

HARVESTING GREEN POWER

Farmers are sowing the seeds of an alternative energy future. But how much of the country can we fuel on corn? *By Adrienne Carter*

ON A STILL OCTOBER AFTERNOON, DAVID Kolsrud is gearing up for the harvest. Today, he'll reap some 30 acres of soybeans on his 500-acre farm in Beaver Creek, Minn. His son, Chris, mans a 12-ton combine, a mechanized harvester that sweeps up whole plants and shoots out a steady stream of beans. This evening, Kolsrud will head off to a grain elevator over the border in South Dakota to deliver 1,100 bushels of them. As if all this weren't enough to manage, the 58-year-old Kolsrud also runs a burgeoning energy business. Steering his John Deere tractor with one hand and



**KOLSRUD HAS
INVESTED IN WIND
POWER, ETHANOL,
AND BIODIESEL**



LUVERNE'S ETHANOL PLANT HAS REPAID CO-OP MEMBERS HANDSOMELY

clutching a cell phone in the other, he discusses his stake in a new biodiesel plant in Delaware. Earlier today, Kolsrud played host to a group of Canadian bankers and business developers at a local ethanol plant he co-owns with 220 area farmers. Now there are follow-up discussions, and he's consulting on potential projects in Saskatchewan.

Tomorrow will be just as hectic. Kolsrud has to rise with the sun to make the 105-mile drive northeast to Granite Falls, Minn., for a breakfast meeting with Ron Fagen, a leading builder of biofuel plants and windmills. Before sundown he must squeeze in a few more hours in the field. He's been so busy this year that some of last year's crop is still sitting in silos on his farm. "Corn prices are up, so I guess I'll just have to sell it for more money," he deadpans.

With his mop of white hair and sunburnt cheeks, Kolsrud may be the new face of American agriculture. Alternative energy, once a cause célèbre for bands of tree huggers, has emerged as a pillar of the nation's strategy for energy independence, economic security, and the battle against global warming. Much is riding

on efforts like Kolsrud's. For all the talk of green rooftops on Chicago's skyscrapers and wind farms off the coast of Nantucket, there will be no national transition to "green power" without a widespread conversion of our rural farm economy, with its unparalleled abundance of wind, sunlight, and energy-rich crops.

The first wave of energy farming has paid off brilliantly for early adopters like Kolsrud. Based on the value of just his green-energy assets today, he's a millionaire several times over, and the same may be true for hundreds if not thousands of energy farmers across the Midwest. But

this transformation of the farm belt raises a host of concerns. To make even a small dent in imports of oil from the Middle East, an increasing portion of food crops will have to be converted to fuel. That could push up the cost of food on the dinner table. And global warming? Critics of America's budding ethanol economy say that if you factor in all the natural resources needed to cultivate corn and transform it into ethanol, the environmental gains are less than meet the eye (page 72).

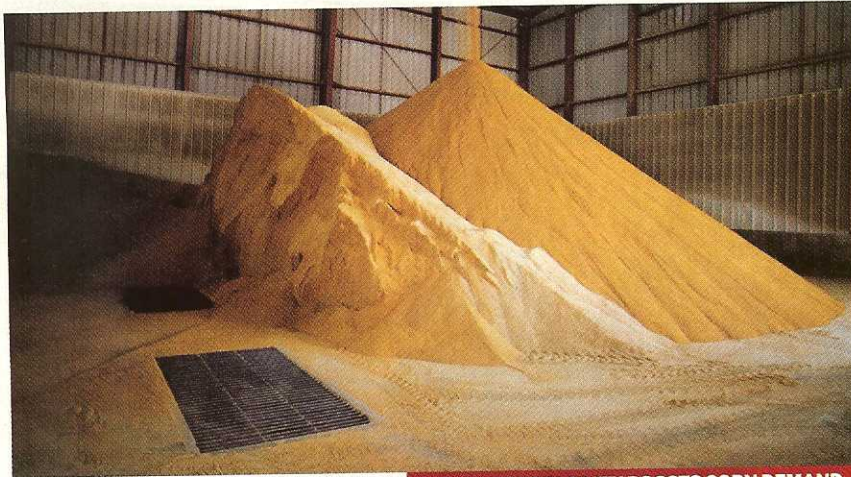
Pioneers in agricultural biotech say

they will soon be able to address some of these worries with better biofuels. But such breakthroughs require heavy investment in research. And given the wild fluctuations in oil prices, which have fallen by more than 20% in the past several months, research funding may not continue at today's heady pace.

"The New Cash Crops"

RIGHT NOW, ON THE rolling prairies of Minnesota, the future of energy farming seems bright. Towering over the fields of corn and soybeans that stretch to the horizon are majestic wind turbines and colossal industrial plants. Most of those facilities are pumping out ethanol, an eco-friendly additive to gasoline; a few are making biodiesel, a clean fuel used to help power trucks and buses. Similar structures already dot the landscape on farms across the U.S., from the fertile valleys of California to the orange groves of Florida. Texas ranches are now home to 2,631 megawatts of wind power, roughly 25% of the country's total wind capacity and enough to power more than 650,000 homes. Iowa, America's biggest source of ethanol and a major player in wind, now produces so much biofuel and green elec-

**GREEN
BiZ**



THE LUVERNE FACILITY BOOSTS CORN DEMAND

FARM FUTURES

Thanks to farmers' big stake in the green energy rush, rural income and employment are set to surge

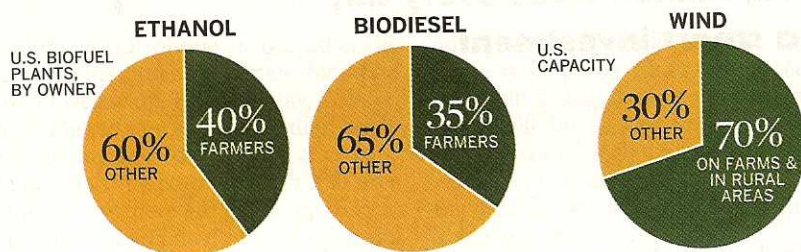
FALLOW America's family farms have struggled for decades

	INCOME PER FARM*	SUBSIDIES	FARM EMPLOYMENT	TOTAL FARMS
1970S	\$27,000	6% of farm income	3.9 million	2.95 million
TODAY	\$27,000	33% of farm income	3.1 million	2.10 million

*Constant 2006 dollars

Data: U.S. Agriculture Dept., Purdue University

HOME GROWN Farmers have a big slice of green energy markets



Data: Renewable Fuels Assn., American Wind Energy Assn., BW estimate

RENEWED Clean energy will add jobs and boost the nation's economy*

	ETHANOL	BIODIESEL	WIND
NEW JOBS	203,879	39,100	12,500
ANNUAL BOOST TO US GDP	\$46B	\$24B	\$100M to \$200M

Data: LECG

Data: American Wind Energy Assn.

*By 2015 **For farmers and rural landowners receiving rental payments

tricity that it has gone from a net importer of energy to a key supplier to other states. And Pennsylvania, a big soybean exporter, hopes to have 11 biodiesel plants up and running in the next five years. "Clean energy and biofuels are the new cash crops for farmers," says Howard A. Learner, executive director of the Environmental Law & Policy Center, an environmental and economic advocacy group.

If Americans start to buy more energy from the Midwest rather than the Middle East, green energy boosters say it will eventually help stabilize energy prices and shrink oil imports. Over the long term, wind power could grow from less than 1% of the U.S. power supply today to 20%. Ethanol and biodiesel, now around 4% of transportation fuels, could go to 20% or more.

Admittedly these are optimistic projections. Still, in Washington, lawmakers trumpet them as they tout the merits of energy independence. But to farmers, long at the mercy of fickle commodity prices and woefully dependent on government handouts, green mainly means money. Suppose the U.S. were to reduce imports of oil and oil byproducts by 20% and replace that with homegrown biofuels: In the course of one year—assuming prices average about \$50 per barrel—farm communities and other biofuel players would reap some \$50 billion that, in the past, would have flowed to foreign oil producers.

Wind also brings a payoff. The American Wind Energy Assn. estimates that by 2015 this resource could put an extra \$100 million to \$200 million in the pockets of farmers and rural landowners who rent out land to wind turbines. Green energy is "the biggest new market we've had for rural America in a long time," says Thomas C. Dorr, the Agriculture Dept.'s head of rural development.

Banding Together

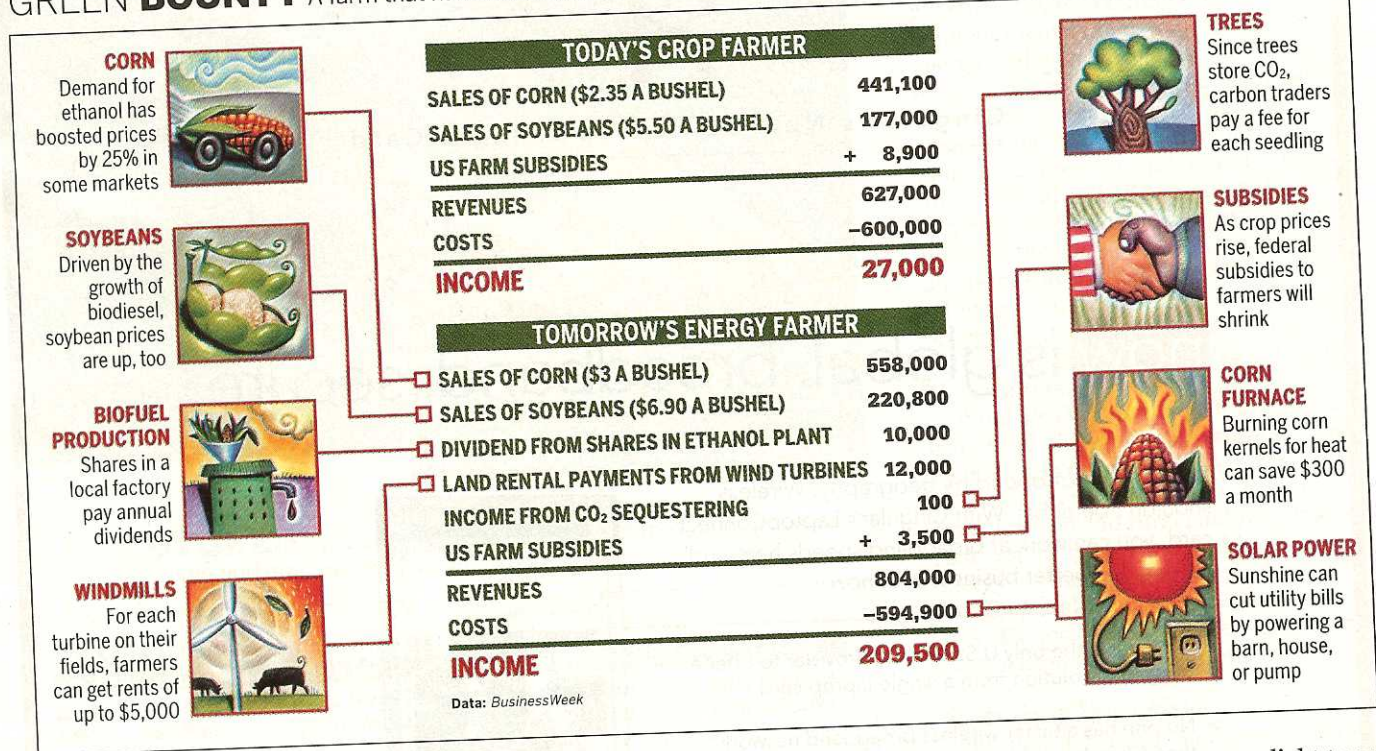
FEW PLACES HAVE embraced energy farming as heartily as Kolsrud's home of Rock County, Minn., population 9,520. It's a community so intimately tied to agriculture that the local radio station updates commodity prices, not stocks. The farm supply store, M&M Distributors, is the major chain, not Home Depot. Buffalo are a more common sight than people.

Kolsrud's transformation from traditional farmer to energy entrepreneur began in the summer of 1995. After an exhausting day weeding his soybeans by hand, he realized the years of hard work and unpredictable pay would break his will, if not his back. Then, as now, the typical farmer's life played out like a sad country song. While a 500-acre farm like Kolsrud's could pull in more than \$135,000 in revenue a year, equipment, fuel, and other costs would eat up practically all the profit. That dynamic forced many farmers to expand aggressively, take on second jobs, or get out altogether. "You could hardly support a family," says Kolsrud, a fourth-generation farmer who bought his first 140 acres in 1972, after returning from military service in Berlin during the Vietnam War.

Despite initial skepticism, Kolsrud ultimately saw ethanol as an ideal lever to shift his prospects. So he and a handful of others scraped together \$3 million from 220 farmers in Minnesota, South Dakota, and Iowa to build one of the first ethanol plants in the area.

CHARTS BY LAUREL DAUNIS ALLEN/BW

GREEN BOUNTY A farm that harvests energy could see income shoot up nearly eight times—and costs could tumble



It took two years of arm-twisting, and dealmaking—and they also had to find \$18 million in loans and other personal guarantees. “We were a bunch of Forrest Gumps trying to come up with a business model,” says Kolsrud.

By 1998, their 12 million gallon factory was up and running. Today, that 100% farmer-owned cooperative, Agri-Energy, has expanded capacity to 21 million gallons, much of it bound for gas stations in New Jersey. The plant is also part of a growing empire. In 2002, some members of the co-op branched into wind energy with Min-Wind, a partnership that operates 11 wind turbines and produces enough electricity for 3,800 homes. Also in their portfolio of green investments are sizable stakes in biodiesel plants and in another dozen or so ethanol factories. In all, Kolsrud and his neighbors have plowed \$65 million into green energy projects.

The partners never imagined the rewards they'd reap. The first \$1,600 dividend check was such a shock that one farmer actually returned it, thinking the plant had made a mistake. Since the plant

opened in Luverne, Minn., eight years ago, a \$10,000 stake has earned a total of \$54,000 in dividends, and such an investment itself is now worth \$55,000.

Demand from the local ethanol plant is also propping up corn prices in the area. Since Rock County is situated far from major corn transport hubs, added freight costs mean that farmers here usually got 40¢ to 50¢ less per bushel than the going rate in Chicago. Thanks to increased demand for corn from Agri-Energy and other nearby ethanol plants, that gap has been cut in half.

It's not unusual for farmers to be millionaires, but typically the money is tied up in land. So extra cash from ethanol and higher corn prices is a blessing, helping people pay off debt on their land or fund their kids' education. Some farmers are splurging on equipment—like the latest tractor with a satellite positioning system and auto-steering. “The biggest complaint now is about the tax bill,” jokes Kolsrud, who recently took his family to Aruba and drives a blue Ford Explorer that runs on E85, a blend of 85% ethanol and 15% gas.

Few people in the two-stoplight town of Luverne have been left untouched by the green-power boom. Locals originally griped about the yeasty smell of the emissions from the plant, but special gear was able to remove the fumes. Now, a big topic of discussion is who in town failed to buy an early stake in the plant and how badly they regret it. Local tax coffers are also looking healthier: Agri-Energy will pony up around \$280,000 in taxes to Rock County next year. The semis and train cars rolling into town to deliver the corn or haul the ethanol to blenders also boost commerce on Main Street.

Still, there are harsh reminders that the fortunes of alternative energy remain tethered to oil prices. At \$70 for a barrel of oil, it costs \$2.60 to make a gallon of gasoline, vs. around \$1.25 for ethanol, estimates Paul Ho, a director at Credit Suisse First Boston's energy group. But the gap shrinks as oil prices fall. Most experts figure that oil would have to duck below \$30 for months at a stretch before the economics of ethanol stop making sense. Yet even with oil trading at just \$60 and ethanol giant Archer Daniels Midland reporting bumper profits, Wall Street is getting skittish. Ethanol stocks like Aventine Renewable Energy Holdings and VeraSun Energy are 42% and 20% off their initial public offering prices, respectively, while producer Hawkeye Energy has delayed its IPO. “People are



forgetting the high energy prices in the summer. It's crazy," says Jacob Golbitz, research director for consulting firm HighQuest Partners.

It helps that alternative-energy markets are propped up by state and federal mandates to push more ethanol into fuel tanks and more green power onto the grid. The new nationwide renewable fuel standard, for example, calls for 7.5 billion gallons of ethanol production by 2012. Most experts think demand will far outpace those government-set levels, driven in part by state requirements for biofuels and the growing consumer preference for cleaner gas.

There are, however, some much darker scenarios, including speculation about a coming ethanol glut. Today, about 106 ethanol plants are operating, with a combined capacity of 5.1 billion gallons. Another 3.5 billion gallons in new capacity is under construction in the U.S., according to the Renewable Fuels Assn. If supply far outstrips demand and prices crash, you could see an archipelago of bankrupt distilleries scattered across the Great Plains. Older, smaller, and less efficient plants, many built by farmers, would be the first to go under, says Ho. Asked about the risk of a price crash, Kolsrud appears unfazed. There's a bit of homespun wisdom he saves for such moments: "You have to accept that some days you're the pigeon, and some days you're the statue."

Wind power follows a somewhat different dynamic. Whether there's a drought or deep snow on the ground, it pays off so reliably these days that farmers call it a second crop. In return for hosting a single turbine, they get \$2,000 to \$5,000 a year from wind developers. It's not uncommon for a typical family farm to have three or four of those turbines. And



MULDER PLANS TO STAY

if you own the windmills, you can really make a killing. Paul and Alice Neppel originally put up a turbine to offset the \$200,000 annual electricity bill on their livestock and crop farm in Dolliver, Iowa. Last year, they made \$150,000 selling the energy wholesale back to the local power company. "You wake up in the morning and you're so happy the wind is blowing," says Alice.

Farmers have other ways to play in emerging green markets. One is trapping carbon emissions by planting long-lived trees that lock up carbon dioxide as they grow. Many companies believe that, in the near future, the U.S. government will soon start to impose caps on greenhouse gases, following the lead of governments in Europe and Asia. If that happens, a market will emerge enabling companies to buy and sell credits—essentially rights to emit.

To get a sense of how this will work, U.S. companies have already begun trading credits through a body called the Chicago Climate Exchange (CCX), and paying up in real currency. Farmers can join the CCX to become registered providers of these greenhouse gas emission offsets. Credits equal to the emission of 100 metric tons of carbon were

selling recently for about \$4.25. It's not hugely profitable right now—a 600-acre farm that sequesters 1,500 tons of carbon dioxide a year would collect little more than \$60 in return. But the hope is that those prices will rise sharply if the U.S. goes the way of other countries.

On farms with big populations of chickens,

pigs, or cows, even manure can work as an alternative energy source. Using a system known as an anaerobic digester that transforms manure into methane, a farmer with a herd as small as 300 cattle or 2,000 pigs can produce enough biogas to meet a farm's entire heating and electricity needs, with some left over to sell back to the market.

New forms of ethanol may also put extra bucks in a farmer's pocket some day. Most experts agree that cellulosic ethanol, made from nonfood crops such as switchgrass as well as corn stalks and other

biowaste, will be the next driver of growth for the industry. The technology to make this is still a few years off, but in Luverne, farmers are already placing their bets. Loren Forrest, age 64, is cultivating a small plot of *Giganteus Miscanthus*, a kind of grass that can shoot to 12 feet tall in a year. He estimates that he could someday up his profits by \$25 per acre growing and selling next-generation energy crops, in addition to his regular corn and soybeans.

Shrinking Subsidies?

WHILE FARMERS WAIT for the cellulosic revolution, they're enjoying the spike in commodity prices caused by demand for biofuels. Corn has sold for an average of \$2 to \$2.50 a bushel since the 1970s. But agrarian economists predict corn prices will hit a new long-term level north of \$3. Across a typical year's crop, that's an extra \$9 billion going to farmers.

That means that Uncle Sam won't have to kick in as much money to support them, since some of the current corn subsidies are based on the price of commodities. "It depends on how high prices go, but subsidies could be cut by \$5 billion to \$10 billion a year," says professor Christopher Hurt of Purdue University. Still, he admits, some of those savings will be offset by the increasing amount of money the government is spending on biofuel. Today, fuel blenders receive a 51¢-per-gallon tax credit for ethanol.

Economists welcome evidence that the green energy boom is slowing the migration of young people away from the farm. The outflow has stopped in North Dakota. After nearly three decades of losses, the population grew in the past two years. Across the country, over the next 10 years, biofuel and wind investment are predicted to create more than 250,000 jobs, mostly

Spotlight on Power Crops

What Comes After Corn: An early ethanol investor, farmer Loren Forrest hopes to build a next-generation plant that can cook up corn waste to make more biofuel more cheaply.

Ethanolville, USA: Field notes from *BusinessWeek* reporter Adrienne Carter's journey through the farm belt's emerging economy.

Energetic Flora: A slide show examining some of the exotic crops that could deliver far more fuel per bushel than corn.

BusinessWeek online

<http://www.businessweek.com/extras>

in nonurban areas. Luverne's 21 million gallon ethanol plant, for example, employs 28 people, with most of the salaries ranging from \$35,000 to \$75,000 before profit-sharing.

Numbers like those offer real hope to locals like Shannon Mulder. For the affable 22-year-old who grew up outside Luverne, farming means family. And while she was determined to stay near home following high school, sky-high land costs made farming impossible. The town's nonfarm jobs offered little promise. By age 20, Mulder had reached the top hourly wage as a nursing assistant in the maternity ward at the local hospital.

So she entered the renewable energy program at the technical college in Granite Falls, Minn., funded in part by local ethanol plants. Like similar initiatives popping up at community colleges and technical schools across the farm belt, the two-year curriculum covers everything from biology and robotics to chemistry and fluid technology. It also complements

the school's programs in wind energy. Nearing graduation, Mulder sees herself operating an ethanol plant someday or working in sales. "The industry is so raw, so open," says Mulder, in her Minnesota drawl. "I want to taste it all."

Kolsrud and the other farmers at Agri-Energy face their own rite of passage. Ethanol's high profit margins, even in light of the recent drops in oil prices, have attracted the attention of Wall Street and other corporate types. But at 21 million gallons, Agri-Energy's plant is just a bit player, and the business model has limitations. For one thing, it's a co-op, making it difficult for farmers to cash out. And co-op rules require members to supply the corn, so investors must be nearby farmers.

So lately, the board and co-op members are discussing a possible merger between Agri-Energy and up to six other producer-owned ethanol plants in the Midwest. It's a deal that could create a massive ethanol player—perhaps second only to Archer Daniels Midland. In time, the plan is to go

public with a stock offering. Rumors are now flying about a potential sale. Some say that if the deal goes through, a \$10,000 stake purchased when the plant opened could be worth \$240,000.

Kolsrud declines to talk about the value of Agri-Energy, but he supports the stock offering. Others are content with the current structure—and its steady flow of dividends—and don't want to upset the apple cart. One fear is that they will lose control of the operations and the local community may not benefit as much once outside investors flood in. Given the recent performance of stocks in the ethanol business, there's also a chance that the offering could fall flat. Kolsrud understands the risk, but thinks the farmer-owners must adapt or get left behind as the industry consolidates. The members are expected to vote on the proposal by the end of the year. "They're arguing about whether to be rich or very rich," he says. ■

—With Adam Aston in New York

WHAT GOOD ARE BIOFUELS?

Crops that double as energy sources are cheap, abundant, and homegrown. Yet as farmers rush to transform food crops into fuel, some environmentalists have begun to fret. Energy & Environment Editor Adam Aston explains:

What are biofuels?

There are two main types: ethanol, made from corn, sugarcane, or other carbohydrate-rich plants; and biodiesel, which is derived from soybeans or other oil-bearing crops, or even from animal fat.

Can I buy ethanol or biodiesel now?

You may already have it in your tank. About half the U.S. gasoline supply is spiked with up to 10% ethanol. U.S. carmakers are promoting a blend called E85, made of 85% ethanol and 15% gas. But to burn this mix vehicle engines must be upgraded, and only about 800 gas stations carry it. Biodiesel is even rarer: 75 million gallons were made last year, versus 4 billion gallons of ethanol.



SLASH-AND-BURN IN INDONESIA

Indonesia, a boom in biodiesel made from palm oil is encouraging the slash-and-burn clearance of rain forests to create cropland.

Don't you have to consume a lot of energy to make biofuels?

Not really. Thanks to more efficient growing and production processes, the "energy balance" of today's ethanol is positive. For each unit of energy consumed in planting, fertilizing, harvesting, and distilling, ethanol yields about 1.5 units. At 3.0, biodiesel's energy balance is even better. But the Holy Grail is so-called cellulosic ethanol made from woody crops and plant waste. It has an energy balance of up to 36.

How "green" are biofuels?

Environmental groups such as the Natural Resources Defense Council like them because, with both E85 and biodiesel, tailpipe pollution and greenhouse gas (GHG) emissions fall. But while air quality may improve, water can suffer. More energy-crop farming may stress already overdrawn water supplies, and increased use of fertilizers could taint surface waters. What's more, as fuel crops rise in value, farmers allot more land to them. In tropical areas such as

Do food supplies suffer if more crops are used to make energy?

So far, the answer is no. Last year, 14% of the corn harvest was used to make ethanol, almost all of it industrial-corn varieties not normally used in food. In some states, though, ethanol plants can process more corn than local farmers can now grow. Worldwide ethanol demand has pushed up the cost of corn by 25% and sugar by 100%. Rising food prices especially hurt the world's poorest nations, many of which depend on U.S. exports.