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How Biofuels Could Starve the Poor

By Prof. C. Ford Runge
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This article by professors C. Ford Runge and Benjamin Senauer of the University of Minnesota provides an incisive analysis of the corn-based biofuel industry and its impacts on food agriculture.

The agribusiness biotech conglomerates, which constitute a powerful lobby in Washington, are behind the biofuel industry, which is the recipient of billions of dollars of US government subsidies. The biofuel industry is dominated by a handful of large companies including Arch Daniels Midland (ADM).

"The enormous volume of corn required by the ethanol industry is sending shock waves through the food system" ultimately leading to higher international prices of major grain staples.

The article concludes that the shift towards biofuel will contribute to dramatically increasing the incidence of hunger and undernourishment in developing countries.

"*The world's poorest people already spend 50 to 80 percent of their total household income on food. For the many among them who are landless laborers or rural subsistence farmers, large increases in the prices of staple foods will mean malnutrition and hunger. Some of them will tumble over the edge of subsistence into outright starvation, and many more will die from a multitude of hunger-related diseases."*

It is worth noting that Fidel Castro, in a recent article focussing on the transformation of food into fuel, arrives, from a different perspective, at broadly the same conclusion. Fidel Castro describes the biofuel industry as a "colossal squandering of cereals destined to fuel production" which undermines the broad objective of combating poverty and famine in the developing World. .

Michel Chossudovsky, Global Research, 7 April 2007

Summary [Foreign Affairs]:

Thanks to high oil prices and hefty subsidies, corn-based ethanol is now all the rage in the United States. But it takes so much supply to keep ethanol production going that the price of corn — and those of other food staples — is shooting up around the world. To stop this trend, and prevent even more people from going hungry, Washington must conserve more and diversify ethanol's production inputs.

THE ETHANOL BUBBLE

In 1974, as the United States was reeling from the oil embargo imposed by the Organization of Petroleum Exporting Countries, Congress took the first of many legislative steps to promote ethanol made from corn as an alternative fuel. On April 18, 1977, amid mounting calls for energy independence, President Jimmy Carter donned his cardigan sweater and appeared on television to tell Americans that balancing energy demands with available domestic resources would be an effort the "moral equivalent of war." The gradual phaseout of lead in the 1970s and 1980s provided an additional boost to the fledgling ethanol industry. (Lead, a toxic substance, is a performance enhancer when added to gasoline, and it was partly replaced by ethanol.) A series of tax breaks and subsidies also helped. In spite of these measures, with each passing year the United States became more dependent on imported petroleum, and ethanol remained marginal at best.

Now, thanks to a combination of high oil prices and even more generous government subsidies, corn-based ethanol has become the rage. There were 110 ethanol refineries in operation in the United States at the end of 2006, according to the Renewable Fuels Association. Many were being expanded, and another 73 were under construction. When these projects are completed, by the end of 2008, the United States' ethanol production capacity will reach an estimated 11.4 billion gallons per year. In his latest State of the Union address, President George W. Bush called on the country to produce 35 billion gallons of renewable fuel a year by 2017, nearly five times the level currently mandated.

The push for ethanol and other biofuels has spawned an industry that depends on billions of dollars of taxpayer subsidies, and not only in the United States. In 2005, global ethanol production was 9.66 billion gallons, of which Brazil produced 45.2 percent (from sugar cane) and the United States 44.5 percent (from corn). Global production of biodiesel (most of it in Europe), made from oilseeds, was almost one billion gallons.

The industry's growth has meant that a larger and larger share of corn production is being used to feed the huge mills that produce ethanol. According to some estimates, ethanol plants will burn up to half of U.S. domestic corn supplies within a few years. Ethanol demand will bring 2007 inventories of corn to their lowest levels since 1995 (a drought year), even though 2006 yielded the third-largest corn crop on record. Iowa may soon become a net corn importer.

The enormous volume of corn required by the ethanol industry is sending shock waves through the food system. (The United States accounts for some 40 percent of the world's total corn production and over half of all corn exports.) In March 2007, corn futures rose to over $4.38 a bushel, the highest level in ten years. Wheat and rice prices have also surged to decade highs, because even as those grains are increasingly being used as substitutes for corn, farmers are planting more acres with corn and fewer acres with other crops.

This might sound like nirvana to corn producers, but it is hardly that for consumers, especially in poor developing countries, who will be hit with a double shock if both food prices and oil prices stay high. The World Bank has estimated that in 2001, 2.7 billion people in the world were living on the equivalent of less than $2 a day; to them, even marginal increases in the cost of staple grains could be devastating. filling the 25-gallon tank of an SUV with pure ethanol requires over 450 pounds of corn — which contains enough calories to feed one person for a year. By putting pressure on global supplies of edible crops, the surge in ethanol production will translate into higher prices for both processed and staple foods around the world. Biofuels have tied oil and food prices together in ways that could profoundly upset the relationships between food producers, consumers, and nations in the

years ahead, with potentially devastating implications for both global poverty and food security.

THE OIL AND BIOFUEL ECONOMY

In the United States and other large economies, the ethanol industry is artificially buoyed by government subsidies, minimum production levels, and tax credits. High oil prices over the past few years have made ethanol naturally competitive, but the U.S. government continues to heavily subsidize corn farmers and ethanol producers. Direct corn subsidies equaled $8.9 billion in 2005. Although these payments will fall in 2006 and 2007 because of high corn prices, they may soon be dwarfed by the panoply of tax credits, grants, and government loans included in energy legislation passed in 2005 and in a pending farm bill designed to support ethanol producers. The federal government already grants ethanol blenders a tax allowance of 51 cents per gallon of ethanol they make, and many states pay out additional subsidies.

Consumption of ethanol in the United States was expected to reach over 6 billion gallons in 2006. (Consumption of biodiesel was expected to be about 250 million gallons.) In 2005, the U.S. government mandated the use of 7.5 billion gallons of biofuels per year by 2012; in early 2007, 37 governors proposed raising that figure to 12 billion gallons by 2010; and last January, President Bush raised it further, to 35 billion gallons by 2017. Six billion gallons of ethanol are needed every year to replace the fuel additive known as MTBE, which is being phased out due to its polluting effects on ground water.

The European Commission is using legislative measures and directives to promote biodiesel, produced mainly in Europe, made from rapeseeds and sunflower seeds. In 2005, the European Union produced 890 million gallons of biodiesel, over 80 percent of the world's total. The eu's Common Agricultural Policy also promotes the production of ethanol from a combination of sugar beets and wheat with direct and indirect subsidies. Brussels aims to have 5.75 percent of motor fuel consumed in the European Union come from biofuels by 2010 and 10 percent by 2020.

Brazil, which currently produces approximately the same amount of ethanol as the United States, derives almost all of it from sugar cane. Like the United States, Brazil began its quest for alternative energy in the mid-1970s. The government has offered incentives, set technical standards, and invested in supporting technologies and market promotion. It has mandated that all diesel contain two percent biodiesel by 2008 and five percent biodiesel by 2013. It has also required that the auto industry produce engines that can use biofuels and has developed wide-ranging industrial and land-use strategies to promote them. Other countries are also jumping on the biofuel bandwagon. In Southeast Asia, vast areas of tropical forest are being cleared and burned to plant oil palms destined for conversion to biodiesel.

This trend has strong momentum. Despite a recent decline, many experts expect the price of crude oil to remain high in the long term. Demand for petroleum continues to increase faster than supplies, and new sources of oil are often expensive to exploit or located in politically risky areas. According to the U.S. Energy Information Administration's latest projections, global energy consumption will rise by 71 percent between 2003 and 2030, with demand from developing countries, notably China and India, surpassing that from members of the Organization for Economic Cooperation and Development by 2015. The result will be sustained upward pressure on oil prices, which will allow ethanol and biodiesel producers to

pay much higher premiums for corn and oilseeds than was conceivable just a few years ago. The higher oil prices go, the higher ethanol prices can go while remaining competitive — and the more ethanol producers can pay for corn. If oil reaches $80 per barrel, ethanol producers could afford to pay well over $5 per bushel for corn.

With the price of raw materials at such highs, the biofuel craze would place significant stress on other parts of the agricultural sector. In fact, it already does. In the United States, the growth of the biofuel industry has triggered increases not only in the prices of corn, oilseeds, and other grains but also in the prices of seemingly unrelated crops and products. The use of land to grow corn to feed the ethanol maw is reducing the acreage devoted to other crops. Food processors who use crops such as peas and sweet corn have been forced to pay higher prices to keep their supplies secure — costs that will eventually be passed on to consumers. Rising feed prices are also hitting the livestock and poultry industries. According to Vernon Eidman, a professor emeritus of agribusiness management at the University of Minnesota, higher feed costs have caused returns to fall sharply, especially in the poultry and swine sectors. If returns continue to drop, production will decline, and the prices for chicken, turkey, pork, milk, and eggs will rise. A number of Iowa's pork producers could go out of business in the next few years as they are forced to compete with ethanol plants for corn supplies.

Proponents of corn-based ethanol argue that acreage and yields can be increased to satisfy the rising demand for ethanol. But U.S. corn yields have been rising by a little less than two percent annually over the last ten years, and even a doubling of those gains could not meet current demand. As more acres are planted with corn, land will have to be pulled from other crops or environmentally fragile areas, such as those protected by the Department of Agriculture's Conservation Reserve Program.

In addition to these fundamental forces, speculative pressures have created what might be called a "biofuel mania": prices are rising because many buyers think they will. Hedge funds are making huge bets on corn and the bull market unleashed by ethanol. The biofuel mania is commandeering grain stocks with a disregard for the obvious consequences. It seems to unite powerful forces, including motorists' enthusiasm for large, fuel-inefficient vehicles and guilt over the ecological consequences of petroleum-based fuels. But even as ethanol has created opportunities for huge profits for agribusiness, speculators, and some farmers, it has upset the traditional flows of commodities and the patterns of trade and consumption both inside and outside of the agricultural sector.

This craze will create a different problem if oil prices decline because of, say, a slowdown in the global economy. With oil at $30 a barrel, producing ethanol would no longer be profitable unless corn sold for less than $2 a bushel, and that would spell a return to the bad old days of low prices for U.S. farmers. Undercapitalized ethanol plants would be at risk, and farmer-owned cooperatives would be especially vulnerable. Calls for subsidies, mandates, and tax breaks would become even more shrill than they are now: there would be clamoring for a massive bailout of an overinvested industry. At that point, the major investments that have been made in biofuels would start to look like a failed gamble. On the other hand, if oil prices hover around $55-$60, ethanol producers could pay from $3.65 to $4.54 for a bushel of corn and manage to make a normal 12 percent profit.

Whatever happens in the oil market, the drive for energy independence, which has been the basic justification for huge investments in and subsidies for ethanol production, has already

made the industry dependent on high oil prices.

CORNUCOPIA

One root of the problem is that the biofuel industry has long been dominated not by market forces but by politics and the interests of a few large companies. Corn has become the prime raw material even though biofuels could be made efficiently from a variety of other sources, such as grasses and wood chips, if the government funded the necessary research and development. But in the United States, at least, corn and soybeans have been used as primary inputs for many years thanks in large part to the lobbying efforts of corn and soybean growers and Archer Daniels Midland Company (adm), the biggest ethanol producer in the U.S. market.

Since the late 1960s, adm positioned itself as the "supermarket to the world" and aimed to create value from bulk commodities by transforming them into processed products that command heftier prices. In the 1970s, adm started making ethanol and other products resulting from the wet-milling of corn, such as high fructose corn syrup. It quickly grew from a minor player in the feed market to a global powerhouse. By 1980, adm's ethanol production had reached 175 million gallons per year, and high fructose corn syrup had become a ubiquitous sweetening agent in processed foods. In 2006, adm was the largest producer of ethanol in the United States: it made more than 1.07 billion gallons, over four times more than its nearest rival, VeraSun Energy. In early 2006, it announced plans to increase its capital investment in ethanol from $700 million to $1.2 billion in 2008 and increase production by 47 percent, or close to 500 million gallons, by 2009.

Adm owes much of its growth to political connections, especially to key legislators who can earmark special subsidies for its products. Vice President Hubert Humphrey advanced many such measures when he served as a senator from Minnesota. Senator Bob Dole (R-Kans.) advocated tirelessly for the company during his long career. As the conservative critic James Bovard noted over a decade ago, nearly half of adm's profits have come from products that the U.S. government has either subsidized or protected.

Partly as a result of such government support, ethanol (and to a lesser extent biodiesel) is now a major fixture of the United States' agricultural and energy sectors. In addition to the federal government's 51-cents-per-gallon tax credit for ethanol, smaller producers get a 10-cents-per-gallon tax reduction on the first 15 million gallons they produce. There is also the "renewable fuel standard," a mandatory level of nonfossil fuel to be used in motor vehicles, which has set off a political bidding war. Despite already high government subsidies, Congress is considering lavishing more money on biofuels. Legislation related to the 2007 farm bill introduced by Representative Ron Kind (D-Wis.) calls for raising loan guarantees for ethanol producers from $200 million to $2 billion. Advocates of corn-based ethanol have rationalized subsidies by pointing out that greater ethanol demand pushes up corn prices and brings down subsidies to corn growers.

The ethanol industry has also become a theater of protectionism in U.S. trade policy. Unlike oil imports, which come into the country duty-free, most ethanol currently imported into the United States carries a 54-cents-per-gallon tariff, partly because cheaper ethanol from countries such as Brazil threatens U.S. producers. (Brazilian sugar cane can be converted to ethanol more efficiently than can U.S. corn.) The Caribbean Basin Initiative could undermine this protection: Brazilian ethanol can already be shipped duty-free to CBI countries, such as Costa Rica, El Salvador, or Jamaica, and the agreement allows it to go duty-free from there

to the United States. But ethanol supporters in Congress are pushing for additional legislation to limit those imports. Such government measures shield the industry from competition despite the damaging repercussions for consumers.

STARVING THE HUNGRY

Biofuels may have even more devastating effects in the rest of the world, especially on the prices of basic foods. If oil prices remain high — which is likely — the people most vulnerable to the price hikes brought on by the biofuel boom will be those in countries that both suffer food deficits and import petroleum. The risk extends to a large part of the developing world: in 2005, according to the un Food and Agriculture Organization, most of the 82 low-income countries with food deficits were also net oil importers.

Even major oil exporters that use their petrodollars to purchase food imports, such as Mexico, cannot escape the consequences of the hikes in food prices. In late 2006, the price of tortilla flour in Mexico, which gets 80 percent of its corn imports from the United States, doubled thanks partly to a rise in U.S. corn prices from $2.80 to $4.20 a bushel over the previous several months. (Prices rose even though tortillas are made mainly from Mexican-grown white corn because industrial users of the imported yellow corn, which is used for animal feed and processed foods, started buying the cheaper white variety.) The price surge was exacerbated by speculation and hoarding. With about half of Mexico's 107 million people living in poverty and relying on tortillas as a main source of calories, the public outcry was fierce. In January 2007, Mexico's new president, Felipe Calderón, was forced to cap the prices of corn products.

The International Food Policy Research Institute, in Washington, D.C., has produced sobering estimates of the potential global impact of the rising demand for biofuels. Mark Rosegrant, an ifpri division director, and his colleagues project that given continued high oil prices, the rapid increase in global biofuel production will push global corn prices up by 20 percent by 2010 and 41 percent by 2020. The prices of oilseeds, including soybeans, rapeseeds, and sunflower seeds, are projected to rise by 26 percent by 2010 and 76 percent by 2020, and wheat prices by 11 percent by 2010 and 30 percent by 2020. In the poorest parts of sub-Saharan Africa, Asia, and Latin America, where cassava is a staple, its price is expected to increase by 33 percent by 2010 and 135 percent by 2020. The projected price increases may be mitigated if crop yields increase substantially or ethanol production based on other raw materials (such as trees and grasses) becomes commercially viable. But unless biofuel policies change significantly, neither development is likely.

The production of cassava-based ethanol may pose an especially grave threat to the food security of the world's poor. Cassava, a tropical potato-like tuber also known as manioc, provides one-third of the caloric needs of the population in sub-Saharan Africa and is the primary staple for over 200 million of Africa's poorest people. In many tropical countries, it is the food people turn to when they cannot afford anything else. It also serves as an important reserve when other crops fail because it can grow in poor soils and dry conditions and can be left in the ground to be harvested as needed.

Thanks to its high-starch content, cassava is also an excellent source of ethanol. As the technology for converting it to fuel improves, many countries — including China, Nigeria, and Thailand — are considering using more of the crop to that end. If peasant farmers in developing countries could become suppliers for the emerging industry, they would benefit from the increased income. But the history of industrial demand for agricultural crops in

these countries suggests that large producers will be the main beneficiaries. The likely result of a boom in cassava-based ethanol production is that an increasing number of poor people will struggle even more to feed themselves.

Participants in the 1996 World Food Summit set out to cut the number of chronically hungry people in the world — people who do not eat enough calories regularly to be healthy and active — from 823 million in 1990 to about 400 million by 2015. The Millennium Development Goals established by the United Nations in 2000 vowed to halve the proportion of the world's chronically underfed population from 16 percent in 1990 to eight percent in 2015. Realistically, however, resorting to biofuels is likely to exacerbate world hunger. Several studies by economists at the World Bank and elsewhere suggest that caloric consumption among the world's poor declines by about half of one percent whenever the average prices of all major food staples increase by one percent. When one staple becomes more expensive, people try to replace it with a cheaper one, but if the prices of nearly all staples go up, they are left with no alternative.

In a study of global food security we conducted in 2003, we projected that given the rates of economic and population growth, the number of hungry people throughout the world would decline by 23 percent, to about 625 million, by 2025, so long as agricultural productivity improved enough to keep the relative price of food constant. But if, all other things being equal, the prices of staple foods increased because of demand for biofuels, as the ifpri projections suggest they will, the number of food-insecure people in the world would rise by over 16 million for every percentage increase in the real prices of staple foods. That means that 1.2 billion people could be chronically hungry by 2025 — 600 million more than previously predicted.

The world's poorest people already spend 50 to 80 percent of their total household income on food. For the many among them who are landless laborers or rural subsistence farmers, large increases in the prices of staple foods will mean malnutrition and hunger. Some of them will tumble over the edge of subsistence into outright starvation, and many more will die from a multitude of hunger-related diseases.

THE GRASS IS GREENER

And for what? Limited environmental benefits at best. Although it is important to think of ways to develop renewable energy, one should also carefully examine the eager claims that biofuels are "green." Ethanol and biodiesel are often viewed as environmentally friendly because they are plant-based rather than petroleum-based. In fact, even if the entire corn crop in the United States were used to make ethanol, that fuel would replace only 12 percent of current U.S. gasoline use. Thinking of ethanol as a green alternative to fossil fuels reinforces the chimera of energy independence and of decoupling the interests of the United States from an increasingly troubled Middle East.

Should corn and soybeans be used as fuel crops at all? Soybeans and especially corn are row crops that contribute to soil erosion and water pollution and require large amounts of fertilizer, pesticides, and fuel to grow, harvest, and dry. They are the major cause of nitrogen runoff — the harmful leakage of nitrogen from fields when it rains — of the type that has created the so-called dead zone in the Gulf of Mexico, an ocean area the size of New Jersey that has so little oxygen it can barely support life. In the United States, corn and soybeans are typically planted in rotation, because soybeans add nitrogen to the soil, which corn needs to grow. But as corn increasingly displaces soybeans as a main source of

ethanol, it will be cropped continuously, which will require major increases in nitrogen fertilizer and aggravate the nitrogen runoff problem.

Nor is corn-based ethanol very fuel efficient. Debates over the “net energy balance” of biofuels and gasoline — the ratio between the energy they produce and the energy needed to produce them — have raged for decades. For now, corn-based ethanol appears to be favored over gasoline, and biodiesel over petroleum diesel — but not by much. Scientists at the Argonne National Laboratory and the National Renewable Energy Laboratory have calculated that the net energy ratio of gasoline is 0.81, a result that implies an input larger than the output. Corn-based ethanol has a ratio that ranges between 1.25 and 1.35, which is better than breaking even. Petroleum diesel has an energy ratio of 0.83, compared with that of biodiesel made from soybean oil, which ranges from 1.93 to 3.21. (Biodiesel produced from other fats and oils, such as restaurant grease, may be more energy efficient.)

Similar results emerge when biofuels are compared with gasoline using other indices of environmental impact, such as greenhouse gas emissions. The full cycle of the production and use of corn-based ethanol releases less greenhouse gases than does that of gasoline, but only by 12 to 26 percent. The production and use of biodiesel emits 41 to 78 percent less such gases than do the production and use of petroleum-based diesel fuels.

Another point of comparison is greenhouse gas emissions per mile driven, which takes account of relative fuel efficiency. Using gasoline blends with 10 percent corn-based ethanol instead of pure gasoline lowers emissions by 2 percent. If the blend is 85 percent ethanol (which only flexible-fuel vehicles can run on), greenhouse gas emissions fall further: by 23 percent if the ethanol is corn-based and by 64 percent if it is cellulose-based. Likewise, diesel containing 2 percent biodiesel emits 1.6 percent less greenhouse gases than does petroleum diesel, whereas blends with 20 percent biodiesel emit 16 percent less, and pure biodiesel (also for use only in special vehicles) emits 78 percent less. On the other hand, biodiesel can increase emissions of nitrogen oxide, which contributes to air pollution. In short, the “green” virtues of ethanol and biodiesel are modest when these fuels are made from corn and soybeans, which are energy-intensive, highly polluting row crops.

The benefits of biofuels are greater when plants other than corn or oils from sources other than soybeans are used. Ethanol made entirely from cellulose (which is found in trees, grasses, and other plants) has an energy ratio between 5 and 6 and emits 82 to 85 percent less greenhouse gases than does gasoline. As corn grows scarcer and more expensive, many are betting that the ethanol industry will increasingly turn to grasses, trees, and residues from field crops, such as wheat and rice straw and cornstalks. Grasses and trees can be grown on land poorly suited to food crops or in climates hostile to corn and soybeans. Recent breakthroughs in enzyme and gasification technologies have made it easier to break down cellulose in woody plants and straw. field experiments suggest that grassland perennials could become a promising source of biofuel in the future.

For now, however, the costs of harvesting, transporting, and converting such plant matters are high, which means that cellulose-based ethanol is not yet commercially viable when compared with the economies of scale of current corn-based production. One ethanol-plant manager in the Midwest has calculated that fueling an ethanol plant with switchgrass, a much-discussed alternative, would require delivering a semitrailer truckload of the grass every six minutes, 24 hours a day. The logistical difficulties and the costs of converting cellulose into fuel, combined with the subsidies and politics currently favoring the use of corn and soybeans, make it unrealistic to expect cellulose-based ethanol to become a

solution within the next decade. Until it is, relying more on sugar cane to produce ethanol in tropical countries would be more efficient than using corn and would not involve using a staple food.

The future can be brighter if the right steps are taken now. Limiting U.S. dependence on fossil fuels requires a comprehensive energy-conservation program. Rather than promoting more mandates, tax breaks, and subsidies for biofuels, the U.S. government should make a major commitment to substantially increasing energy efficiency in vehicles, homes, and factories; promoting alternative sources of energy, such as solar and wind power; and investing in research to improve agricultural productivity and raise the efficiency of fuels derived from cellulose. Washington's fixation on corn-based ethanol has distorted the national agenda and diverted its attention from developing a broad and balanced strategy. In March, the U.S. Energy Department announced that it would invest up to $385 million in six biorefineries designed to convert cellulose into ethanol. That is a promising step in the right direction.

C. Ford Runge is Distinguished McKnight University Professor of Applied Economics and Law and Director of the Center for International Food and Agricultural Policy at the University of Minnesota. Benjamin Senauer is Professor of Applied Economics and Co-director of the Food Industry Center at the University of Minnesota.

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