wood and fodder needs.

Second, the need to increase agricultural production without expanding the land base makes improvements in agricultural productivity critical to our energy future. In the past half-century, agricultural productivity doubled because of innovations in inputs like irrigation and chemical fertilizers and pesticides. It may double in the next half-century, but productivity gains will need to be driven by other innovations. Agricultural biotechnology has already been demonstrated to increase yields and reduce inputs of harmful chemicals. Agricultural biotechnology may allow us to target improvements in the photosynthetic efficiency and content of cellulose, hemi cellulose and lignin. It may be possible to engineer plants to allocate greater quantities of carbon to stem growth as opposed to height growth, enhancing biomass production. While biotechnology has risks, the goal of environmental policy should be to compare relative risk of alternatives not the absolute risk of a given technology. This requires a new environmental paradigm that encourages small but measured risks in the near term in order to avoid large ones in the future.

Third, farmer adoption of specialized crops like perennial grasses will depend on whether they have a contract or a market for their product. This, in turn, depends on decisions to invest in processing capacity. The adoption of biofuels, therefore, is a two-step dance: industry must take the lead, and farmers will follow. But investments in processing capacity require long-term commitments to biofuels which may demand government incentives. While subsidies are necessary to minimize risk for investors, they are currently rigid and not linked to oil price, the impact on energy security, or environmental impacts. Incentives in the future should be dynamic and flexible so as to adapt to changing economic, political and environmental conditions. Agricultural and energy policy must be integrated. In particular, whereas agricultural policy has traditionally aimed to restrict supply to reduce downward pressure on commodity prices, an era of biofuels demands increased supply of certain crops. Policy, therefore, will need to change to enhance supply. Biofuels can serve to reduce the taxpayer burden by eliminating deficiency payments to farmers.

Biofuels should be one among a portfolio of policies that includes regulation of pollution through taxation or trading; energy efficiency and conservation; integrated planning of land use, zoning and transportation; and other technologies that are tried, tested and deployed to address the problems of climate change and rising energy demand.

A smooth transition to a biofuel-intensive future requires considerable technical innovation, such as agricultural productivity growth, development and commercialization of cellulosic conversion, and a reduction in the resource intensity of biofuels. Economics has a key role to play in ensuring a smooth transition to a biofuel future. Economists are responsible for designing incentives for technology adoption that are dynamic and ensure efficiency without having adverse effects on income distribution and the environment. The risks associated with cellulosic ethanol should not be discounted, but they should be measured relative to other energy alternatives.

Sustainable Biofuels Redux : Science-based policy is essential for guiding an environmentally sustainable approach to cellulosic biofuels

Authors: G. Philip Robertson, Virginia H. Dale, Otto C. Doering, Steven P. Hamburg, Jerry M. Melillo, Michele M. Wander, William J. Parton, Paul R. Adler, Jacob N. Barney, Richard M. Cruse, Clifford S. Duke, Philip M. Fearnside, Ronald F. Follett, Holly K. Gibbs, Jose Goldemberg, David J. Mladenoff, Dennis Ojima, Michael W. Palmer, Andrew Sharpley, Linda Wallace, Kathleen C. Weathers, John A. Wiens, Wallace W. Wilhelm

From: Science 322 (October 3 2008), pg. 49-50. Edited

Last May's passage of the 2008 Farm Bill raises the stakes for biofuel sustainability: A substantial subsidy for the production of cellulosic ethanol starts the United States again down a path with uncertain environmental consequences. This time, however, the subsidy is for both the refiners (\$1.01 per gallon) and the growers (\$45 per ton of biomass), which will rapidly accelerate adoption and place hard-to-manage pressures on efforts to design and implement sustainable production practices—as will a 2007 legislative mandate for 16 billion gallons of cellulosic ethanol per year by 2022. Similar directives elsewhere, e.g., the European Union's mandate that 10% of all transport fuel in Europe be from renewable sources by 2020, make this a global issue. The European Union's current reconsideration of this target places even more emphasis on cellulosic feedstocks. The need for knowledge- and science-based policy is urgent.

Although many questions about biofuel sustainability remain unanswered—indeed, some remain unasked—what we now know with reasonable certainty can be readily summarized. First, we know that grain-based bio-fuel cropping systems as currently managed cause environmental harm. In addition to questions of carbon debt created by land cleared elsewhere to replace displaced food production, farming our existing landscapes more intensively, with even greater quantities of bio-mass extracted, can easily exacerbate existing environmental problems. The effects of more intense agriculture are well documented: increased soil erosion, greater nitrate and phosphorus loss, and a decline in biodiversity, with concomitant impacts on ground and surface water quality, air quality, and biodiversity-based services such as pest suppression and wildlife amenities. Business as usual writ larger is not an environmentally welcome outcome.

Because grain-based ethanol will likely remain in the nation's energy portfolio, it is important to understand that appropriate practices can soften its environmental impact. We know that the development of cellulosic feedstocks has substantial promise for avoiding many of the environmental challenges that face grain-based biofuels. In the long term, most cellulosic feedstocks are expected to be generated from perennial crops grown specifically for that purpose. Perenniality eliminates the need for most chemical inputs and tillage after an

establishment phase and lessens the need for nitrogen fertilizer. Further, cellulosic crops can be grown as more complex species mixes, including native polycultures grown for additional conservation benefits. Moreover, the cultivation of cellulosic crops has the potential to promote soil carbon sequestration, reduce nitrous oxide emissions, provide to ecosystems in the surrounding landscape biodiversity-based services such as pollination and pest suppression, and afford much higher rates of energy return than grain-based systems.

The identification of unintended consequences early in the development of alternative fuel strategies will help to avoid costly mistakes and regrets about the effects on the environment. Policies that support long-term sustainability of both our landscapes and our atmosphere are essential if we are to chart a low-carbon economy that is substantially better than business as usual.

Getting to such an economy will also require a more comprehensive and collaborative research agenda than what has been undertaken to date. In particular, there is an urgent need for research that emphasizes: (i) a systems approach to assess the energy yield, carbon implications, and the full impact of biofuel production on downstream and downwind ecosystems, however distant from the point of production (ii) a focus on ecosystem services—including those that are biodiversity-based—to provide the information necessary for the development and implementation of land-management approaches that meet multiple needs (iii) an understanding of the implications of policy and management practices at different spatial scales—from farm and forest to landscapes, watersheds, food-sheds, and the globe—and an assessment of alternative cost-effective policies designed to meet sustainability goals.

Sustainable biofuel production systems could play a highly positive role in mitigating climate change, enhancing environmental quality, and strengthening the global economy, but it will take sound, science-based policy and additional research effort to make this so.



International Food Policy Research Institute

Sustainable solutions for ending hunger and poverty

Biofuels and Grain Prices: Impacts and Policy Responses

Mark W. Rosegrant, Director, Environment and Production Technology Division-International Food Policy Research Institute

Testimony for the U.S. Senate Committee on Homeland Security and Governmental Affairs
May 7, 2008

Background

Recent dramatic increases in food prices are having severe consequences for poor countries and poor people. The Food and Agriculture Organization of the United Nations (FAO) reports that food prices rose by nearly 40 percent in 2007 and made further large jumps in early 2008. Nearly all agricultural commodities—including rice, maize, wheat, meat, dairy products, soybeans, palm oil, and cassava—are affected. In response to the price hikes, food riots have occurred in many developing countries, including Burkina Faso, Cameroon, Côte d'Ivoire, Egypt, Haiti, Indonesia, Senegal, and Somalia. According to the FAO, 37 countries are now facing food crises.

Triggers and Underlying Factors

High food-price triggers have included biofuel policies, which have led to large volumes of food crops being shifted into bioethanol and biodiesel production; bad weather in key production areas, such as droughts in wheat-producing Australia and Ukraine; and higher oil prices, which have contributed to increased costs of production inputs and transportation. Prices then spiraled further as a result of poor government policies such as export bans and import subsidies, combined with speculative trading and storage behavior in reaction to these policies.

However, the preconditions for rapidly rising food prices stem from underlying long-term trends in food supply and demand that have contributed to a tightening of global food markets during the past decade. Rapid growth in demand for meat and milk in most of the developing world put strong demand pressure on maize and other coarse grains as feed, and small maize price increases had been projected for some time as a result. Other underlying factors include stronger economic growth in Sub-Saharan Africa since the late 1990s, which has increased the demand for wheat and rice in the region; and rapid income growth and urbanization in developing Asia, which has led to increased demand for wheat, meat, milk, oils, and vegetables. On the supply side, long-term underlying factors include underinvestment in agricultural research and technology and rural infrastructure, especially irrigation, as well as increasing pressure on the natural-resource base (land and water).

The Role of Biofuels in Food Price Increases

The role of biofuel policies in the food-price hikes has become particularly controversial. The rapid increase in demand for and production of biofuels, particularly bioethanol from maize and sugarcane, has had a number of effects on grain supply-and-demand systems. Expanded production of ethanol from maize, in particular, has increased total demand for maize and shifted land area away from production of maize for food and feed, stimulating increased prices for maize. Rising maize prices, in turn, have affected other grains. On the demand side, higher prices for maize have caused food consumers to shift from maize (which is still a significant staple food crop in much of the developing world) to rice and wheat. On the supply side, higher

maize prices made maize more profitable to grow, causing some farmers to shift from rice and wheat (and other crop) cultivation to maize cultivation. These demand- and supply-side effects have tended to increase the price of rice and wheat and other crops.

To examine the impact of alternatives to current biofuel demands, the following analyses were implemented:

1. Recent food price evolution with and without high biofuel demand
2. Impact of a freeze on biofuel production from all crops at 2007 levels
3. Impact of a moratorium (elimination) on biofuel production after 2007.

These issues are examined using the International Food Policy Research Institute's (IFPRI) IMPACT model (International Model for Policy Analysis of Agricultural Commodities and Trade), a partial equilibrium modeling framework that captures the interactions among agricultural commodity supply, demand, and trade for 115 countries and the world. IMPACT includes demand for food, feed, biofuel feedstock, and other uses.

1. Recent food price evolution with and without high biofuel demand

A comparison between a simulation of actual demand for food crops as biofuel feedstock through 2007 and a scenario simulating biofuel growth at the rate of 1990-2000 before the rapid takeoff in demand for bioethanol approximates the contribution of biofuel demand to increases in grain prices from 2000 to 2007. The percentage contribution of biofuel demand to price increases during that period is the difference between 2007 prices in the two scenarios, divided by the increase in prices in the baseline from 2000 to 2007. The increased biofuel demand during the period, compared with previous historical rates of growth, is estimated to have accounted for 30 percent of the increase in weighted average grain prices. Unsurprisingly, the biggest impact was on maize prices, for which increased biofuel demand is estimated to account for 39 percent of the increase in real prices. Increased biofuel demand is estimated to account for 21 percent of the increase in rice prices and 22 percent of the rise in wheat prices.

2. Impact of a freeze on biofuel production at 2007 levels

If biofuel production was frozen at 2007 levels for all countries and for all crops used as feedstock, maize prices are projected to decline by 6 percent by 2010 and 14 percent by 2015. Smaller price reductions are also expected for oil crops, cassava, wheat, and sugar.

3. Impact of a moratorium (elimination) on biofuel production after 2007

If biofuel demand from food crops were abolished after 2007 (in other words, if a global moratorium on crop-based biofuel production were imposed), prices of key food crops would drop more significantly— by 20 percent for maize, 14 percent for cassava, 11 percent for sugar, and 8 percent for wheat by 2010.

Conclusion

Various pressures on international grain markets have contributed to the rapid price increases during the past several years, and biofuels have been just one contributor—albeit a major one. Slowing supply growth and rapidly growing demand for grain for all uses (including food and feed), which have been made worse by policy-induced distortions, are long-term underlying factors that cannot easily be reversed. If the world food economy is to meet the increased demand for food, feed, and fuel that is being driven by rapid socioeconomic growth in the world's biggest and fastest-growing developing countries, and also cope with the future challenges of increasing land-use pressures and climatic change, agricultural productivity will have to grow significantly faster in the future than it has in recent years.

Higher food prices reduce the poor's access to food, which has possible long-term, irreversible consequences for health, productivity, and well-being—particularly if higher prices lead to reduced food consumption by infants and preschool children. If the current biofuel expansion continues, calorie availability in developing countries is expected to grow more slowly; and the number of malnourished children is projected to increase, even though agricultural value added in these regions would also accelerate as a result of higher farm incomes.

It is therefore important to find ways to keep biofuels from worsening the food-price crisis. In the short run, removal of ethanol blending mandates and subsidies and ethanol import tariffs, and in the United States—together with removal of policies in Europe promoting biofuels—would contribute to lower food prices. But for the longer term, it is even more critical to focus on increasing agricultural productivity growth and improving developing-country policies and infrastructure related to the storage, distribution, and marketing of food. These factors will continue to drive the future health of the agricultural sector and will play the largest role in determining the food security and human well-being of the world's poorer and more vulnerable populations.

The United States can play an essential role in boosting agricultural growth by increasing investment in agricultural research and supporting reforms targeted at increased crop productivity on a global basis. The 15 international research centers of Consultative Group on International Agricultural Research (CGIAR, www.cgiar.org) have been at the forefront of increasing agricultural productivity in the developing world, with a focus on achieving sustainable food security and reducing poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and the environment. Providing more support to the CGIAR system should be an important part of U.S. efforts to redress the current food crisis.

Biofuels, International Food Prices and the Poor

Author: Joachim von Braun

Introduction

World agriculture is at a turning point: economic growth, energy needs, and climate change redefine the equations of agricultural supply and demand and contribute to accelerate food prices. Biofuels have been particularly high on the global agenda largely due to rising concerns about national energy security, high energy prices, and global climate change, as well as the income expectations of farmers and other investors (von Braun and Pachauri 2006).

The International Grain Council reports an overall growth in the use of cereals by 32% in 2007/8 and an estimated 31% in the coming year, and by 41% and 32% in the USA respectively (see table 1). The USA has a share of about 80% in the total quantity. The total quantity used globally this year (95 Mill. Tons) is large, relative to total world trade of corn (100 Mill. Tons) and relative to total world corn production (777 Mill. Tons).

The rapid expansion of ethanol and biodiesel has increased dependency on natural vegetation and crops grown specifically for energy. Biofuel production has also introduced new food-security risks and new challenges for the poor, particularly when resource constraints have led to trade-offs between food and biofuel production and rising food prices. For the further development and use of biofuels, it is necessary to carefully assess the impact of different technologies, products (ethanol, bio-diesel, bio-gas), and feed stocks (e.g. sugar cane, corn, oilseeds, palm oil, agricultural waste and biomass).

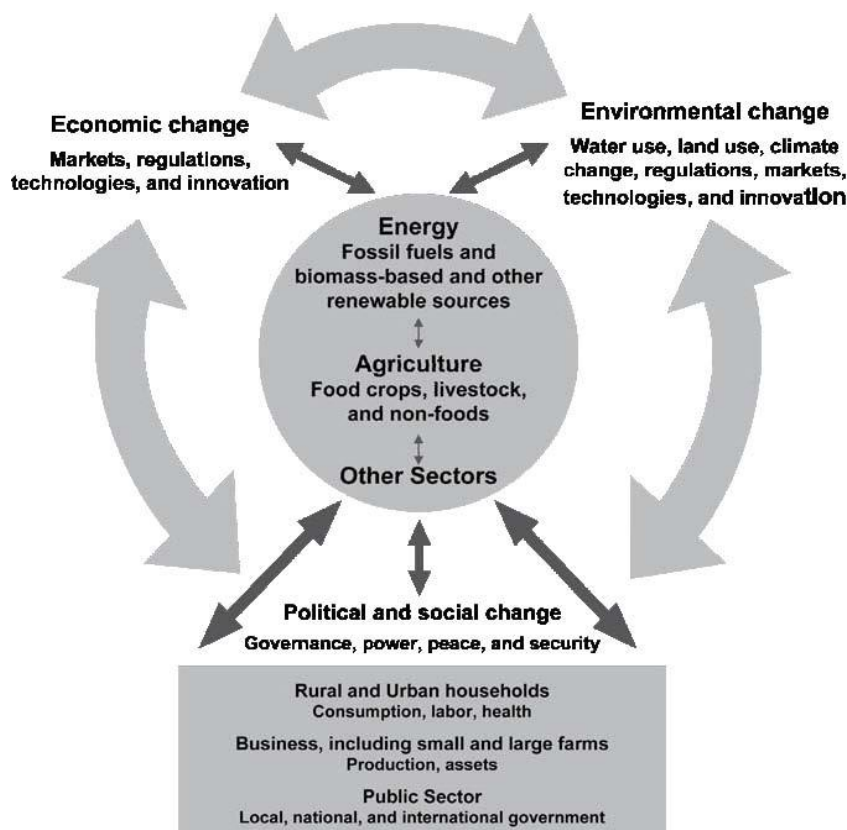
Table 1: Utilization of Cereals for Ethanol production (2004/05 - 2008/09)

	2004/05	2005/06	2006/07	2007/08 ¹⁾	2008/09 ²⁾	2007/08:06/07 change in %	2008/09:07/08 change in %
	in Million Tons						
USA All	34,1	41,3	54,5	76,8	101,7	+ 40,9	+ 32,4
Corn	33,6	40,7	53,8	76,2	100,4	+ 41,6	+ 31,8
Sorghum	0,5	0,6	0,7	0,6	1,3	-14,3	+ 116,7
EU-27	1,1	3,2	3,4	2,9	5,2	-14,7	+ 79,3
Canada	0,5	0,7	1,5	1,8	2,5	+ 20,0	+ 38,9
China	6,5	9,5	11,0	11,5	12,0	+ 4,5	+ 4,3
Other countries	0,8	1,1	1,4	1,9	2,4	+ 35,7	+ 26,3
Total	43,0	55,8	71,8	94,9	123,8	+ 32,2	+ 30,5

1) estimate, 2) projection Source: International Grain Council, June 2008

Energy and agriculture in a broader conceptual framework

A comprehensive policy framework will be fundamental to developing biofuels in such a way that they contribute to energy security, climate change mitigation, and environmental sustainability, and at the same time they do not negatively affect food prices and the food security of the poor. The three main domains upon which biofuels have an impact—namely the political/social, the economic, and the environmental—interact when agriculture and energy become more closely linked through the production of biofuels (Figure 1). This interaction will



lead to changes in the dynamics of agriculture as well as changes in the impact on households, businesses, and the private sector.

Participants in the biofuel discussion come from many sectors and include farmer representatives, the energy industry, global environmental movements, large capital funds, and science and technology lobbies. The extent to which biofuels remain on the agenda will depend on political pressures and security concerns. High levels of rent seeking as well as political lobbying are part of the picture, and their impact can be seen in the current subsidy and trade policies adopted by some countries. The implemented biofuel subsidies are regressive

and anti-poor because low-income households lose much on the food consumption side if food prices rise, and gain little on the energy side if energy prices decline.

The quantities of biofuels required to meet energy needs vary between countries and depend on the choice of feedstock. For example, if 20 percent of the maize crop in the United States were to be used for ethanol production, it would meet only one-third of the country's 10-percent ethanol blending target. On the other hand, if 20 percent of the sorghum crop in India were to be replaced with sweet sorghum, it would be sufficient to meet India's entire 10-percent ethanol blending target (Winslow 2008). Less-known crops such as *Jatropha curcas* and sweet sorghum also represent an area of opportunity for using marginalized lands and reducing greenhouse gases.

Whether biofuel production is a viable and sustainable source of energy depends not only on the choice of feedstock, but also on cultivation practices, technologies employed, or the security, trade, and environmental policies that are adopted. Many countries have already established ambitious biofuel expansion plans and blending targets, and yet biofuel production remains uncompetitive in many places of the world. Since second-generation biofuel technologies, which may lessen the food–fuel competition and the negative effects on the poor, are still a long way away, it makes sense for many countries to wait for the emergence of these technologies and “leapfrog” onto them later.

However, it is also important to recognize that technology may not necessarily overcome the food–fuel competition. The trade-offs between food and fuel may actually be accelerated when biofuels become more competitive relative to food with a further increased demand as a consequence. Therefore, it is not a question of either or: It is essential to simultaneously invest in energy **and** other agricultural technologies to soften the trade-offs. The Consultative Group on International Agricultural Research (CGIAR) can play a vital role in this process.

Biofuels and rising food prices

Feedstock makes up the principal share of total biofuel production costs. It accounts for 50–70 percent and 70–80 percent of overall costs for ethanol and biodiesel, respectively (IEA 2004). Net production costs, which refer to all costs related to production (including investments), differ widely across countries. For instance, Brazil produces ethanol at about half the cost of Australia and one-third the cost of Germany. However, feedstock costs have increased by 50 percent and more during the past few years, impinging on comparative advantage and competitiveness. While the biofuel sector will contribute to price changes, it will also be a victim of changes in feedstock prices.

The high price of energy is a key factor behind rising food prices. Energy and agricultural prices have become increasingly intertwined. With oil prices at an all-time high and the U.S. government subsidizing farmers to grow crops for energy, U.S. farmers have massively shifted their cultivation toward biofuel feed stocks, especially corn (see Table 1), often at the expense of soybean and wheat cultivation.

An IFPRI study by Mark Rosegrant (2008) did a comparison between a simulation of actual demand for food crops as biofuel feedstock through 2007 and a scenario simulating biofuel growth at the rate of 1990-2000 before the rapid takeoff in demand for bioethanol. This approximates the contribution of biofuel demand to increases in grain prices from 2000 to 2007. The percentage contribution of biofuel demand to price increases during that period is the difference between 2007 prices in the two scenarios, divided by the increase in prices in the

baseline from 2000 to 2007. The increased biofuel demand during the period, compared with previous historical rates of growth, is estimated to have accounted for 30 percent of the increase in weighted average grain prices. The biggest impact was on maize prices, for which increased biofuel demand is estimated to account for 39 percent of the increase in real prices. Increased biofuel demand is estimated to account for 21 percent of the increase in rice prices and 22 percent of the rise in wheat prices (Rosegrant 2008).

Scenario analyses undertaken with IFPRI's International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) have examined the effects of biofuels on food prices as they may occur in the future. The developed scenarios include:

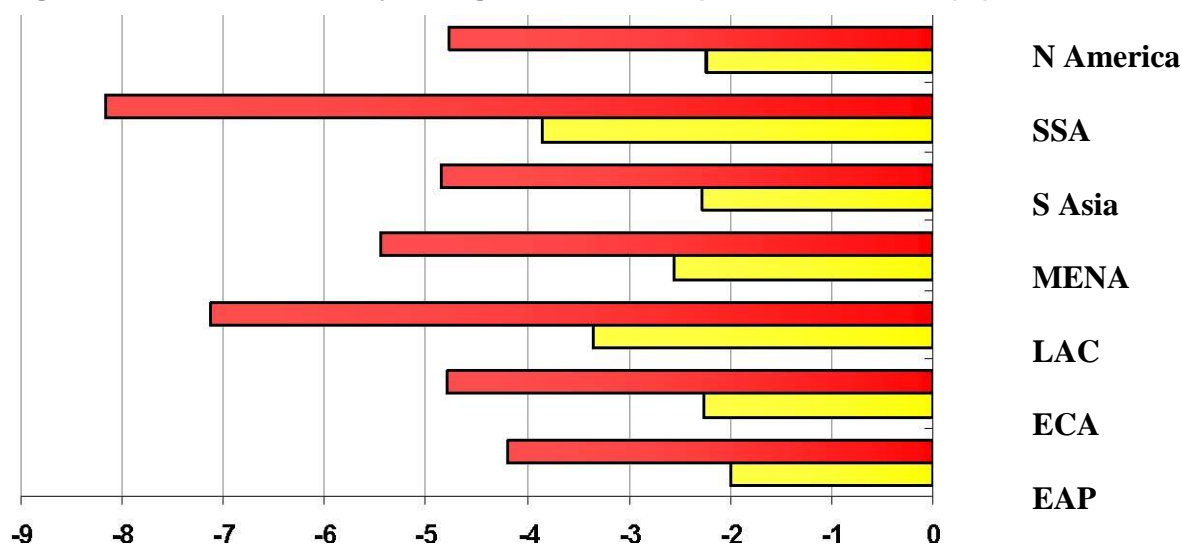
Scenario 1 — based on the actual biofuel plans of countries and biofuel expansion for identified high-potential countries. Under this scenario prices increase ceteris paribus by 18 percent for oilseeds and 26 percent for corn by 2020.

Scenario 2 — based on a more drastic expansion of biofuels, assuming a doubling of the production expansion rate over Scenario 1 levels. Under this drastic biofuel expansion scenario (Scenario 2), the price of corn rises by 72 percent and of oilseeds by 44 percent.

Would the poor go even hungrier with more biofuel production?

Poor people are impacted by biofuels as consumers in food and energy markets, producers of agricultural commodities in small businesses, and workers in labor markets. The increase in agricultural demand and the resulting increase in agricultural prices will affect poor people in different ways. Some poor farmers could gain from this price increase. However, net buyers of food, which represent the majority of poor people, would respond to high food prices with reduced consumption and changed patterns of demand, leading to calorie and nutrition deficiencies.

Under the two IMPACT scenarios, the increase in crop prices resulting from expanded biofuel production is also accompanied by a net decrease in availability and access to food. Calorie consumption is estimated to decrease across regions under all scenarios compared to baseline levels (Figure 2). Food-calorie consumption will fall the most in Sub-Saharan Africa, where calorie consumption is projected to decrease by more than 8 percent if biofuels expand drastically.

Figure 2. Calorie availability changes in 2020 compared to baseline (%)

Source: IFPRI IMPACT Model projections.

As a result of rising food prices, cuts will likely be made to food expenditures, exacerbating diet quality and micronutrient malnutrition. A study of the effects in an East Asian setting suggests that a 50-percent increase in the price of food, holding income constant, will lead to the decline of iron intake by 30 percent. As a result, the prevalence of micronutrient deficiency among women and children will increase by 25 percent (Bouis 2008). Studies also show that current malnutrition of mothers and children has long lasting effects (Lancet 2008) and will show in deteriorated health and income decades later.

Implications for policy

A comprehensive policy framework will be fundamental to developing biofuels in such a way that they contribute to energy security, are environmentally sustainable and that complementary policies protect the pro-poor as long as grain based biofuels contribute to high food prices. Such a framework requires a strategic approach with three pillars:

1. *Science and technology policy*, which calls for accelerated agricultural productivity to maintain and improve food security, accompanied by an expanded focus on agricultural and biofuel technologies and close coordination with biofuel users—for example, the automobile industry.
2. *Markets and trade policy*, which calls for building a global system for biofuel markets and trade that is undistorted and operates with low transaction costs. Transparent standards are needed, including sustainability and performance-based standards rather than technology-based standards that will quickly become outdated.
3. *An insurance and social-protection policy for the food-insecure poor*, which is a necessity given existing large-scale food and nutrition insecurity and the growing number of changes in the food system which are partly driven by the expansion of biofuels. Such protection could include employment programs, school feeding and food for schooling programs, conditional and unconditional cash transfer programs, and social security systems for the poorest.