



Looking back, Dan Sanders Jr. admits with a laugh that he “didn’t have a clue.”

Prior to opening their ethanol plant in 2006, Sanders and his father had no idea the industry would boom like it did and that Front Range Energy LLC would be just one of more than a hundred newly built or under-construction biorefineries to pop up around the country.

But what Sanders knew without a doubt: The plant would pump millions of dollars into Windsor, Colo., benefiting its 16,000 residents unlike any other business.

First, hundreds of temporary workers—who spent their paychecks in town—were hired during the nine-month construction. Thirty-five permanent workers—all locals—have been employed since production began. Supplies and materials are bought in the area as much as possible. The grain is purchased from area farmers. And, the ethanol plant pays taxes to support roads, water and infrastructure. A new school just opened.





GROWING GREEN

**Ethanol production bolsters communities,
but will gains endure?**

“It creates a huge amount of wealth for everyone,” Sanders says.

And not just in Windsor, but in small communities across the country.

Spikes in gasoline prices, conflict in major oil-producing areas and widespread support for renewable fuels have caused ethanol production in the United States to surge. The increase in profitability has attracted a new class of investors to rural America.

Although some communities oppose ethanol plants because of their high water use, contribution to air pollution and heavy truck traffic, many rural areas welcome the economic surge ethanol production brings to the area.

Though highly successful in recent years, ethanol profits can swing with rising and falling corn and crude oil prices, say Nancy Novack, associate economist, and Jason Henderson, assistant vice president and Omaha Branch executive, both of the Federal Reserve Bank of Kansas City.

Novack and Henderson recently researched whether ethanol can power stalled economies in rural America, examining both the economics

of the industry and factors that could shake its stability.

Biorefineries are appearing in all corners of the country, now in 20 states, including seemingly unlikely ones such as New York, California and Georgia. However, production still remains concentrated in the Corn Belt.

The Tenth Federal Reserve District, which includes western Missouri, Nebraska, Kansas, Oklahoma, Wyoming, Colorado and northern New Mexico, has a high concentration of ethanol plants. The No. 2 ethanol producing state in the country is Nebraska.

“This year the U.S. ethanol industry will produce nearly 6 billion gallons of renewable fuel,” Henderson says. “Many rural communities equate ethanol production with economic opportunity in the 21st century.”

Although those tied to the industry are optimistic about what the future holds for ethanol production and its benefits for rural America, Novack and Henderson remain cautious.

There are risks and side effects. Future profits will be highly variable given the volatility

Understanding ethanol

Ethanol is a clean-burning fuel most commonly made from corn, but also sorghum, barley, wheat and sugarcane, and is produced in biorefineries through a fermenting and distilling process. It is nontoxic and biodegradable.

In 2006, ethanol production consumed about 20 percent of the country’s corn crop. People’s consumption of this type of corn is limited; it’s used to make corn flakes, corn oil and other processed corn products. Its main use (roughly two-thirds) in the United States is for livestock feed.

Ethanol made from corn creates byproducts, such as grains for cattle feed or carbon dioxide for soft drinks, which enhances revenue.

Blended with unleaded gas (usually 10 percent and called E-10 Unleaded), ethanol’s high oxygen content slows the rate at which gas burns and helps it burn cleaner, reducing toxic exhaust emissions, such as carbon monoxide. Another formula produces E-85, a blend of 85 percent ethanol and 15 percent gasoline, that can be used in flexible-fuel vehicles, which continue to be more available in the marketplace.

All major vehicle manufacturers worldwide approve the use of the ethanol-gasoline blend, which also helps improve engine performance and keeps engine parts cleaner.

Enough biomass from both feedstock and non-feedstock sources is available for ethanol to reduce the country’s dependence on oil, and meet food, livestock feed and export demands, according to the USDA.

"ETHANOL IS A BOOMING INDUSTRY NOW," says Dan Sanders Jr., owner of Front Range Energy LLC. **"We're probably going to see some overbuilding."**

of prices of corn and other energy products.

"With changing markets, environmental policies and technological advances," Novack says, "opportunities could fade quickly."

Makings of a hot market

In 25 years of ethanol production, Lee Reeve hasn't had any biorefineries set up shop near Reeve Agri-Energy, or much interest in general in the work that goes on at his Garden City, Kan., facility and its adjacent farmland. Until now.

After years of being asked "what's ethanol?" there are half a dozen biorefineries "within a stone's throw," and his family-owned and -operated business is approached by investors all the time.

"This is kind of the second start for ethanol," Reeve says.

In 1982, its first year, Reeve Agri-Energy produced 1 million gallons of sorghum-based ethanol. The plant now produces 12 million gallons annually. Reeve also sells a wet grain byproduct for cattle feed.

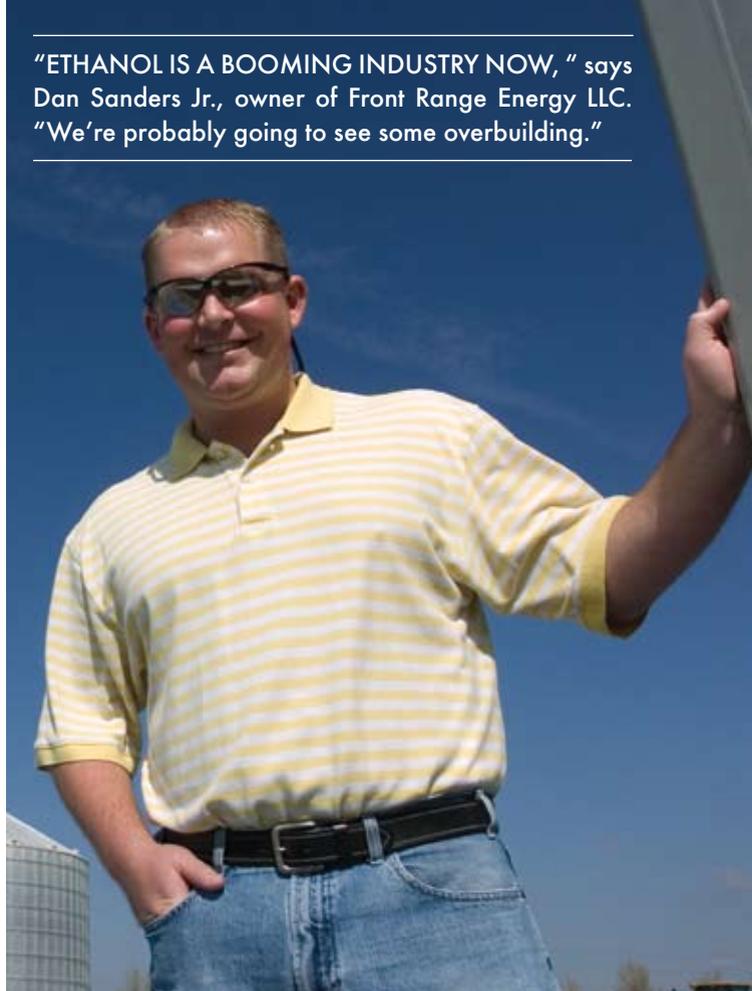
"You have this tremendous demand. We're not even close to meeting it," Reeve says. "If you're a farmer, this is a good problem to have."

There is no question of the public's current interest in ethanol, which actually dates back to the 1800s. Henry Ford's first automobile ran on pure ethanol.

From 2000 to 2005, ethanol production soared 140 percent, and the industry saw roughly another 20 percent increase in 2006. This translates to more than 4.5 billion gallons of ethanol produced annually in the United States, according to the Renewable Fuels Association.

"Profits have fueled ethanol's massive recent expansion," Henderson says, "but environmental policy is the industry's foundation."

The Clean Air Act Amendments of 1990 required reformulated gasoline be sold in areas where ozone requirements were not being met. Ethanol meets this mandate without the contamination possibilities, such as tainted



groundwater, that other substitutes have.

The Energy Policy Act of 2005 eliminated the reformulated gasoline requirement, but still mandates blended gasoline to reduce emissions.

The Renewable Fuels Standard, established under this act, secured the need for ethanol by requiring 7.5 billion gallons of renewable fuels be blended into the nation's fuel supply by 2012.

"Given its explosion of growth," Henderson says, "some rural communities are pinning their hopes for future prosperity on ethanol."

Side effects

In 2006, about 20 percent of the U.S. corn crop went to ethanol production, according to the USDA. And during fall harvest, surging crop prices validated ethanol's potential.

However, higher prices can bring unwanted side effects, Novack says.

Climbing corn prices can tempt producers of other crops to shift production to corn,

which could swell future supplies and dampen prices. Scott Merritt, executive director of the Nebraska Corn Growers Association, says, "This is where the market kicks in."

As part of its objective, the Association supports ethanol production because of the potential boost to crop prices.

"They (farmers) are going to grow what the market tells them," Merritt says. "Crop rotation is determined by markets."

Right now, the demand is for ethanol, so "you're going to see a surge in corn planting for a couple years, no doubt about it," Merritt says.

Higher corn prices also can affect livestock by boosting feed costs, which happened during the last six months of 2006. Crop prices surged and feed costs jumped 24 percent.

However, corn-based ethanol creates a byproduct—distillers dried grains, or DDGs—used to feed cattle. DDGs alleviate some of the cost burden of feed, but spoil quickly and are expensive to transport. As a result, ethanol plants and cattle feedlots are starting to co-locate more frequently.

While co-location makes sense financially,

Jim Schwartz worries it could lead to a concentration of cattle in the country's Corn Belt.

"It is going to have an impact," says Schwartz, who is the director of the Wyoming Livestock Board. "A lot of the time, what's good for the farmer is not always good for the rancher. We need to find that balance. I think it can be achieved."

Schwartz predicts higher expenses for beef producers, which would lead to higher beef prices for consumers.

Wealth distribution is also a concern, Novack says. Ethanol facilities are viewed as a way to keep rural wealth invested in rural America. Throughout the years, ethanol plants have become larger in size, and fewer are owned by farmers.

From 1999 to 2005, roughly 70 percent of ethanol plants under construction were farmer-owned. In 2006, that number dropped to just 10 percent.

Farmer cooperatives work well for raising capital to build smaller plants (40-50 million gallons annually), but larger plants (100 million gallons or more annually) need more capital than can typically be raised by farmers in the region alone.

"The long-term viability of these riches in rural communities is yet to be seen," Novack says.

Sustainability

The future of ethanol depends on the market's evolution, environmental policies and emerging technologies, say Novack and Henderson.

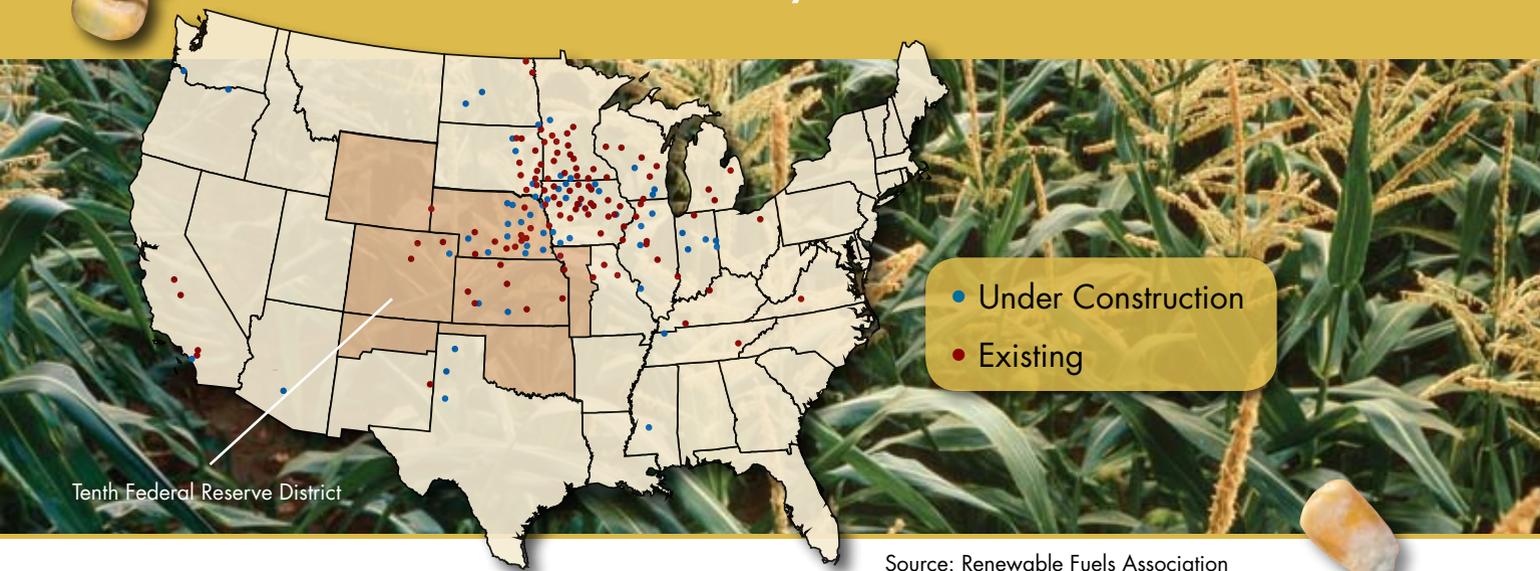
In a year's time, ethanol prices have ranged from \$1.20 per gallon to \$4. Profits have been as volatile as its pricing. By the end of 2006, profits ranged from 50 cents to \$3 a gallon.

"High profitability in the future is based on high crude oil prices," Novack says.

Novack and Henderson conducted simulations to determine how sensitive ethanol profits are to fluctuations in both corn and crude oil prices. They found, based on historical relationships, ethanol profits are highly variable



Ethanol Biorefinery Facilities (As of December 2006)



with potential for losses under high corn prices and low crude oil prices.

“This can make ethanol profits disappear overnight,” Henderson says. “Or, a period of high crude oil prices and high ethanol profits could attract other substitutes into the market and increase the competition with ethanol, driving its profits down.”

Transportation risks are also an ongoing concern. Ethanol-blended gasoline cannot be delivered through the nation’s pipeline system because it absorbs impurities from the lines. Transporting it by truck or rail is necessary, but adds as much as 17 cents per gallon to the price.

Policy changes could boost or limit ethanol demand. Moreover, Novack and Henderson say, the industry is federally subsidized 51 cents per gallon of ethanol blended with gasoline. If this is cut, ethanol profits will fall.

A final issue facing the ethanol industry is the impact of new technologies, which are being developed to produce ethanol from other resources, such as waste paper, wood and wheat straw. This would further expand production outside of the Corn Belt, challenging the future of corn-based ethanol.

Despite its challenges, Todd Adams, chief executive officer of Adams Bank & Trust in Ogallala, Neb., and an investor in ethanol biorefineries, has faith ethanol will continue to power rural communities in the future.

“By and large, I think it is sustainable,” says Adams, who is also a member of the board of directors for the Omaha Branch of the Federal Reserve Bank of Kansas City. “If we’re really determined to reduce our dependence on foreign oil, ethanol is going to play a role in that.”

And this means rural America will continue to reap the benefits of ethanol production.

“That’s the promise of ethanol—to revitalize our rural areas,” says Adams, citing new employment for young workers and a larger tax base. “Those are all the things you see on paper. What’s hard to capture on paper is the enthusiasm and optimism this creates in rural communities. ‘Does my town have a reason to go on and exist?’

“Ethanol can give it that reason.”

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BY BRYE STEEVES, SENIOR WRITER

FURTHER RESOURCES

CAN ETHANOL POWER THE RURAL ECONOMY?

By Nancy Novack and Jason Henderson
www.KansasCityFed.org/TEN

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