Rural COOPERATIVES

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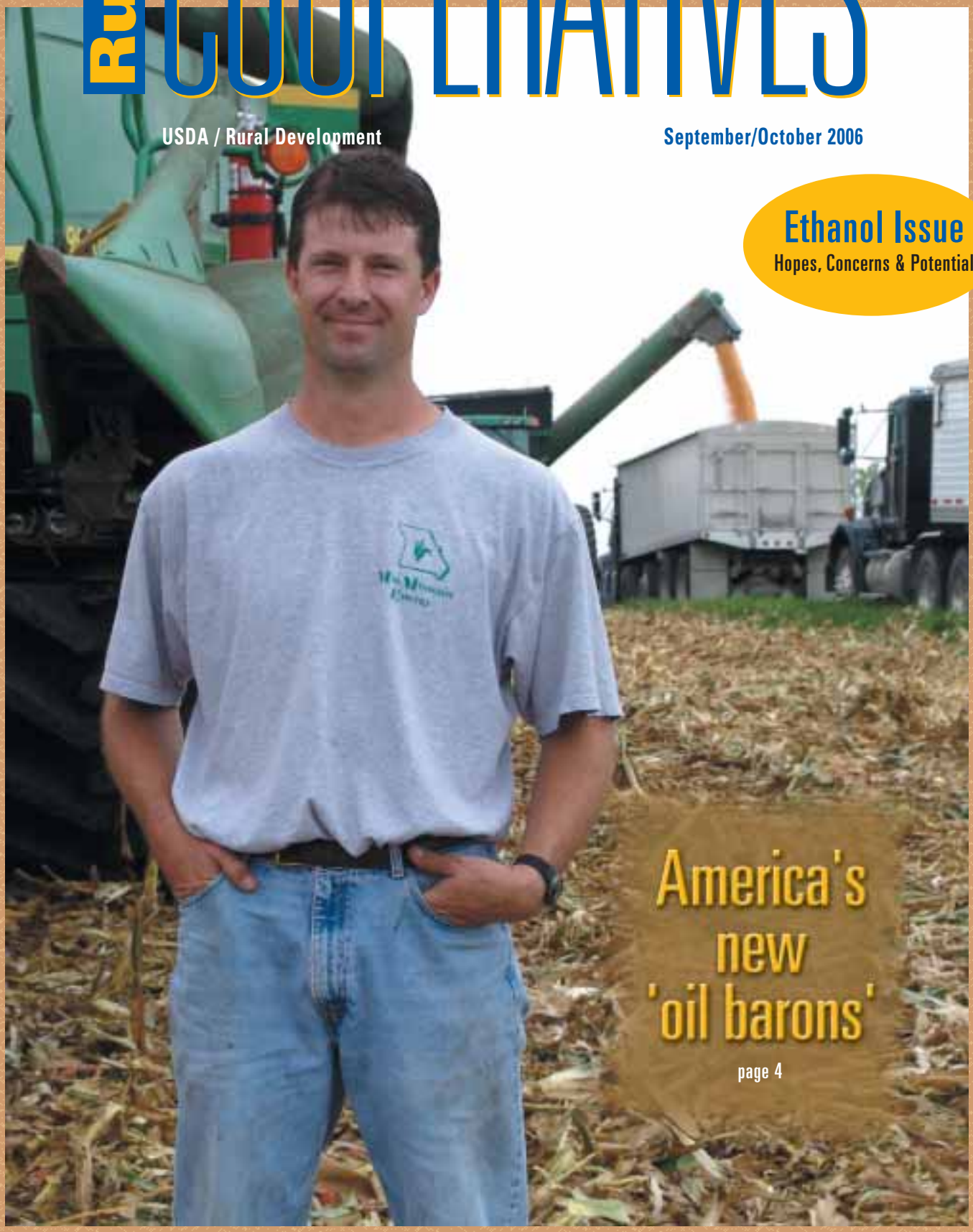

Ethanol Issue

Hopes, Concerns & Potential

America's new 'oil barons'

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Renewable Energy: Ethanol Comes of Age

Five years ago, shortly after the Sept. 11 attacks, Indy race car driver Paul Dana had an idea: run the Indianapolis 500, the world's largest single-day sporting event, on ethanol as a symbol of America's determination to reduce its dependence on imported oil.

The idea came naturally to Paul, who had grown up on a Missouri farm with a Corn Belt perspective on ethanol. So he set out to make it happen, with the help of the Renewable Fuels Assoc. and some farm groups. He lobbied drivers, team owners and anyone else who would listen, and he soon persuaded Tony George, the owner of the Indianapolis Motor Speedway, to take a close look.

Paul's perseverance paid off. Once the engineers had vetted the project, Tony George gave the order and the Indy Racing League (IRL) announced a historic switch: Indy cars are going green. The 2006 race was run without incident on a 10 percent ethanol blend, and the 2007 IRL circuit will be 100 percent ethanol powered.

Paul Dana was tragically killed in a racing accident in March 2006 at the Homestead-Miami Speedway in Florida, but his vision lives on. The Farm-Belt "homebrew" of the 1960s is now powering high-performance race cars, as well as helping fuel millions of private automobiles across the country. Ethanol has truly come of age.

This issue of *Rural Cooperatives* reviews ethanol's rapidly growing impact on America's farm economy. When Paul Dana began his quest, the United States was producing 1.77 million gallons of ethanol annually. In 2005, barely five years later, we produced 3.9 million gallons. When the 42 plants now under construction join the 102 already operating, total capacity will exceed 7.8 million gallons. Ethanol this year may absorb 20 percent of the U.S. corn harvest. The effects are many:

- Improved national security due to a reduction in oil imports.
- A cleaner environment.
- Higher prices for corn growers.
- Wealth creation, new jobs and tax-base increases in rural communities.
- Potentially higher costs for livestock operations, which are at least partially offset by an increased supply of dried distillers grain.
- Lower support payments and reduced U.S. vulnerability to WTO litigation.

Driver Jeff Simmons of the Rahal Letterman Racing Team (left) discusses the conversion to ethanol fuel at the Indianapolis 500 with Rural Development Under Secretary Thomas Dorr. USDA photo by Darrell Mowery

- New markets for third-world producers if ethanol diverts U.S. corn from the export market and as ethanol production expands internationally.

These and other adjustments will continue to unfold as the ethanol industry matures. From a rural development standpoint, it is important to note that ethanol is much more than just BTUs. It is a rural, distributed resource. Farmers own the feedstock. Transportation costs favor local sourcing and a decentralized production base. State-of-the-art technical and managerial assistance is readily available. A franchise model of development opens the door to local ownership and control.

While the ethanol boom is attracting an ever-wider pool of investors, agricultural producers and cooperatives are thus still able to compete. This is also true in other emerging energy resources like wind, solar and — a few years down the road — cellulosic ethanol. Renewable energy is distributed energy, and that spells opportunity for rural entrepreneurs.

A strategic goal for USDA Rural Development, therefore, is to encourage local investment in, and ownership of, the renewable energy resources already present in rural communities. This is a historic opportunity for wealth creation in rural communities. Renewable energy is a top priority for America's farmers as well as the nation as a whole, and we look forward to working with America's cooperatives to get the job done.

Another great opportunity: some of you may still have time to register for Advancing Renewable Energy: An American Rural Renaissance, a conference to be held Oct. 10–12 at America's Center in St. Louis. See pages 35 & 42 for more details, or visit: www.technologyforums.com/6EN/

—Thomas Dorr

USDA Under Secretary for Rural Development ■

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On the Cover:

Mid-Missouri Energy Cooperative member Brian Miles isn't just harvesting corn, he's harvesting ethanol and helping to wean America from its dependence on foreign oil. The hopes, concerns and potential for the nation's ethanol industry are examined in this special issue. USDA photo by Dan Campbell

Fuel Farming

Missouri farmers harvest bumper crop of ethanol, raising spirits and cash

By Dan Campbell, editor
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As he guides his combine across fields of ripe corn near Marshall, Mo., Brian Miles doesn't look anything like a Texas oil tycoon. Nor do Randy Britt of nearby Kaseyville or Dale Samp of Cairo, Mo., as they tend their crops and livestock.

But a new breed of home-grown 'oil baron' is sprouting on farms like this all across America. J.R. Ewing (of "Dallas" fame) has nothing on these farmers and others like them, some of whom are making more profit these days from their investments in ethanol than from other farm income. Indeed, J.R.'s oil fields probably went dry years ago, but these "fields of renewable energy" should never run dry, barring severe drought.

Much of their crop will be trucked just a few miles away to be processed into ethanol. Better still, the corn will be processed at bio-refineries that Miles, Britt, Samp and hundreds of their fellow Missouri producers own and operate.

Inside the cab of his combine, Miles glances at the corn stalks bowing down and disappearing beneath him, then at a yield monitor that displays his per-acre haul and the average moisture content of the corn. As he drives, the GSP-enabled monitor creates an electronic map of his fields that will later be used to fine-tune everything from his fertilizer and seed applications to where he will lay new drainage tiles.

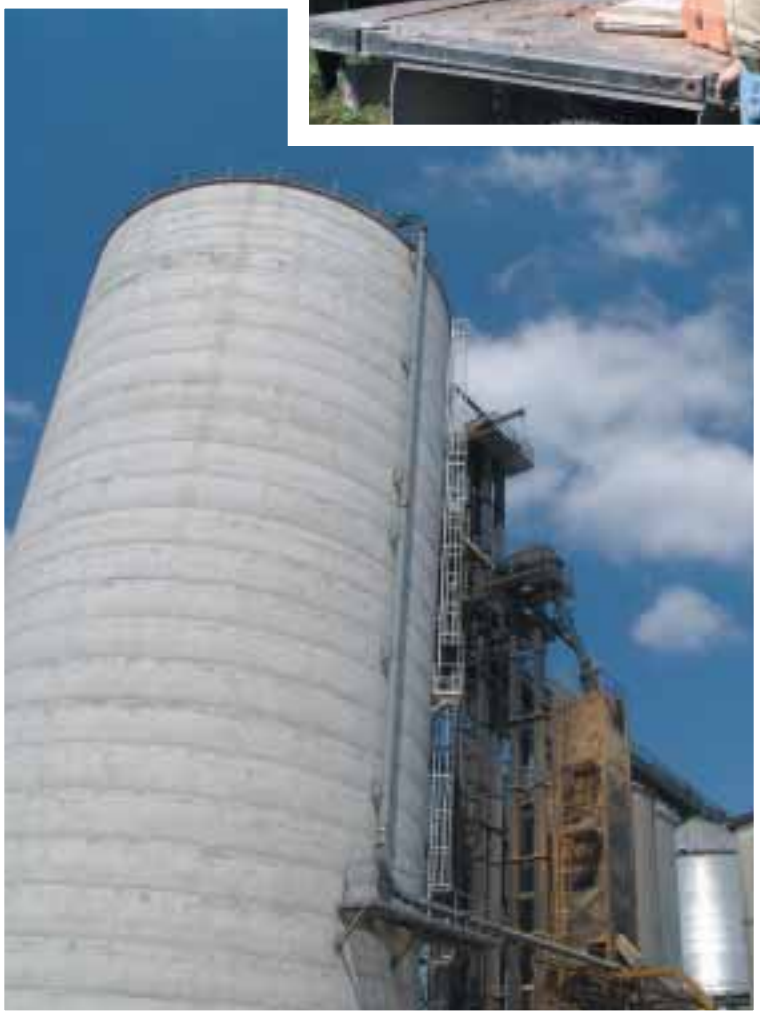
"This technology helps us practice precision agriculture, so we only apply what the crop needs," he says over the rumble of the machine. "We treat the land with respect, because I want my kids and their kids to be able to farm this land as well," says the young father of three. The increased returns the farm nets from its ethanol investment may also help ensure that farming remains economically viable enough to keep his children in farming, should they so choose.

In addition to the economic benefits of biofuel, producers also cite patriotic and homeland security incentives as adding to a sense of urgency for renewable fuels development.

"We are showing the nation that we do not have to be so dependent on foreign oil, and that we should not allow ourselves to be held hostage to Middle East oil," says John Eggleston, president of Northeast Missouri Grain Processors Inc., a cooperative which is majority owner of Northeast Missouri Grain LLC (NEMO) in Macon, Mo., the state's first ethanol plant. "We still have a long way to go, but farmers are helping to change the energy picture. We feed the world, and we can help fuel it too."

Co-ops unite producers

Miles is one of 700-plus farmers of Mid-Missouri Farmers Energy (MidMo), a new-generation cooperative that operates a 50-million-gallon-per-year ethanol plant near the



Clockwise from upper left: Brian Miles used ethanol dividends to buy some rental acreage; the Mid-Missouri Energy plant; Randy Britt says ethanol has provided an alternative market for corn, helping to boost prices; The Northeast Missouri Grain ethanol plant; Dale Samp's ethanol dividends helped with costs of building a new home on his farm. USDA photos by Dan Campbell

small village of Malta Bend, about 12 miles northwest of Marshall. This new-generation co-op plans to begin an expansion project next year which will double the plant capacity to 100 million gallons of annual production. Samp and Britt are among the 311 members of NEMO, which produces about 45 million gallons of ethanol annually in Macon.

Producers who invested in the ethanol plants have reaped dividends "beyond our wildest expectations," says Ryland Utlaut, president of MidMo and former president of the National Corn Growers Association. "We couldn't have picked a better time for our plant to come on line," he says, noting that the start-up 19 months ago coincided with a tremendous run-up in ethanol prices.

Ethanol profits climbed steadily as oil prices soared from $40 to more than $75 a barrel last summer. The phase-out of MTB as an oxygenator for gasoline and the hurricanes that battered Gulf Coast oil refineries also combined to push the price up.

Some producers report that their stock values in co-op ethanol plants have increased 5 to 10 times since the initial purchase (although virtually no one is selling stock, so such claims are hard to verify). MidMo paid members a 31-percent dividend on its first partial year of operation, and will pay an even higher dividend this year. NEMO has also paid sizable dividends for several years running.

In addition to returns from their ethanol plants, producers have also benefited from corn prices that have been boosted from 10 to 20 cents per bushel in the plants' procurement areas. "That doesn't just help co-op members, it helps all farmers," says Eggleston.

Good uses for ethanol dividends

On the Miles' farm, those ethanol dividends helped to buy an additional 140 acres that the family had been renting for more than 30 years. For Samp, ethanol dividends provided additional funds for the custom home he built on his farm. Britt says he's used his ethanol returns in a number of ways to improve his grain and cattle operation.

Miles credits NEMO and the Golden Triangle Energy Cooperative in Craig, Mo., for "paving the way for our success." The success of MidMo is similarly inspiring more biofuel projects. Three or four of his fellow MidMo directors are on boards of co-ops or LLCs that are building biodiesel plants around the state, including one slated to open this fall in Mexico, Mo.

Miles, who grew up in Marshall and graduated from the University of Missouri in Columbia, says the town's economy had been fairly stagnant for many years. But the ethanol plant has been a jolt in the right direction. "The addition of 35 or 40 good jobs at the plant — and that doesn't count other spin-off jobs it created — is a huge plus for a rural town like ours."

"The impact has been tremendous," agrees Matt Staley,

vice president and branch manager for the Farm Credit Services (FCS) of Missouri office in Marshall. FCS helped many producers finance their stock purchases in MidMo. "It's not only the dollars the plant has generated, but its success has also been a great source of community pride. And it has inspired other fledgling co-ops and LLCs that are now riding their coat tails."

Macon County Presiding Commissioner Craig Jones says the NEMO plant is "pulling grain from 100 miles away and has been the most productive new business venture the county has seen in years. And it's virtually all new money," he stresses, adding that its spin-off benefits have "mushroomed" throughout the county.

NEMO has created 42 full-time and seven part-time jobs. Pay and benefits are good, and that doesn't count related jobs in trucking, rail and all the other "ripple-effect" jobs, Jones adds. He thinks NEMO's success may even have helped inspire voters to approve a special tax needed to four-lane a highway through the county, which in turn should help attract other new businesses.

"Ethanol has been the best thing to happen in Missouri in a long time," says Britt while driving his pickup truck across a pasture of tall grass where some of his 400 Black Angus cattle are grazing. "Returns have been much better than anyone could have reasonably expected, and it has strengthened the corn market. Our choices used to be to feed corn to our cattle, haul it to the river terminals or ship it south to turkey growers. Now we keep it close to home and get and extra 10-15 cents a bushel for it."

With the production of so much dried distillers grain (DDG) at the ethanol plants, which is sold for livestock feed, Britt says ethanol may even help bring back some of the cattle-feeding industry, which moved west years ago.

Opening the door

When Eggleston and his fellow producers first discussed building an ethanol plant in the late 1990s, Missouri had no ethanol facilities and no new-generation co-ops. So raising equity investments from producers and lending institutions proved challenging. "It seemed this plant was never meant to be built," Eggleston recalls.

"It was almost like pulling teeth," agrees Dale Samp, Eggleston's co-director on both the NEMO co-op and LLC boards. "A lot of the producers were already highly leveraged and were reluctant to take on more risk." In his own case, Samp says one factor that influenced his decision to join was attending a meeting where Jeff Broin, CEO of the Broin Companies, made a strong case for producers to invest in ethanol as a hedge against low corn prices.

While enjoying the high dividends of recent years, Samp says the ethanol market will have to drop back to earth again at some point. But he expects the operation to continue to be profitable, especially with China and India now soaking up more world oil supplies.

NEMO's initial plan had been to build a 30-million-gallon plant. But the reluctance of growers to invest in it meant the co-op had to keep reducing the scale of the project, eventually settling for a 15-million-gallon plant. The co-op had hoped to own the plant outright, but it formed an LLC to facilitate raising additional funds.

The co-op wound up owning 81 percent of the LLC and holds five of the seven seats on the LLC board. Broin and Associates., which built the plant and provides operational management under contract to the LLC, holds one board seat, and Corn Energy LLC holds the seventh seat. Other investors include Ralls Electric Cooperative and the Missouri Corn Merchandising Council.

It took about 100 producer meetings to raise the $6 million in equity needed to build the plant. The minimum investment was five shares at $2,500 each. Ralls Electric Cooperative stepped in at a crucial point in the planning with assistance when the fledgling co-op was low on money, and the co-op was also able to tap into a state economic development fund.

Missouri recognized that the state and rural communities would gain much more from local, producer ownership than

from outside ownership. So it established a 20-cent-per-gallon subsidy for the first 12.5 million gallons of ethanol produced and 5 cents per gallon for the next 12.5 million gallons, but only if producers own at least 51 percent of the plant.

NEMO's plant capacity was doubled about three years ago, to 36 million gallons, and it is actually producing at a 45-million-gallon clip, which Eggleston says is a tribute to manager Steve Burnett and the staff. The expansion timing was good, as ethanol prices were climbing just as the work was completed.

Clockwise from upper left: ethanol and corn samples are tested in the lab at the NEMO plant; MidMo (next two photos) plans to double production capacity, to 100 million gallons; NEMO Plant Manager Steven Burnett checks on the CO_2 plant, which supplies a brewery and other beverage customers; Ryland Utlaut, center, in the receiving room at MidMo. USDA photos by Dan Campbell

In the early days, it was hard to find local buyers for the plant's DDG, so most of it was shipped to Arizona and California. But now most is shipped by truck to cattle, poultry and hog producers in-state.

In addition to ethanol and DDG sales, NEMO has invested in a food-grade carbon dioxide facility and the company that markets and trucks the pressurized CO_2 to beverage companies, a brewery, a municipal water plant and some food and meat processors. A truck terminal was built to handle the CO_2 traffic, which employs another 15 full-time drivers and mechanics. The co-op leases the facility to a subcontractor.

Investing in other ventures

Another plant expansion isn't really feasible for NEMO at this time, but members wanted to expand their presence in the ethanol market, so it instead purchased a 30-percent interest in a new, 45-million-gallon ethanol plant opening this fall in Ladonia, Mo. NEMO has also invested in Mo-Biofuels, a new biodiesel plant in Mexico, Mo.

It has also purchased an interest in some non-biofuel projects, including Mo-Farm Dairies, a 1,250-head dairy in the southwest corner of the state, and it contracts with Favored Grain, which procures non-GMO grain from producers for feeding to cattle raised to supply meat to high-end restaurants.

When the plant capacity was expanded, NEMO also entered into a joint venture with the city of Macon on a 10-megawatt turbine generator. Under the arrangement, the city gets the electricity and NEMO gets the waste exhaust heat from the large jet engine that powers the generator. The waste heat is fed through a large boiler which, in turn, generates more than half of the steam requirements of the ethanol plant.

NEMO's plant is located on a 1/2-mile-long rail spur, but the majority of its ethanol goes out on trucks. Still, Eggleston says it would have been a mistake to build without rail access. In the early months of operation, when NEMO was having a hard time selling DDG, "we would have drowned in DDG if we hadn't been able to ship it out on railcars," Eggleston says. DDG sales now account for 15 to 25 percent of the plant's annual revenue. "We call DDG and CO_2 *co-products*, not *byproducts*, to emphasize how critical they are to our success," he adds.

MidMo 100 percent farmer owned

MidMo was formed through the merger of two different groups pursuing ethanol plants; one effort was centered in Marshall, the other at Carrollton, Mo. Patty Kinder, now assistant plant manager at MidMo, was at that time an economic development officer in Carrollton. Utlaut credits her for bringing the two groups together and for making the call to the Fagan Group that resulted in an initial ethanol feasibility survey of the area.

By 2001, the combined group had a business plan in hand. The new co-op then launched its equity drive, which it hoped would raise just over $12 million of the $24 million in equity needed, which would give the co-op 51 percent control. Shares were $10,000 each, with a minimum of two shares required for membership. Only producers were eligible to join. Average investment per member was $33,000. The co-op signed up members in 43 Missouri counties and five other states.

After 82 meetings, the co-op had commitments for more

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A farm-supply co-op view of ethanol

They are like first cousins who are often mistaken for each other. Both are farmer-owned co-ops with headquarters offices practically next door to each other in Columbia, Mo. Both provide vital supplies and services to their members.

But MFA Inc. and MFA Oil are two separate businesses. MFA Inc. provides members with fertilizer, seed and livestock feed, as well as grain-marketing services. MFA Oil deals mainly in gasoline and diesel fuel.

Both co-ops have much at stake in the region's rapidly evolving renewable fuels economy.

At MFA Inc., the reaction to ethanol depends on which side of the building you are on. Ron Utterback, vice president of crop protection, farm supply and seed, is optimistic. "We could definitely benefit from it, depending on the speed of its development and how fast we adapt."

MFA Oil is selling E85 at 30 retail outlets and a10-percent ethanol-gas blend at virtually all of its 77 Break Time convenience stores and 166 unmanned fueling stations. Photo courtesy MFA Oil

He has little doubt that the state's corn acreage will increase sharply as a result of ethanol development, probably at the expense of soybeans. He also expects that some land in the CRP conservation program will also be put back into production. But that will likely be acreage that "really should have never gone into the CRP to start with," he says.

For MFA, more corn acreage means more sales, because corn requires more fertilizer and crop protectants than soybeans, Utterback says. Typically, two acres of soybeans are planted for every acre of corn in the state. So there is room to expand corn without even requiring that more land be put into production. Utterback says he thinks that the planting pattern will shift closer to a 50-50 corn/soybean split, more typical of other Corn Belt states.

When it comes to soil types and micro-climates, Missouri is a very complex state. Few know that better than Utterback, who directs MFA's efforts to tailor its seed and fertilizer products to the state's unique growing regions (it also supplies producers in neighboring states). MFA has climbed to the top of its market because its products have been adapted over the past century to the region's many micro-environments and soil classifications, he notes.

The emergence of ethanol is not the only factor prompting more acres to shift to corn. New seed varieties that allow corn to thrive on drier, "tighter" soils have also been prompting some expansion of corn planting. So Utterback sees potential for this traditionally corn-deficit state to increase its corn crop considerably, and for MFA to increase its business right along with its members' corn crops.

Livestock concerns

On the other side of the MFA Inc. building, Dr. Kent Haden, vice president of livestock operations, has some concerns. He doesn't want to be the rain cloud over the ethanol parade. However, he gets paid to look at the health of the state's livestock industry and factors impacting it. Ethanol is most definitely such a factor, so he has been studying its potential impact in a state that ranks second only to Texas in the size of its cow-calf herd (2.1 million cows).

His main concern is that if increased corn planting doesn't take up the slack, competition for corn could drive prices so high that it could force some of Missouri's livestock out of state – perhaps even to Argentina or Brazil. "When livestock goes, usually it's poultry first, then hogs and then cattle [which corresponds to each segment's dependence on corn for feed]," Haden says.

Haden views dried distillers grain (DDG) as a good-quality protein ingredient for up to 20 percent of feed for cattle. But DDG has turned the feed picture somewhat topsy-turvy. Protein has long been the main nutrient cat-

tle producers sought in their feeds. However, cattle on a heavy DDG ration get plenty of protein, but may not be getting sufficient starch.

Starch, of course, is stripped from corn in making ethanol. Without sufficient starch, beef does not marble properly — especially not the way the Japanese and some other Asian export markets like it, Haden says. And there's the rub, since corn is by far the most cost-effective source of starch for cattle, Haden says.

Dressed carcasses of hogs fed a heavy DDG ration also typically weigh about 6 pounds less than corn-fed hogs, based on University of Missouri data, because more of the growth goes to the guts, notes Haden. He is not aware of any similar data for cattle. MFA is producing some special mineral supplements it recommends for producers feeding high-DDG rations.

Some have suggested that new feed yards could open near DDG sources in Missouri. Haden says he hopes it happens. But, he adds, it will be tough to accomplish because 30 Missouri counties have adopted stricter environmental regulations that make it hard to keep more than 300 head confined in one location. "And more counties are adopting those regulations." The same regulations will likely limit growth of the state's dairy industry, he notes.

Oil co-op sees gains

Things are more clear-cut for MFA Oil. Tom May, director of marketing, says the co-op is bullish on ethanol and is doing all it can to educate consumers about the advantages of its use. MFA Oil sells a 10 percent ethanol blend at virtually all of its 77 Break Time convenience stores and 166 un-manned retail outlets. E85, a blend of 85 percent ethanol and 15 percent gasoline used in flex-fuel vehicles, is sold at 30 of those locations. Various blends of biodiesel are also available at many outlets as well.

Most of MFA Oil's retail outlets are in rural Missouri, as well as parts of Arkansas, Iowa and Oklahoma. "So the health of rural towns is absolutely critical to the health of our cooperative. We think ethanol is making a positive economic impact on the communities we serve," May says. MFA Oil was recently presented with the Paul Dana Award (named after the race car driver who got ethanol approved for use in the Indy 500) by the American Coalition for Ethanol, designating it as its marketer of the year.

MFA Oil has entered into a partnership with Mid-Missouri Energy (MidMo) under which it is selling E85 for 20 percent less than regular gasoline. Flex-fuel vehicles get 5 to 20 percent less fuel mileage, so a 20-percent reduction in price makes E85 a good value for the cooperative's customers.

"MFA Oil is excited to partner with another farmer cooperative to bring more value to Missouri's corn crop and economy. We felt working with MidMo was a great way of keeping more ethanol dollars at home," says May.

MFA Oil gave away a Ford F-150, flex-fuel pickup truck last Fourth of July as part of an ethanol-education campaign. At that event, May says he "lost track of how many people stopped by our booth and said they would be filling up with E85 now that it costs 20 percent less than unleaded gasoline." He also sees signs that consumers are beginning to understand that E85 is better for the environment because it burns cleaner than fossil fuels. (E85 emissions contain just 1 part per million of nitrogen oxide vs. 9 parts per million for gasoline, according to the October issue of *Consumer Reports* magazine).

May says he finds it "almost mind-boggling that it took the nation so long" to finally get a head of steam going behind its biofuels industry. In Missouri, there are 120,000 flex-fuel vehicles, a number that should be steadily going up as consumers get behind homegrown fuels, May says. The state of Missouri has passed a law mandating that by 2008, all gasoline in the state be blended with 10 percent ethanol, which will encourage further development of the state's ethanol industry.

"Ethanol is not the only answer to our energy needs, but it is one thing that is working out there right now," May says. "Cellulosic ethanol will probably be playing a role in the future, too. With sky-high gas costs, you know the market will find a way to produce more alternative fuels."

— By Dan Campbelll, editor ■

"They're the good guys!"

High oil prices, the war in Iraq and other factors prompted a group of protestors to set up a picket line outside a Big O Tire-Petro Mart gas station in Columbia, Mo., in June.

But when the leader of the group, University of Missouri librarian Rebecca Schedler, learned that the station is owned by MFA Oil, she redirected her troops, according to a report in the *Columbia Daily Tribune*. "That's a farmers' cooperative. They're the good guys," she said.

The picketers instead set up shop outside the gas station of a major national oil company.

Chalk up another "cooperative advantage."

Left Behind

Some country elevators left behind as ethanol diverts traditional supplies

By Catherine Merlo

Editor's note: Merlo is a Bakersfield, Calif.-based writer/editor with extensive experience writing about cooperatives and the issues that impact them.

In his 25 years as executive director of the Minnesota Grain and Feed Association, Bob Zelenka has faced farm crises, droughts and floods. But nothing has shaken him or the 600 country grain elevators and feed mills he represents as deeply as the current ethanol boom.

"It's been the biggest thing to hit our industry," says Zelenka, "and the hardest to adapt to."

In the last year alone, Zelenka has seen almost a dozen Minnesota grain elevators go out of business and several others forced to consolidate "because of the ethanol industry's growth," he says.

Zelenka and his members aren't the only ones worrying about ethanol's growing appetite for corn. As more of the U.S. crop is diverted to ethanol production, some agricultural insiders are beginning to voice concerns over the pell-mell pace of the renewable fuel's growth and its impact on various farm sectors.

While the ethanol gold rush delivers a much-needed boost for corn farmers and rural America — more demand for the yellow-eared crop, more ethanol plants, more tax revenues and jobs — a growing number of analysts are calling for a closer look at the boom's wider-reaching consequences. Already, a "food vs. fuel" ethics debate is emerging in agricultural, energy and academic circles.

Some farm experts predict the explosion of corn-based ethanol production will shift demand away from important food and livestock needs. They say that could lead to potential corn shortages and higher costs for grain exporters, hog and poultry operators, transportation companies, even food processors. Others wonder whether vastly expanded corn acreage might consume marginal land and affect conservation practices.

Even Warren Staley, CEO of agribusiness leader Cargill, has questioned whether biofuels such as ethanol and biodiesel are the answer to U.S. reliance on foreign oil. Staley said that at a time when the need for increased food production is critical, promotion of ethanol runs contrary to Cargill's priority to be the leading global food provider, Dow Jones' *MarketWatch* reported May 1.

Moreover, Staley and others also have pointed out that even if all of the U.S. corn crop were used to produce ethanol, it would replace only about 20 percent of motor fuel.

"Ethanol is not the be-all, end-all solution," says Don Roose, president of U.S. Commodities, an Iowa-based grain and livestock hedging and trading firm. "It's one of a number of sources of renewable energy, and it's unrealistic to think we can switch grain production over and stop imports of foreign oil."

Ethanol's "untethered" growth

Minnesota's Zelenka has ruffled a few feathers in the last year by questioning ethanol's unchecked growth, which, he says, is propelled by government incentives, not by the market.

"We get criticized for suggesting there are ramifications from the untethered growth of this industry," he says. "But you can't help but see that there are downsides to this industry's growth that, unfortunately, no one seems to want to recognize."

Bob Zalenka says ethanol is diverting corn from many local elevators, causing a dozen facilities in Minnesota to shut down last year. Photo courtesy Minnesota Grain and Feed Assoc.

Zelenka points to grain elevators, which depend heavily on the export and domestic feed markets. Some now find themselves bypassed in the corn buy-and-sell process because ethanol plants often prefer corn shipments straight from the farm. That leaves many elevators feeling the pinch of hard-to-find supplies to fulfill their market requirements. In some areas, corn deficiencies are driving up local prices, creating thinner margins for the grain storage businesses.

"A lot of our members have found that ethanol is a real threat to their existence," says Zelenka.

For example, two or three years ago, some grain elevators invested $5 million each to build new shuttle-loading facilities. "Those were massive investments," Zelenka says. "Now they're having dif-

ficulty competing with, in some cases, a subsidized ethanol plant nine miles away. Who would have expected this explosion in ethanol?"

Ethanol boom forces major ag changes

Fueled by increased demand for energy, ethanol commenced its eye-popping growth at the new millennium's start. In 1999, there were 50 ethanol plants in the United States. Today, there are 102 ethanol bio-refineries, with another 42 under construction, reports the Renewable Fuels Association.

"Planned plants, if all develop, would take total corn processing into the 8.2- to 8.6-billion-bushel area — assuming processing for non-ethanol uses remains relatively constant," says Robert Wisner, an agricultural economics professor at Iowa State University. "Other uses of corn are currently running at about 8.3 billion. This year's corn crop, with the second highest yield on record, is forecast to be just under 11 billion bushels. The bottom line is that we will need a lot more corn acres in the next few years if most of these plants materialize."

Many of those acres will come out of soybeans and will be continuous corn, Wisner adds, which carries a number of implications for other farm sectors. "Major adjustments will be required by a large part of the agricultural sector, including input firms and retailers, grain handlers, transportation firms, manufacturers of grain bins and handling equipment and livestock-related businesses," he says.

Hard on hog producers

Among those wary of ethanol's potential to devour U.S. corn supplies are hog and poultry producers. The ethanol explosion is "a negative" for them, says Glenn Grimes, professor emeritus of livestock marketing with the University of Missouri-Columbia.

That's because those industries rely heavily on corn for feed. About 10 percent of the nation's corn production is fed to hogs, Grimes says. On the plus side for livestock, ethanol production generates distillers grains (DDG), a high-protein co-product of ethanol that can replace corn in beef and dairy rations, and to a lesser extent in hogs and poultry (see page 22).

Both hog and poultry production are highly vulnerable to feed price increases. "Each 50-cent increase in corn equates to a $2.50 per-hundredweight rise in hog production costs," Grimes says.

The breakeven price for producing live hogs during 2005-06 was $39-$40 per hundredweight, says Grimes. If corn prices should rise from their current $2-per-bushel level to $5 per bushel — not an impossible scenario — that could send hog costs $15 higher, pushing producers out of business.

"With the growth in ethanol production that is planned for the next few years, any kind of short corn crop would mean $5 or higher corn prices," says Grimes. "With crude oil prices and government programs, ethanol plants can pay $8 to $9 and still break even. We'd see drastically lower U.S. hog production long before we hit $8 corn."

Pushing hog producers out of business would remove many more jobs than found in ethanol production, Grimes says. "The number of people involved in producing ethanol from 1 million bushels of corn is much smaller than in raising hogs with 1 million bushels of corn," he says.

Among the results of higher corn prices also would be "significantly higher food prices," adds Grimes.

Another consequence could be a drop in corn exports as producers scramble to fill domestic ethanol orders. That export decline "could be a saving grace for Latin American farmers who have been battered by fierce U.S. competition," writes the Council on Hemispheric Affairs (CHA).

Environmental consequences

Concern over environmental impacts has some observers waving a yellow flag over the alternative fuel's booming development.

About five to six gallons of water are needed for each gallon of ethanol produced, Iowa State's Wisner says. An ethanol plant that produces 100 million gallons of fuel a year will use about 500 to 600 million gallons of water annually. Many areas, including parts of Minnesota, are short on water supplies and have not planned for the high water use of thirsty ethanol plants. "Some areas' water resources will be placed under stress," Wisner says.

What's more, America's corn fields already take up the largest chunk of U.S. farmland, accounting for some 80 million of the nation's roughly 357 million acres of farmable land. To meet escalating demand, corn acreage may have to expand another 3 million acres

Ethanol leaders aware of concerns

Ethanol leaders are aware of the concerns from various farm sectors about the consequences of ethanol's corn-driven needs, says Matt Hartwig, communications director with the Renewable Fuels Association. "We're very cognizant of the limits of how much corn can be used before it has negative impacts on other industries, which we don't want," he says.

With technological advances and improved efficiencies at both the farm and ethanol plant levels, "we'll be able to get increased ethanol production using roughly the same acres as now," says Hartwig.

By 2015, U.S. corn growers will produce 15 billion bushels per year, Hartwig says, based on numbers from the National Corn Growers Association. "We'll be able to produce 15 billion gallons of ethanol, using 5 to 5.5 billion bushels of a 15-billion-bushel crop," he says.

"Ethanol represents one of the, if not the, most important value-added industries for American agriculture," adds Hartwig. "Its positive impact can't be denied." ■

a year, says U.S. Commodities' Roose.

That could mean spreading corn production into marginal land and drawing acreage out of conservation reserve programs. Such acreage expansion is likely if U.S. corn production is to reach the 15 or 16 billion bushels expected for food, ethanol and export needs, say Grimes and Wisner. That could potentially impact soil conservation and wildlife.

Rethinking ethanol policies

What Zelenka and others want is a more carefully thought-out national policy on ethanol. Many would like to see ethanol produced from corn alternatives, such as switchgrass, or corn stalks.

A clear hierarchy for the nation's agricultural resources should be established, Zelenka says. In his opinion, that means a ranking of food, feed and fuel — in that order. Zelenka is not opposed to ethanol, calling its concept "good."

"We've encouraged our members to work more closely with ethanol plants," says Zelenka. "But it's been a real challenge for [grain elevators]. It creates uncertainty when you don't know when the next ethanol plant will pop up. They're thinking, 'Should I build additional storage? Improve my transportation facilities?'"

Open discussion, however, is difficult, says Zelenka. "People are scared to speak out," he says. "The zeal to put these ethanol plants up clouds the realistic picture. It's considered blasphemy if you say anything negative about them."

Too far with ethanol incentives?

Like Wisner, Roose and Zelenka, Grimes recognizes ethanol's positive impact on corn producers. But the University of Missouri professor thinks government incentives for the renewable fuel need to be re-evaluated.

"We do need to wean ourselves from foreign oil, but we're going too far with incentives for ethanol," Grimes says. "With $70 (per-barrel) crude oil, we don't need subsidies to produce ethanol. With $50 crude, we do."

Grimes says Middle East instability points to continued $70 or higher crude oil prices.

"There's no stopping of ethanol plants with the incentives we have or the mandates for more ethanol in our fuel," he says. "The market system itself would be more useful now than policy to promote the use of ethanol."

Ultimately, the future of corn and ethanol may be determined by a combination of market forces and government policy, the system for many crops even now. "Our crops for export, feed and food have always been kept in balance by government programs," says U.S. Commodities' Roose. "It's been a slow migration over the years. But with the new, unprecedented growth in ethanol, the story is yet to be written."

Finding a balance for ethanol in the see-saw world of agriculture could pose a big challenge. The escalating pressure on corn supplies may come down to a matter of national priorities. At some point, the crop's supply and demand could become inelastic, Roose says. In that world of corn scarcity, all corn-related sectors will be fighting to keep their industries alive.

"Whether large or small, grain crops are 80 percent dependent on weather," says Roose. "If we ever get a dramatically reduced crop as we did in 1983, '88, '93 and '95, we're going to have to ask, 'What gives?' or, more to the point, 'Who gives?'" ■

USDA chief economist's ethanol outlook

USDA Chief Economist Keith Collins addressed key ethanol-related issues in a statement before the U.S. Senate Committee on Environment and Public Works on Sept. 6. Following is a brief excerpt. For more on each of these points and Collins' other comments, visit: www.usda.gov/oce.

- Gasoline and ethanol prices are likely to stay high enough over the next several years to maintain ethanol expansion.
- Corn ethanol returns are such that plants can remain profitable over a wide range of corn prices.
- Corn prices could set new record highs over the next five to six years.
- Ethanol plants will likely continue to operate even if corn prices rise well above past record highs. Ethanol plants will be able to bid corn away from a variety of other uses over a wide range of corn prices.
- The United States will need substantial increases in corn acreage to prevent exports from declining and livestock profitability from falling.
- The Conservation Reserve Program (CRP), which has 36 million acres set aside from crop production for environmental reasons, may provide a source of additional crop acreage.
- It is likely other exporters (such as Brazil and Argentina) will have to supply more corn to the world market as world meat demand rises and U.S. corn ethanol production increases.
- Corn stocks are likely to be increasingly tight and corn prices high, so the corn sector will be highly vulnerable to market disruptions — ethanol plants and other users will be operating in a much riskier environment than we have today.
- Corn ethanol alone cannot greatly reduce U.S. dependence on crude oil imports.
- Cellulosic ethanol production appears to be the best renewable alternative for reducing crude oil imports.
- Ethanol growth is manageable in the near future. Markets will work over the longer term, but the allocation function of market prices can mean substantial costs for some sectors . . . . ■

Bring It on Home

Local ownership of renewable energy helps 'keep it on the farm'

Alan Borst, Ag Economist
USDA Rural Development,
Co-op Programs

Food, fiber… and now fuel. In the 21st century, U.S. farmers are challenged to meet the country's needs not only for food and fiber, but also for much-needed renewable energy. An important policy question to be answered is: Who will have ownership of the facilities that will produce energy from rural Americans' wind and crops?

According to the Renewable Fuels Association, 46 of 102 U.S. ethanol plants are farmer owned, with a capacity to produce 1.6 billion gallons of ethanol. Total U.S. ethanol capacity is 4.4 billion gallons, giving producer-owned plants a 39 percent share of the market (for a complete list, visit: http://www.ethanolrfa.org/industry/statistics/#EIO). According to the National Biodiesel Board, as of April 2006 there were 65 U.S. biodiesel plants in operation with a total production capacity of 395 million gallons (for the list, visit: http://www.biodiesel.org/buyingbiodiesel/producers_marketers/ProducersMap-Existing.pdf).

Producer-owned ethanol plants, such as Mid-Missouri Energy, return an average of 56 percent more income to local communities then do plants owned by absentee investors, according to a new National Corn Growers Association study. USDA photo by Dan Campbell

Growers and local residents have been investing in ethanol and biodiesel plants across the country to share the market with larger agribusinesses. Many of these ventures have been very profitable over the past few years. This has attracted much outside investment in competing plants.

In 2004, less than 1 percent of installed U.S. wind energy capacity was owned by farmers. Most farmers with wind turbines on their property have leased their land to larger energy companies. Where farmers own the turbines, they may expect to double or triple their income over leasing. The "Windustry" website lists 52 farmer-owned U.S. wind projects, most individual and quite small (http://www.windustry.com/maps/CommunityDatabaseApril272006.pdf).

In the case of both biofuels and wind, greater farmer ownership implies both the potential for greater profits and the risks of greater losses. One challenge that has confronted rural Americans considering such a venture has been the question of how to organize it — selecting the best business model to follow.

There is a large matrix of U.S. public policies and programs at all levels of government that acutely influence the potential and actual economic performance of farmer-owned energy ventures. The way in which these policies and programs are designed and implemented can make or break the best designed renewable energy ventures.

Why promote local ownership?

In the European Union, where a much larger share of energy is generated from local renewable sources, the promotion of local energy investment has been a major policy goal in recent years. Predac, an EU network of 23 energy organizations from 10 countries, has identified four arguments for favoring local ownership of renewable energy sources. Here is an adaptation of their list for the American setting:

- **Share the economic benefits of renewables.** When project financing comes from a few large investors from outside the project area, profit flows away. Local investment allows rural residents to retain a greater share of the earnings. A September 2004 U.S. Government Accountability Office report modeled the relative economic impacts of locally owned and remotely owned wind systems. It found that locally owned wind systems generated an average of 2.3 times more jobs and 3.1 times more local dollar impact than do wind systems financed by out-of-area interests.
- **Support economic development in rural areas**. In regions where agriculture or traditional industries are declining, renewable energy source projects offer an opportunity to diversify economic activities by a production that cannot be transferred elsewhere.
- **Improve local acceptance of renewable energy projects.** Some renewable energy source projects face local opposition, including wind energy, which unavoidably modifies the landscape. Local investment is likely to reduce the risk of a strong opposition by allocating more benefits to those people who actually or potentially endure the drawbacks.
- **Play an educational role.** Local investment can play a significant educational role by increasing the number of people directly and indirectly involved in projects, and thus the public awareness of renewable energy. By creating social links in the framework of a local project, it can also promote the emergence of new local projects through exchanges about the initial one.

Local ownership of ethanol plants keeps more value-added dollars in rural towns, such as Marshall, Mo. (also see cover story, page 4). From top: the Waggin' Wheel Cafe in Malta Bend (near Marshall) saw business soar with the construction of the new Mid-Missouri Energy ethanol plant; the street circling the county courthouse in Marshall gets a new "overcoat"; new home construction in Marshall. USDA Photos by Dan Campbell

Federal policies to promote greater local energy ownership

There is one major federal program specifically targeted at promoting farmer and rural small business ownership of renewable fuel facilities through grants and loan guarantees: USDA Rural Development's Renewable Energy Systems and Energy Efficiency Improvements Program. It was authorized by Section 9006 of the 2002 Farm Bill. The program authorizes loans, loan guarantees and grants to farmers, ranchers and rural small businesses to: (1) purchase renewable energy systems, and (2) make energy efficiency improvements.

In August 2006, USDA announced the awarding of $17.51 million in Section 9006 Grants to 375 recipients in 36 states. The grant program complements the Bush Administration's overall effort to increase America's energy independence through the development of renewable energy resources as well as improving efficiency of existing systems.

USDA Rural Development grant funds can be used to pay up to 25 percent of the eligible project costs. Additionally, the program provides loan guarantees of up to $10 million to fund up to 50 percent of eligible projects. Eligible projects include those that derive energy from a wind, solar, biomass or geothermal source, or hydrogen derived from biomass or water using wind, solar or geothermal energy sources.

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Studies: farmer-owned ethanol plants contribute more to local economies

Two recent reports stress that producer ownership of biofuels plants does far more to stimulate the rural economy than do plants owned by absentee investors.

The National Corn Growers Association (NCGA) study — "Economic Impacts on the Farm Community of Cooperative Ownership of Ethanol Production" — concludes that: "Since a farmer-owned cooperative ethanol plant is literally a member of the community, the full contribution to the local economy is likely to be as much as 56 percent larger than the impact of an absentee-owned corporate plant." John Urbanchuk of LECG, LLC, conducted the analysis.

The Institute for Local Self-Reliance (ILSR) has also issued a report that urges the U.S. Department of Energy to change what it terms a "piecemeal approach" to commercializing ethanol from cellulose and develop a comprehensive strategy that emphasizes a local, producer ownership. "The future of American agriculture may depend on this," says David Morris, ILSR vice president and author of "Putting the Pieces Together: Commercializing Cellulosic Ethanol."

Keeping profits at home

In many ways, the economic impact of farmer-owned and absentee-owned ethanol plants on the local community is similar, the NACG study points out. Yet, there are two important differences that significantly increase the impact of a farmer-owned plant:

- The share of expenditures for operations of a farmer-owned plant derived in the local community is likely to be larger than that of an absentee-owned plant. For example, virtually all accounting, administrative and marketing functions will be provided locally, while these functions may be centralized off site for an absentee-owned plant.
- Farmer-owners of a cooperative or limited liability corporation (LLC) ethanol plant will participate in the profits through dividends. Dividends paid to farmer-owners represent additional income that is spent and invested largely in the local community, according to the study.

Most absentee-owned facilities are owned by centralized agribusiness corporations.

"By putting money directly into the pockets of local residents, farmer-owned ethanol plants have spurred economic growth in rural communities across the country," said Bruce Noel, chairman of the NCGA Ethanol Committee. "When farmers and other local investors are given the opportunity to participate in the ownership of ethanol plants, the economic benefits to the community are magnified enormously."

Nearly half of all ethanol plants are owned and operated by farmer cooperatives or LLCs and account for 38 percent of total ethanol production. However, during the past two years there has been substantial influx of non-farmer capital into the ethanol market. According to the Renewable Fuels Association, only two of the 43 ethanol plants under construction are majority farmer owned.

"It's unfortunate that there currently aren't more opportunities for farmers and other locals to invest in the plants being constructed in their communities," Noel said. "With locally owned plants, the profits stay in the community and that discretionary income is what truly facilitates rural development."

"Any ethanol plant — regardless of who owns it — is good for corn farmers and good for the U.S. economy," Noel said. "But if you're talking about the effects on the local economy and farm income, ownership matters. Those plants that are farmer-owned undoubtedly have a more pronounced impact on the local economy."

ILSR sees gains from farmer ownership

Congress made clear in the Energy Policy Act (EPAct) that its focus was on farmers and rural development, Morris stressed, adding that Congress required that projects "demonstrate outstanding potential for local and regional economic development." In addition, EPAct requires that a priority be given to projects "that include agricultural producers, or cooperatives of agricultural producers, as equity partners in the ventures; and...have a strategic agreement in place to fairly reward feedstock suppliers."

The ILSR report proposes that DOE's strategy take into account a key element of the Energy Policy Act: a mandate for 250 million gallons per year of cellulosic ethanol by 2013. ILSR argues that the various incentives contained in the Act — direct grants, loan guarantees and direct purchasing — will not significantly accelerate that time line. Therefore, ILSR has urged DOE to use the EPAct's resources to achieve its qualitative goals: maximizing the benefits to the nation's farmers and rural communities.

"Given the mandate, the country will achieve EPAct's quantitative goals regardless of what DOE does," says Morris. "On the other hand, the future structure and prosperity of American agriculture may well depend on how DOE and USDA craft their biofuels strategy."

"Will we have over 1,000 farmer-owned bio-refineries, allowing virtually all full- time farmers in the country to directly benefit from the coming age of biofuels?" Morris asks. "Or will future agriculture look the same as current agriculture, with millions of small producers selling to a handful of dominant processing companies?" ■

From Grass to Gas

On the road to energy independence, how soon will cellulosic ethanol be a factor?

By Anthony Crooks, Ag Economist
USDA Rural Development

Our nation used more than 140 billion gallons of gasoline last year and imported about 60 billion from the Middle East. The 4.3 billion gallons of fuel ethanol produced largely by our nation's farmers was a good start toward extending the nation's fuel supply, but really is just a baby step.

"America is addicted to oil," President Bush stressed in his State of the Union Address, during which he outlined the Advanced Energy Initiative (AEI) to address this serious problem. "We will increase our research in better batteries for hybrid and electric cars, and in pollution-free cars that run on hydrogen. We'll also fund additional research in cutting-edge methods of producing ethanol, not just from corn, but from wood chips and stalks, or switchgrass. Our goal is to make this new kind of ethanol practical and competitive within six years." For more on the AEI, visit: http://www.whitehouse.gov/news/releases/2006/05/20060524-4.html.

Speaking at a Senate Foreign Relations Committee meeting in June, former Federal Reserve Chairman Alan Greenspan said: "Corn ethanol, though valuable, can play only a limited role, because its ability to displace gasoline is modest at best. But cellulosic ethanol, should it fulfill its promise, would help to wean us off our petroleum dependence."

Advocates of cellulosic ethanol have been saying its day would arrive "within the next five years" since the mid-1990s. But this time they just may be right. They too were encouraged by President Bush's remarks. And while everything turns on oil prices, rising oil prices encourage new technologies by making them economical — including, perhaps, cellulosic ethanol within five or six years.

Is industry heading to cellulose?

Cellulosic ethanol is fuel ethanol made from cellulose, the inedible fiber that forms the stems and branches of plants. As the main component of plant cell walls, cellulose is the most common organic compound on earth. Crop residue (corn stover, wheat straw and rice straw), wood waste, and even municipal solid waste are sources of cellulose. High-biomass dedicated energy crops — think of President Bush's reference to switchgrass in his State of the Union Address — are also promising cellulose sources that can be produced in many regions of the United States.

Switchgrass is noteworthy for ethanol production because of its potential for high fuel yields, hardiness and ability to be grown in diverse areas. Trials show current average yields to be about five dry tons per acre. However, crop experts say that progressively applied breeding techniques could more than double that yield. Its long root system helps to make switchgrass drought-tolerant, growing well even on marginal land, and it requires little to no fertilizing. Its expected ethanol yield ranges from 60 to 140 gallons per ton; with typical yields in the 80-to-90 gallon range.

The potential energy from cellulosic ethanol is significant. A recent study estimates that a gallon of ethanol produced from corn provides about 20,000 Btu (British thermal units) more energy than the energy that went into making it. The net gain from cellulose, however, from a crop such as switchgrass, which doesn't require fertilizer, irrigation, or other energy-intensive activities, is triple that of corn, about 60,000 Btu per gallon. Not only that, but an acre of land planted in switchgrass can produce four times the cellulosic material as can land planted to corn.

Cellulose is among the most undervalued and underused energy assets in the United States. The Natural Resources Defense Council recently reported that by 2030, cellulosic ethanol could supply half of U.S. transportation fuel needs without reducing food and animal feed production.

Painting courtesy Jean Accola, www.accolagallery.com

Moreover, the unrealized potential of industrial biotech, completely apart from ethanol, is astonishing. Once plant sugars become abundantly available, any number of substances that now contribute to our "oil addiction" may be replaced with sugar molecules.

But before dedicated crops such as switchgrass and miscanthus (a tall grass) are planted for cellulosic ethanol production, an abundance of annually generated crop residue is available for conversion. Right now, ethanol, blended into gasoline, accounts for only about 2.5 percent of the nation's fuel supply. The potential from forestland and agricultural land, the two largest sources for biomass, exceeds an estimated 1.3 billion dry tons per year. That's a cellulosic ethanol replacement equivalent of about 30 percent of the demand for gasoline without affecting food production.

Switchgrass (left) may have even more potential than corn as a source for ethanol. Miscanthus grass (above) is also being researched as a potential cellulosic energy crop. Photo courtesy Steve Long, University of Illinois

Ethanol in the United States is made primarily from the sugar that makes up the starch in corn. Ethanol manufacturers process the corn kernel using enzymes that break down the starch into simple sugars. Those sugars are then fed into a fermentation tank, where yeast digests them to produce ethanol. The corn stalk and leaves, actually about half of the plant material, is disposed of.

Ethanol from cellulose is more complicated because cellulose forms a more complex chain of sugar molecules (6-carbon sugar molecules, a.k.a. C6) than those from corn starch (5-carbon molecules, C5). Breaking down cellulose into fermentable sugars for ethanol production therefore, requires a "pretreatment" process to open the cellulosic structure in order for conversion to occur.

Ready for commercialization?

One of the keys to progress has been to reduce the cost of converting cellulosic materials into fermentable sugars. The Department of Energy's National Renewable Energy Laboratory (NREL) has partnered with private biotech companies to make important advances in conversion technology.

Novozymes, a biotech company based in Denmark with operations in the United States, began collaborative research with NREL in January 2001 to cut the cost of converting corn stover into sugars for the production of ethanol. Recently, the two partners announced a monumental achievement — a 30-fold reduction in the costs of the enzymes needed to produce ethanol from cellulosic sources. Now costing between 10 – 18 cents per gallon in laboratory trials, enzymes are no longer an economic barrier to the commercialization of cellulosic ethanol.

NREL has also partnered with other firms to make improvements in pre-treatment technology. But the industry is only at the earliest stages of commercialization. There are still many technical hurdles to be overcome to make cellulosic ethanol production commercially competitive. Recent spikes in oil prices and energy policy initiatives help to encourage the continuation of research and development. Developments may have come piecemeal, but at least they are now in place. The key is to integrate the pieces into an economically competitive process and commercialize it.

Iogen Corporation, headquartered in Ottawa, Canada, the only company in North America operating a stand-alone, demonstration-scale, 1-million-gallon-per-year (1 MMGY) plant, is planning its first full-scale facility to produce ethanol from cellulosic biomass sources. Drawing on its partnership with Novozymes, Iogen has formulated an enzymatic "cocktail" that can break down wheat straw into sugars that can be transformed into ethanol.

EcoEthanol™ is the patented name of Iogen's cellulose ethanol process which uses enzymatic hydrolysis to convert the cellulose into sugars.

Executive Vice President Jeff Passmore said the effort has been a painstaking exercise in going back and forth between developing the enzymes and scaling up the process to industrial levels. But with support from its partners — Royal Dutch Shell, Volkswagen AG, the Canadian government and a recent commitment of $30 million from Goldman Sachs (representing a combined investment of more than $130 million) — Iogen hopes to build the world's first commercial-scale cellulosic ethanol plant.

The company is considering sites for the facility in Idaho or in Canada, and has met with Idaho farmers to ensure they can contract enough wheat and barley straw to make that location feasible. In Idaho, 320 farmers stand ready to supply the 500,000 tons of straw for the proposed plant. (See *Rural Cooperatives*, Jan/Feb '06.)

Iogen officials say the proposed plant could produce between 40 million and 50 million gallons of cellulose-based ethanol annually and would add a considerable revenue stream to the local area for the straw feedstock required. Although the plant's size is relatively modest by today's standards of 100 – 200 MMGY, its price tag certainly isn't. Because cellulosic ethanol requires not one but three processing facilities — an ethanol distillery, a pretreatment facility and a power generation plant, Iogen's commercial-scale enterprise is expected to cost from $350 to $400 million, or roughly six times the cost of a corn (dry mill) ethanol plant of the same scale.

To finance such a formidable undertaking may require a shared risk/investment arrangement among Iogen, its present partners, and the U.S. federal government (DOE and USDA). A federal grant of as much as $80 million and a guaranteed loan to hedge against the risks associated with unproven technologies were provided specifically for cellulosic ethanol plant development in the Energy Policy Act of 2005.

But, despite its substantial upfront costs, the plant's day-to-day operating costs are expected to be about the same as, or even a bit less, than an equivalent corn plant. Furthermore, a cellulosic plant has a number of alternative co-products and potential revenue streams that would otherwise be unavailable to a corn dry mill. In addition to ethanol and alcohol, fertilizers, acids, ultra-high-quality sugars, and other products may also be produced or sold to help recover the higher capital outlay. The plant will have its own power generator fueled by a waste material of the pretreatment processor, called lignin, to offset its energy costs.

Technological revolution or evolution?

Cellulosic ethanol production may one day dominate the renewable fuels industry. A recent study called for CE to completely replace U.S. oil imports (around 50 billion gallons) by the year 2050. Until that day, emerging CE facilities will compete alongside corn dry mill plants.

But what if instead of a dichotomous path of development, CE on one side and grain-based ethanol on the other, the industry developed along an integrated path where grain-based plants included technologies to process the whole corn plant?

Three of the larger ethanol companies are betting that the future of cellulosic ethanol will follow this evolutionary path instead of a wholesale revolution. Abengoa Bioenergy, Broin and Co. and DuPont are developing processes that will help to integrate cellulose conversion technologies into their existing dry mill ethanol plants. Each company is involved in a formalized Research and Development Agreement with U.S. DOE to push its respective technologies along.

Abengoa Bioenergy

Abengoa received a $10 million DOE grant to develop a next-generation dry mill corn ethanol plant. The $17.7 million project is titled "Advanced Biorefining of Distillers' Grain and Corn Stover Blends: Pre-Commercialization of a Biomass-Derived Process Technology." The project involves a partnership of Abengoa-owned High Plains Ethanol in York, Neb., Novozymes North America Inc., VTT-Finland and the NREL. The project goal is to develop and demonstrate an integrated biorefining process which includes the fermentation of both pentose (C5) and glucose sugars (C6). Such an ambitious undertaking involves two significant steps:

- Step 1 — Optimization of the dry mill technology. Abengoa built a starch pilot facility in York two years ago to optimize the production of ethanol from cereals: corn, wheat, barley and sorghum.
- Step 2 — Development of a biomass fractionation system. Abengoa is building a second pilot plant (also in York) which it expects to be up and running by fall 2006 and will use corn stover as its feedstock.

The twin York facilities are expected to mimic what Abengoa is demonstrating with its enzymatic hydrolysis technology on a larger scale in Spain. In a partnership with Ebro Puleva and the European Union 5th Framework Programme, Abengoa's 2 MMGY biomass commercial demonstration facility uses wheat straw and is co-located with a starch plant in Salamanca with the two sharing utilities and support systems. However, just as with the Iogen wheat straw demonstration facility in Canada, the plant in Spain will not ferment the pentose (C5) sugars and glucose (C6) sugars simultaneously. Only glucose (C6) from the cellulose hydrolysis will be fermented into alcohol. The pentose-laden residue will be mixed with animal feed and incorporated into other studies.

Broin's efforts

Before this next-generation plant will be capable of producing ethanol from the entire corn plant, it must first produce ethanol from the whole kernel — both starch (the only portion currently utilized for ethanol) and the residual fiber (what is now the distillers grains). Converting the residual fiber requires processing with cellulose enzymes. The application of cellulosic technology could dramatically increase the ethanol yield of the nation's more than 100 existing dry-mill ethanol facilities.

NREL collaborates with Broin and Associates Inc. of Sioux Falls, S.D., on a $5.4 million project entitled "A Second Generation Dry Mill Biorefinery," to separate bran, germ and endosperm from corn kernels prior to making ethanol from the remaining starch. Trademarked as BFrac®, the technology is expected to be merged with cellulosic technologies.

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Keep on Truckin'

Ethanol boom creates transportation challenges

By Stephen Thompson, Assistant Editor

Ethanol producers are having little trouble finding buyers for their product, but getting it to market can be another matter. As the ethanol market matures, the availability of economical transport may make the difference between long-term profitability and failure.

Transportation infrastructure in the United States is meeting the needs of the ethanol market, but increasing volumes are creating challenges. Rail companies are scrambling to meet demand, but until new capital investments are in place, ethanol shippers may have to deal with a squeeze in the next few years.

Transport by truck is an economical option for short hauls — up to about 500 miles from the producer. Trucks have the advantages of being easy to obtain, offering operational flexibility and requiring lower expenditures for loading facilities than other modes of transport.

Currently, for short distances, there are few problems with using trucks, aside from possible local infrastructure deficiencies. However, for long distances, truck transport quickly becomes too expensive.

Problems with pipelines

Pipelines are by far the most efficient and cheapest way to move large amounts of liquid, costing only about a third of transport by rail or barge. According to the Association of Oil Pipe Lines, there are 95,000 miles of pipelines in the United States for transporting refined petroleum products — by far the most extensive such network in the world. About 70 percent of petroleum in the United States is moved through pipelines.

But piping ethanol poses problems.

A typical pipeline carries a number of different kinds of petroleum products. A pipeline might ship several thousand gallons of high-octane gasoline, followed by a similar amount of lower octane gasoline, followed by a shipment of diesel fuel.

With nothing between the shipments to keep them apart, portions of each mix with the shipment ahead and behind. When the product reaches its destination, the mixed high- and low-octane gasoline can be sold as part of the lower-grade shipment, but the mixed diesel and gasoline must be set aside and re-refined into the discrete products.

Unfortunately, shipping petroleum products leaves deposits in the pipes — deposits that ethanol — with its higher solvent properties — can dissolve, contaminating the shipment. Water can also get into pipelines. Petroleum products don't mix with it; but ethanol is hydroscopic: it blends with water. As a result, with ethanol, instead of re-refining only a small part of the shipment, it may be necessary to re-refine all of it — or even discard some as hazardous waste.

Shipping ethanol in an E-10 blend with gasoline might seem a solution. However, water in the line can actually "strip out" the ethanol, again making it necessary to re-refine the entire shipment. Ethanol is also said to cause corrosion in pipelines, a problem that is still being studied.

Even if these factors are overcome, there's still another, more basic problem: most existing pipelines simply don't run in the right directions.

Transportation cost — both for procuring grain or oilseeds and shipping biofuel — is a major factor influencing the profitability of ethanol and biodiesel. USDA photo by Ken Hammond

Wrong direction

Pipelines for refined petroleum products tend to run from the south — from refineries on the Gulf Coast — to markets in the north, including the Midwest, where most ethanol is produced. Crude-oil pipelines also supply Midwest refineries from the Gulf.

Although gasoline mixed with ethanol can be shipped from these refineries to limited regional markets, there still remains the problem of getting the ethanol to the refineries.

For shipment to the larger, coastal markets, the pipelines just aren't there. This is particularly true on the West Coast and the huge California market. The Pacific coast has a pipeline supply network separate from the rest of the country.

About 55 percent of its supply of crude oil comes from Alaska — shipped in tankers from Valdez to ports such as Los Angeles and Anacortes, Wash. The rest is produced mostly in California, which also refines its own petroleum products.

How about dedicated pipelines? At the moment, there just isn't enough ethanol volume to justify the huge capital expenditures required for a long-distance ethanol pipeline to any market. However, local pipelines linking ethanol plants in high-density areas, such as Iowa and Minnesota, with rail terminals are a distinct possibility.

Some authorities think that ethanol pipelines may become feasible if the use of E-85 becomes widespread. Bob Reynolds, of ethanol-consulting firm Downstream Alternatives Inc., thinks that if E-85 is mandated in the Northeast, a dedicated ethanol pipeline from the Midwest to the petroleum hub in Albany, N.Y., could be built.

However, the huge capital expenditure — $1 million to $2 million per mile for a small-diameter pipeline — could lead to a chicken-or-egg situation, in which politicians would be unwilling to establish such a mandate without a reliable ethanol supply, and investors would be reluctant to put up the money without such a requirement.

With pipelines not currently feasible, there are two practical methods of long-distance shipment: rail and barge.

Rollin' on the river

Barges move about 800 million tons of freight a year, about 15 percent of the national total. They transport about 70 billion gallons of petroleum annually. Barges offer cost-effective transportation to refineries on the Gulf Coast and can be used in "intermodal" service — combining different modes of transportation to achieve higher efficiencies.

But there are limitations. The first is proximity of water transport to the ethanol source. Ethanol can be transported by rail to barge terminals and transshipped, but that adds to cost.

The second obstacle is the need for modernization of locks on the upper Mississippi River. Current locks are too small. That means that barge combinations — called "tows" — from the upper Midwest must be broken up to traverse each lock, and then reconstituted below. This can cause bottlenecks, and industry experts say that if the locks are not modernized soon, increased traffic will cause barge transport costs to rise substantially, also putting upward pressure on rail prices.

The availability of sufficient numbers of barges is a concern also, as is the freezing of waterways in the winter.

The attractiveness of water transport will depend on the circumstances facing each ethanol producer: what markets it wishes to ship to and the relative costs of different transportation modes.

Rail tankers are loaded at the Mid-Missouri Energy ethanol plant, which ships out about half of its production via rail. USDA photo by Dan Campbell

Riding the rails

Railroads moved 6 million tons of ethanol in 2004, the most recent year for which figures are available. That's a tiny fraction of the total rail tonnage of more than 1.5 billion tons. Rail carriers are currently meeting the demand for ethanol transport.

However, a sharp rise in general rail traffic over the past six years is straining capacity. With 37 new ethanol plants under construction and a 50-percent increase in production coming in the next few years, possible bottlenecks threaten serious delays in the short term.

Midwest cooperatives requiring transport for grain have been complaining for years about shortages of hopper cars and the railroads' failures to meet their needs. For their part, the railroads

are spending billions of dollars on upgrading their capacity.

The best way to move bulk cargo by rail is in dedicated "unit trains," made up of a single cargo. This avoids the delays and costs associated with mixed-cargo trains. The quicker a tank car can reach its destination, be unloaded and return, the more capacity it can carry over time and the quicker it can pay for itself (rail tank cars are usually owned or leased by the producer).

An ethanol producer shipping a few carloads at a time in mixed trains can expect to see its shipments delayed in marshalling yards as trains are assembled, and possibly delayed again along the way as the cars are switched between trains before reaching their final destination.

A unit train avoids such problems. Made up of about 95 tank cars, it shuttles between terminals. With each car holding 300,000 gallons, a unit train can carry 28.5 million gallons of ethanol. Taking current turn-around times of about six weeks into account, this means that a plant producing 120 million gallons per year could keep one unit train busy.

Smaller-capacity plants have to share trains. To make the unit-train system work efficiently, there must be a system for consolidating tank cars from various plants into the unit train, and a dedicated receiving terminal at the far end.

One such terminal is the Lomita Rail Terminal in Carson, Calif., owned by U.S. Development Corporation. Inaugurated in August 2003, Lomita is a huge facility capable of unloading 95-car ethanol unit trains in 24 hours. It is connected by pipeline to a blending facility that is part of a nearby Shell Oil receiving station for petroleum tankers, and is capable of meeting the ethanol demand for the entire Los Angeles Basin. Other terminals have been built in Albany, N.Y., Chicago and other major transportation hubs.

The Lomita terminal is served by the Burlington Northern and Santa Fe Railway Co. (BNSF), which runs unit trains under the trademark Ethanol Express. According to BNSF, one Ethanol Express originates in the Midwest headed for Lomita every three days. BNSF recently ordered 30 new locomotives to meet growing demand.

Unlike other carriers, BNSF has reportedly managed to provide a consistently good level of service to ag producers, apparently due in part to early strategic investments in infrastructure.

Limited options

Like grain co-ops, ethanol cooperatives that find themselves dependent on a single major rail carrier can find their options limited. This is true not only if the carrier is having problems meeting its obligations, but also in choices of destination and in negotiating favorable shipping rates.

Some short-line railroads, such as Iowa Northern Railway Co., are seeking to fill a niche market by providing connections with more than one major carrier. Northern Iowa is also offering to consolidate cars on its own lines, instead of in the switching yards of major carriers, claiming that it can save producers time. In addition, the railroad proposes a new switching yard financed in part by ethanol producers, to save even more time.

One bottleneck is a shortage of railcars: the sudden rise in demand has left manufacturers with a year-and-a-half backlog of orders for ethanol tank cars. New manufacturing facilities are being built, but shortages will persist for the next few years due to the continuing steep rise in ethanol production.

Rail is also an attractive option for shipping dried distillers grains (DDG). Because DDG is lighter than corn, larger hopper cars can be used. Some producers are exploring the use of shuttle systems, with incoming cars carrying corn and outgoing cars hauling DDG to feedlots in the same areas in which the corn originated.

Carriers adapting

It takes time for a new industry to reach top efficiency, and ethanol transportation is still being developed. Today it takes 24 to 36 hours for ethanol trains to offload and turn around — in contrast to coal trains, where operations have been refined for decades and which can be emptied in about six hours.

As carriers adapt, kinks will be ironed out. Extra rail side lines are being built, or planned, to deal with increased traffic. Production of rail tank cars should catch up to demand. And transport costs should eventually drop as more efficient methods are discovered. ■

Barges ship about 70 billion gallons of petroleum annually. Many ethanol producers are also shipping by barge, but there is a backlog on barge orders, which may take several years to clear, according to the Renewable Fuels Association.

Measuring the gains for distillers grains

By Anthony Crooks, Ag Economist
USDA Rural Development, Cooperative Programs

The development of distillers grains as a valuable co-product for animal feed has been instrumental to the growth of the fuel-ethanol industry. If ethanol maintains its current pace of expansion, as much as 17 million tons of distillers grains will be generated annually by 2012. That level could rise to as high as 25 million tons by 2016.

Along with that growth in volume, pressure mounts to find a home for this co-product of ethanol (see figure 1), which is largely the protein that remains after the starch content is removed from corn in the distilling process. Sheer volume, favorable prices and the growing quality of distillers grains are expected to encourage nearly every major livestock producer and feed manufacturer to pursue ways of further using this feed.

Revenue from the sale of distillers grains once comprised about one-third of the average ethanol facility's total revenue. However, two spikes in the price of oil, the Energy Bill and soaring ethanol markets have combined to lift ethanol income so much that those distillers grains now comprise a significantly smaller percent of their revenue, on average.

Not that plant managers are complaining about today's circumstance. After all, it's really a reflection of some exceedingly favorable ethanol market conditions, and no one truly expects this environment will last forever. However, if distillers grains are to again return to a greater portion of the revenue portfolio, an increasing diligence by plant managers to ensure a consistent, high-value product will be required. There is a real possibility that the U.S. livestock-feeding industry may ultimately approach market saturation for consumption of distillers grains.

Sale of dried distillers grains to the livestock industry is a major component of ethanol plant profitability. USDA photos by Dan Campbell

From price takers to makers

In the days when ethanol cost a dollar per gallon, plant managers would have been proud to receive 10 percent of their plant's revenue from distillers grains. Plant managers were often confronted by livestock feeders whose opening bid was: "I shouldn't even have to pay for this stuff; you're

making ethanol." Indeed, frequently the best offer was: "I'll pay the freight to haul it off. And that's it."

The situation was almost dire in the beginning. Livestock feeders had the upper hand because they understood that wet distillers grains had to be moved quickly (in less than three days) or it would spoil. Feeders recognized the pressure that plant managers were under to sell, so they would show up on "day two" and "graciously" offer to take the product off the premises.

The first real technological development for distillers grains was the use of driers to extend the product's shelf life and to improve its consistency. Managers then set a goal to keep the dryers going and never make another pound of wet feed that wasn't pre-sold.

A few of the early plants were fortunate enough to have Farmland Industries as one of their investors. Farmland's feed division not only helped to market the co-products but, more importantly, sponsored research and conducted its own studies on how best to make and use distillers grains. Farmland's feed division has since been merged into Land O' Lakes Purina Feeds, which continues the research in its own facilities and is working with land-grant universities in the Corn Belt.

Co-product research and development by universities and private corporations significantly enhanced the nutritional and market value. Researchers at the University of Minnesota, Iowa State University and the University of Nebraska served not only to expand existing markets for distillers grains among ruminants (dairy and feeder cattle), but also performed groundbreaking work to develop new markets among single-stomach species such as swine and poultry.

Feed inclusion rates for distillers grains are presently as high as 40 percent for cattle, 25 percent for swine and 5 percent for poultry. It is expected that these levels could increase another 5 to 10 percent.

The DDG-loading area at the Northeast Missouri Grain ethanol plant in Macon, Mo.

Much more than an afterthought

So, far from being an afterthought, distillers grains grew to become a significant component of a plant's revenue stream. And that progress was critical to the development of the entire industry.

University-trained nutritionists began working with the plants to help market the feeds in the early 1990s. Over time, with more volume and a higher consistency, the plants developed a track record for the products' feed value.

After years of research and a number of technological developments (and a lot of education), feeders learned the nutritional value of distillers grains with a high level of precision: it equals from 120 to 135 percent of the nutrition of corn in the feed ration. As the corn's starch is removed to manufacture ethanol, the corn's protein level is raised in the co-product.

Because nutrients are available in many different ingredients, livestock producers incorporate distillers grains into the ration simply as it makes economic sense to do so. As such, distillers grains compete with all other feeds and feed ingredients in terms of nutritional content, energy and cost per unit. And because distillers grains are discounted relative to corn (despite having a higher nutritional value), feeders look for ways to include (substitute) more of it into their ration.

The development of linear programming (LP) models and other computer applications for blending feed rations at the least-cost (subject to minimum nutritional requirements) contributed greatly to the inclusion of distillers grains. These models provide the relative contribution of a particular feed ingredient — distillers grains, for example — given its price. Virtually every feed manufacturer and seller has an array of computational tools to determine the optimal available feed ration, subject to price and nutritional specifications for the region's cattle, swine and poultry.

With these tools, a marketer or feed seller can demonstrate to the producer the true value of including distillers grains (or any particular feed ingredient) into the ration by how it affects the bottom line. As the managers of these models, nutritionists have become the industry's gatekeepers of distillers grains market value.

The path forward: challenges, opportunities

As the ethanol industry grows, sufficient volumes of distillers grains will be

manufactured to develop a consistently reliable supply at the local, regional and, ultimately, the national and even international levels. Between then and now, however, a few market-limiting issues must be resolved, including:

- **Flowability** — High temperatures and humidity can sometimes cause the most commonly produced distillers grains product, distillers dried grains with solubles (DDG), to stick together and harden into something resembling a fine-grain concrete. The caking problem was so severe that air hammers were used to extract the DDG from railcars. Rail carriers — understandably upset to see their cars damaged by the air-hammer unloading — prohibited plants from using their cars to ship DDG. Having no option but to purchase or lease railcars dedicated to DDG transport put an otherwise unnecessary financial and logistical burden on the ethanol plants. It added about $6 per ton to the cost of shipping, or about $39 million a year industry-wide. Several preventive products are being developed to improve DDG flowability, mostly with mixed results. The industry is still searching for better solutions to this, its biggest obstacle. Opportunities for expansion into international markets, such as Mexico and Asia, are compelling reasons for the industry to resolve these DDG flowability challenges.
- **Movement toward standardization** — An industry-wide push for more consistent color, palatability, nutrient content, particle size and flowability of the product is opening doors to markets previously unimagined. In concert with its effort for consistency, the industry is developing a set of standardized definitions for distillers grain products along with standards for quality and testing. The Renewable Fuels Association (RFA) and the American Feed Industry Association (AFIA) have taken the lead and are working together to reconcile and resolve the numerous ways that distillers grains are now tested and so that nutritionists may soon have something that approaches a single standard.

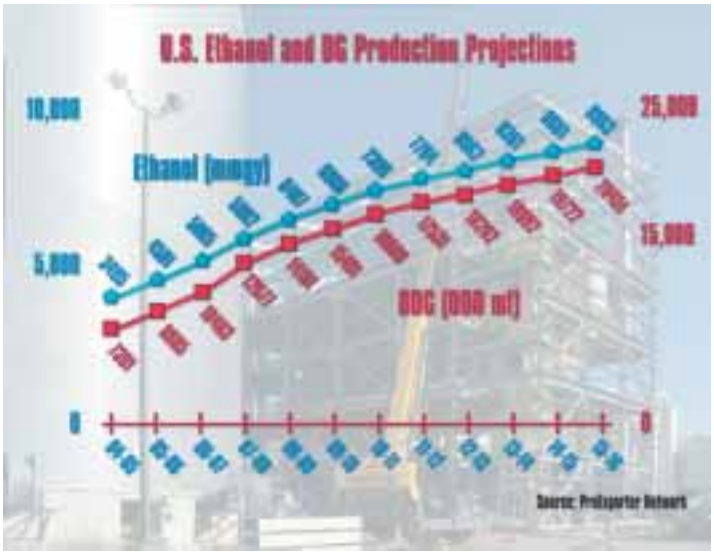
- **Export opportunities** — There is sufficient domestic demand to consume the potential 7 million metric tons of distillers grains that U.S. ethanol plants are expected to produce in 2006. However, if the corn ethanol industry grows to 15 billion gallons per year, there is a genuine need to develop markets beyond our borders. The U.S. Grains Council (USGC) is working hard to identify new and emerging opportunities for distillers grains exports. Inroads into potential growth markets such as Asia, Mexico, Canada and the European Union are being channeled through the USGC's education efforts in its 10 overseas offices. The council conducts DDG feed trials to demonstrate the quality and benefits of using DDG as an ingredient in feed rations for swine, poultry and dairy diets.

  There is great export potential in Asia because there is a sizable feed industry that can use DDG (and the Asian ethanol industry is only just emerging). Asia is also a traditionally significant importer of U.S. grain. Japan, for example, is the top customer for U.S. corn. Education efforts and feeding trials are currently being conducted in Japan, Taiwan and China. Other potential markets for U.S. DDG lie within the European Union, which is already a frequent buyer and has the appropriate systems to handle DDG imports. The EU may also prove to be an especially strong customer during drought years.

  Two significant opportunities for expanding DDG export markets exist in Mexico. Hog growers there have expressed a keen interest in importing significant quantities of DDG to blend into their hog feed, and they have the infrastructure to handle it. The poultry industry, while having a less advanced infrastructure, is still very promising. The poultry market in the Veracruz region alone has the potential to displace 60,000 tons of corn per month. However, because of its infrastructure limitations, the best way to move DDG into the Mexican poultry market may be as a complete feed. Importing processed feeds such as DDG does not require an import certificate and avoids the quota system that regulates the volume of Mexican corn imports.

- **Educating end-users** — From fertilizer to fuel, to plastic resin replacement, to biomaterials (such as cat litter) and now to novel human food applications, more and more unconventional applications are presented for distillers grains every year. Alternative uses could one day make up a significant portion of the global distillers grains market. Research and education efforts are having an impact to promote distillers grain use in ever-wider applications here at home and abroad.

Figure 1 — U.S. Ethanol and Distillers Grains (DG) Production Projections Through 2016



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Ethanol from Sugar

What are the prospects for U.S. sugar co-ops?

By James Jacobs, Ag Economist
USDA Rural Development

More than half of world ethanol production is produced from sugar and sugar byproducts, with Brazil being by far the world leader. Currently, there is no commercial production of ethanol from sugarcane or sugar beets in the United States, where 97 percent of ethanol is produced from corn.

Technologically, the process of producing ethanol from sugar is simpler than converting corn into ethanol. Converting corn into ethanol requires additional cooking and the application of enzymes, whereas the conversion of sugar requires only a yeast fermentation process. The energy requirement for converting sugar into ethanol is about half that for corn.

However, the technology and direct energy costs are but one of several factors that determine the feasibility of ethanol production. Other factors include relative production costs (including feedstocks), conversion rates, proximity to processing facilities, alternative prices and government policies, facility construction and processing costs. As other countries have shown that it can be economically feasible to produce ethanol from sugar and other new feedstocks are researched, interest in the United States in ethanol production from sugar has increased.

In response to the growing interest around sugar and ethanol, USDA released a study in July 2006 titled: "The Economic Feasibility of Ethanol Production from Sugar in the United States" (on the internet at: www.usda.gov/oce/). The report found that at the current market prices for ethanol, converting sugarcane, sugar beets and molasses to ethanol would be profitable. "At this summer's unusually high price, I can conclude that it's economically feasible to produce ethanol from sugarcane and sugar beets," USDA Chief Economist Keith Collins said. However, there is not a clear-cut case that U.S. sugar will be commercially converted to ethanol anytime soon. This article will explore some of the economic and technological factors for the potential of sugar-based ethanol production for farmer-owned cooperatives.

U.S. sugar industry

Sugar beets are an annual crop grown in 11 states across a variety of climatic conditions, from the hot climate of the Imperial Valley of California to the colder climates of Montana and North Dakota. Sugar beet byproducts include beet pulp, which can be sold for animal feed, and molasses, which is also sold for animal feed or further processed to extract more sugar.

Sugarcane is a perennial tropical crop produced in four states: Florida, Hawaii, Louisiana and Texas. Byproducts of sugarcane processing include molasses and bagasse, the fibrous material that remains after sugar is pressed from the sugarcane. Bagasse is often burned as fuel to help power the sugarcane mills.

Sugar cane, seen here at the tassel stage, fuels Brazil's ethanol industry. The potential of using sugarcane and sugar beets for ethanol in the United States is being studied. USDA Agricultural Research Service photo

Total U.S. sugar production fell by more than 20 percent from 2000 to 2006 due to low prices and structural changes in the industry. Production declined significantly or ceased altogether in five states.

Sugar beets have gained a greater share of U.S. sugar production over the past decade, now accounting for 58.8 percent of the nation's sugar output while sugarcane fell to 41.2 percent. Sugar producers and the members of farmer-owned cooperatives are increasingly interested in new technologies and product markets for their crops, including the growing ethanol market.

Sugarbeets thrive in the rich soil of the Red River Valley of Minnesota and North Dakota. Photo courtesy American Crystal Sugar (ACS); A conveyor transports sugar beets from stockpiles into the ACS processing plant in Moorhead, Minn. USDA photo by Dan Campbell

Cooperatives in the sugar industry

Producer-owned cooperatives now dominate the sugar beet and sugarcane processing sectors as market conditions prompted more farmers to take ownership of their processing facilities to ensure a market for their beets or cane.

Sugar beet processing: Beet processing facilities convert raw sugar beets directly into refined sugar in a 1-step process. While planted sugar beet acreage has fallen slightly since the 1990s, sugar production actually increased due to investments in new processing equipment, the adoption of new technologies, improved crop varieties and enhanced technologies for the desugaring of molasses.

Sugar beets are very bulky and relatively expensive to transport and must be processed fairly quickly before the sucrose deteriorates. Therefore, all sugar beet processing plants are located in the production areas. During the past decade, there was a steady conversion of sugar beet processing plants to cooperative ownership. All 23 U.S. sugar beet processing facilities are now operated by farmer-cooperatives. These include: Michigan, four facilities; Minnesota and North Dakota (the largest sugar beet producing region) seven facilities; Colorado and Nebraska, three facilities; Wyoming, two facilities; Idaho, three facilities; Montana, two facilities; and California, two facilities.

Sugarcane processing: Sugarcane is initially processed into raw sugar at mills near the cane fields. Like beets, cane is bulky and relatively expensive to transport and must be processed as soon as possible to minimize sucrose deterioration. The raw sugar is then shipped to refineries to produce refined sugar.

Cooperative ownership of sugarcane mills is not as dominant as with sugar beets. In some states, there has been a decline in the number of cooperative-owned mills. Hawaii has gone from 12 mills in 1994 down to two in 2006, none of which are cooperatives. Louisiana has gone from 20 mills and 10 cooperatives in 1994 to 12 mills and 4 cooperatives in 2006. However, while Hawaii sugarcane acreage has declined significantly, Louisiana's acreage increased slightly as the remaining mills were upgraded and expanded. Florida sugarcane acreage and mill numbers have remained relatively constant, with one cooperative among the six mills. The lone mill in Texas is cooperatively owned, and acreage has been fairly stable over the past decade.

Because all sugar beets and a significant portion of sugarcane is processed at cooperatively owned facilities, there would be significant cooperative involvement in any future sugar-to-ethanol production.

Factors impacting sugar to ethanol viability

Corn is currently the least-cost feedstock available for ethanol production. Ethanol from sugarcane or sugar beet feedstocks costs twice as much. USDA's recent sugar/ethanol report provides these comparative production costs (below).

High oil prices have spurred interest in ethanol, to put it mildly. But for how long? (Prices were dropping at press deadline in September.)

With ethanol prices hovering near $4 a gallon this summer, the USDA report concludes that it would be profitable to produce ethanol from sugar and sugar byproducts. However, if ethanol prices were to drop below $2.35 a gallon, it would not be profitable to use raw or refined sugar as a feedstock. Based on current futures prices, the price of ethanol is expected to drop.

Alternative market prices for sugar

As can be seen above, it is far more costly to convert U.S. refined sugar to ethanol than to convert corn. One reason is that recent domestic sugar prices make it more profitable to convert sugarcane and sugar beets to sugar than to convert it to ethanol. As Jose Alvarez, vice president of operations for the Sugar Cane Growers Cooperative of Florida, said: "It's simple economics. Refined sugar sells at about 18 cents a pound, and the experts tell us ethanol from sugar would be close to 10 cents." (*Florida Sun-Sentinel*, May 31, 2006.)

U.S. policy has long been to protect domestic producers from unstable world prices, where sugar is sold below the cost of production for most countries (often called the "dump" price). Imports are limited to keep domestic prices stable, with the current price support level at 18 cents per pound. Refined sugar is currently a few cents above that, and unlikely to ever fall much below the support price to avoid forfeitures to the government under the sugar loan program.

When domestic sugar prices were very low a few years ago and some sugar was forfeited to the government, alternate uses for surplus sugar were explored. The Minnesota Energy Cooperative experimented with incorporating beet sugar with corn in a dry-milling ethanol plant. They found some synergy in combining the two into their fermentation tanks — increasing ethanol production and decreasing the fermentation time, and allowing them to produce an additional 442,800 gallons of ethanol.

When sugar prices rebounded, the concept of mixing sugar with corn for ethanol was put on the back burner. However, it demonstrated that when market conditions warrant it, the technology is there to significantly boost ethanol production by combining sugar with corn.

Estimated ethanol production costs

Feedstock	Total Costs*	Processing Costs*
Corn (wet milling/dry milling):	$1.03/1.05	$0.63/0.52
Raw Sugarcane	2.40	0.92
Raw Sugar beets	2.35	0.77
Molasses**	1.27	0.36
Raw sugar**	3.48	0.36
Refined sugar**	3.97	0.36

*Per gallon ** Excludes transportation costs

Ethanol from molasses

Molasses was found to be an ethanol feedstock that was fairly cost competitive with corn. Molasses is typically sold as food or a livestock-feed ingredient. However, there are limited supplies to economically support a new ethanol facility.

It is bulky and costly to transport, limiting the feasibility of drawing supplies from multiple sugar processing facilities.

Molasses would be most feasible if supplying an ethanol facility already co-located at a sugar processing plant.

Plant location & capital costs

For new facilities, capital costs are estimated to be higher for those using sugarcane or sugar beets than for corn-based ethanol plants. Also, the economics of plant location is largely dictated by proximity to feedstocks for ethanol.

Most ethanol plants are located in the Midwest near corn supplies. Sugarcane and sugar beets cannot be shipped very far for processing into any product, be it sugar or ethanol. However, building an ethanol plant onto an existing sugarcane or sugar beet factory would have a much lower capital expenditure cost and may make it more comparable to corn-based facilities.

In Brazil, nearly all sugar mills have the capacity to produce both ethanol and sugar. One advantage of co-locating an ethanol processing facility is that sugar producers already bring their crops to these facilities. Another is that the front end of the milling process is the same for ethanol as for sugar, where beet and cane juices are extracted for converting into either ethanol or raw or refined sugar.

Additional fermentation equipment would be needed to make ethanol at existing facilities.

Additional feedstocks needed

USDA's Economic Research Service (ERS) reported the annual capacity of ethanol plants could expand from 4.4 billion in 2006 to 7 billion gallons in 2010. ERS also raised a key question:

Where will the corn come from to supply this expansion?

In 2010, the ethanol sector will need at least 85 percent more corn than in 2005. How the market adapts to this increased demand will likely play a major role in the potential demand for additional ethanol feedstocks and the incentives for developing new processing technologies, especially around the cellulosic conversion of biomass into ethanol (see article on page 22).

Cellulosic processing technologies:

The ethanol industry has grown almost exclusively from grain processing. In the future, ethanol will be produced from other feedstocks, such as cellulosic materials. Cellulose is the most common organic compound on earth. However, it is more difficult to break down cellulosic materials to convert into usable sugars for ethanol.

Yet, making ethanol from cellulose dramatically expands the types and amount of available material for ethanol production, including bagasse and sugarcane trash (stalks and leaves). Instead of having to first convert the sugarcane to sugar juice, ethanol could be produced by processing the entire plant material.

Conversion of sugar byproducts and waste via cellulosic technologies would greatly increase the ethanol yields of sugar feedstocks. Cellulosic ethanol production will augment, not replace, grain-based ethanol, but ultimately expand potential ethanol supplies exponentially.

Bagasse

Sugarcane bagasse, the material left over after sugar juice is squeezed from a cane stalk during milling, is another potential feedstock for cellulosic ethanol. Creating fuel from bagasse and other biomass materials holds promise but will require technology development. The Audubon Sugar Institute in Louisiana has a sugarcane-to-ethanol research project underway focusing on bagasse.

Bagasse is currently burned as fuel in sugarcane mills, but researchers hope to increase the value of what is now considered a waste product. The project received two $500,000 grants from the U.S. Department of Energy for research on producing value-added products from bagasse and molasses.

Research shows that one dry ton of sugarcane bagasse can generate 80 gallons of ethanol. This compares favorably with 98 gallons per ton of corn. Peter Rein, director of the Audubon Sugar Institute, says "The challenge is economics. We can do it in the lab. The technology is there, but the economics aren't there yet to be commercially viable."

Government policy

The growing ethanol industry in the United States can partially be attributed to government policies promoting the production and use of ethanol. Incentives such as the motor fuels excise tax credits, tax credits for small ethanol producers, import duties and state government initiatives helped make ethanol production more cost effective. Regulations for cleaner air and increased fuel efficiency significantly increased demand for ethanol.

The Brazilian ethanol model is often mentioned when the potential for sugar as an ethanol feedstock in the United States is discussed. In the 1970s, Brazil initiated a program of direct investments, subsidies and incentives to increase ethanol production from sugarcane and increase the use of ethanol as a substitute for gasoline.

Brazil is now world's largest producer of both sugar and ethanol. However, the economics — in terms of production, facility costs and government policies — are not directly comparable to those in the United States. Brazil production costs for ethanol from sugar are much lower than here. It has a much longer growing season than U.S. sugar-producing regions and has higher yields per acre because of better climate and investment in more-productive strains of sugar cane.

Some lawmakers from sugar-producing states have been pushing sugar-to-ethanol legislation. The Energy Policy Act of 2005 included $36 million for sugar-ethanol demonstration grants. The funds will be used to explore commercialization of sugar cane ethanol, particularly for small producers with outputs of under 30 million gallons per day.

The Act also included federal loan guarantees to build plants to produce ethanol from cellulosic biomass or cane sugar. Recent proposed legislation to encourage the use of renewable fuels included a 100-million-gallon mandate for sugar-based ethanol beginning in 2008 and each calendar year thereafter. How this would happen was not stated in the pending legislation; it is just a mandate for minimum quantities of renewable fuel derived from sugar.

U.S. sugar producers are a little more tempered in the economic prospects for sugar-to-ethanol. Selling refined sugar is still their primary business and the opportunity costs of converting it to ethanol are still such that the market for sugar is more profitable. There is a general sentiment that policies to increase ethanol production from sugar should augment, but not replace, current U.S. sugar policy.

The American Sugar Alliance, an association of beet and cane sugar producers, has stated that the government would need to step in to stimulate a sugar-to-ethanol industry. "It would take a combination of consumption mandates to ensure that the demand would be there, and conceivably some production incentives to use ethanol." (CNN.com, June 20, 2006)

USDA's sugar/ethanol report concludes that corn certainly has a competitive advantage in the current market environment, and is helped by the current 51-cent-a-gallon federal tax exemption. Some people have suggested that one way to spur sugar-to-ethanol is to provide an increased credit for sugar. This was proposed, but not adopted, to compensate for more sugar imports negotiated in the latest Central American Free Trade Agreement.

Some states are pursuing their own sugar-to-ethanol policies. With unique

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VAPG program helping fuel biofuel growth

USDA Rural Development's Value-Added Producer Grant (VAPG) program is helping to fund producer-owned businesses all across the nation, including biofuel projects. The table on the following pages lists biofuel-related grants issued the past two years.

VAPGs may be used for planning activities and for working capital for marketing value-added agricultural products and for farm-based renewable energy. Eligible applicants are independent producers, farmer and rancher cooperatives, agricultural producer groups and majority-controlled producer-based business ventures. The 2006 funding decisions were announced in September (after this publication went to press) for the 2006 award list, visit: http://www.rurdev.usda.gov/rbs/coops/vadg.htm.

For more information about the program, contact your USDA Rural Development state office, or visit the above website. ■

Value-Added Producer Grants for Biofuels, 2004–2005

Year	Recipient	State	Amount	Type	Project Description
2004	Central Iowa Renewable Energy LLC	IA	$139,986	ethanol	Planning associated with starting a 50 million-gallon-per-year ethanol plant.
2004	Empire Biofuels LLC	NY	$100,000	ethanol	Feasibility study and development of a business plan for marketing ethanol.
2004	Heartland Corn Products	MN	$279,000	ethanol	Planning associated with adding value to the by-product stream of ethanol.
2004	Heartland Grain Fuels, LP	SD	$150,000	ethanol	Evaluate the feasibility of expanding the bio-refining capabilities of existing ethanol plant.
2004	Nebraska Soybean Association	NE	$237,300	biodiesel	Evaluate the economic feasibility of processing soybeans and marketing biodiesel.
2004	New Harvest Ethanol	MN	$170,000	ethanol	Business plan and feasibility study for a coal/biomass-fired ethanol plant.
2004	Oklahoma Farmers and Ranchers Energy Enterprise	OK	$235,000	biodiesel	Determine the feasibility of marketing bio-diesel, bio-based lubricants and hydraulic oil, and other products.
2004	Siouxland Energy & Livestock Co-op	IA	$150,000	ethanol	Working capital for marketing E-85 fuel.
2004	Timber Producers Association of Michigan and Wisconsin	WI	$120,627	biodiesel	Evaluate the feasibility of marketing bio-based consumer chemicals, bio-based industrial chemicals and biofuels made from slash and low-value pulpwood.
2004	Whitesides Dairy Inc.	ID	$28,172	biodiesel	Determine the feasibility of processing dairy biogas into high-purity pipeline or automotive-quality fuel.

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Year	Recipient	State	Amount	Type	Project Description
2005	Blackhawk Biofuels LLC	IL	$100,000	biodiesel	Determine the feasibility of operating a 30 million-gallon-per-year biodiesel plant in Freeport.
2005	Bootheel Ethanol LLC	MO	$150,000	ethanol	Purchase 75,000 bushels of corn.
2005	Central Iowa Renewable Fuels LLC	IA	$150,000	ethanol	Funding for employee training, inventory acquisition and general plant operations for ethanol plant in Goldfield.
2005	Coahoma County Bio-Energy Steering Committee	MS	$45,000	ethanol	Comprehensive marketing and business plans for ethanol plant.
2005	Columbia Crush LLC	OR	$12,500	biodiesel	Marketing and business plans for new oilseed-crushing facility in northeast Oregon.
2005	Commodity Enhancement Corp.	MO	$100,000	biodiesel	Feasibility study of proposed biodiesel facility in west-central Missouri.
2005	Ethanol Grain Processors	TN	$150,000	ethanol	Operating funds and office construction for an ethanol plant is western Tennessee.
2005	Farmers Cooperative	IA	$100,000	biodiesel	Feasibility study for a 30-million-gallon biodiesel plant in Marble Rock.
2005	Frontier Equity Exchange	KS	$41,500	ethanol	Feasibility study and possible business and marketing plans for ethanol production facility in northwest Kansas.
2005	Golden Grain Energy LLC	IA	$150,000	ethanol	Purchase of feedstock.
2005	Indiana Ethanol LLC	IN	$100,000	ethanol	Feasibility study for dry-mill ethanol plant in Randolph.
2005	Indiana Renewable Fuels	IN	$100,000	ethanol	Feasibility study for 50-million-gallon ethanol plant in Fulton County.
2005	Lincolnway Energy LLC	IA	$150,000	ethanol	Operating funds for 50-million-gallon ethanol plant in Nevada, Iowa.
2005	Mercer Landmark Inc.	OH	$31,250	biodiesel	Feasibility study for marketing biodiesel, refined soybean oil, soybean meal and refined glycerin.
2005	Mid-Atlantic Biodiesel Co. LLC	DE	$150,000	biodiesel	Operating funds for 5-million-gallon biodiesel facility.
2005	NEK-SEN Energy Partners	KS	$100,000	ethanol	Feasibility study for 50-million-gallon ethanol plant in northeast Kansas.
2005	Ohio Corn Growers Association	OH	$33,000	ethanol	Feasibility study for an identity-preserved corn dry milling plant.
2005	Patriot Renewable Fuels	IL	$100,000	ethanol	Feasibility study for 50-million-gallon ethanol plant.
2005	Pulaski Alexander Farm Bureau	IL	$100,000	ethanol	Feasibility study for ethanol plant in Pulaski County.
2005	Southern Iowa Bioenergy LLC	IA	$100,000	biodiesel	Feasibility study for 30-million-gallon biodiesel plant in southern Iowa.
2005	Unified Soy Products LLC	NE	$25,000	biodiesel	Feasibility study for a combination soybean crushing facility/soy biodiesel operation.
2005	Western Wisconsin Energy LLC	WI	$150,000	ethanol	Feasibility study for 40-million-gallon ethanol plant.
2005	Wisconsin Soybean Marketing Board Inc.	WI	$50,000	biodiesel	Feasibility study for biodiesel facility.

Co-ops connecting links in food chain

Editor's note: Cooperatives are seeking innovative structures and strategies to deliver locally produced food to a host of consumers, from Community Supported Agriculture and farmers markets to schools, restaurants and grocery stores. Several of the new "food co-ops" (including one in Nebraska discussed below) include producer and consumer members. Local markets mean lower transportation costs and better prices for farmers, plus higher quality products for those who buy their products. In a world where consumers increasingly want to know where their food comes from, these co-ops are turning obstacles into opportunities.

Linking country to city, traditional to high-tech

Several Amish and Mennonite farmers of Lancaster County, Pennsylvania, were already sending fresh products to Philadelphia, 60 miles away. Still, they knew they were missing a lot of opportunities. So they approached the Keystone Development Center which helped them secure the services of a facilitator uniquely suited to help the farmers set up Lancaster Farm Fresh Cooperative.

The facilitator worked well with the farmers, whose way of life includes living without electricity or phones in their homes. And she moved easily in the high-tech world of the buyers. One of the first things she did was to upgrade the ordering system, from cell phones that farmers kept in their delivery truck to on-line ordering. Sales took an immediate leap forward.

The co-op also acquired a centrally located warehouse with the added advantage of refrigeration. Most co-op members are certified organic, and much of what they ship is organic-certified produce. Today, the co-op ships $16,000 of produce, meat and dairy products every week. It supplies not only Philadelphia and other metro markets, but also a rising demand right in Lancaster County, which means a big break on transportation costs.

One of the greatest benefits of starting the co-op has been the way farmers in the southern part of the county are getting to know and work with their counterparts in the northern part. They

Local markets mean lower transportation costs and better prices for farmers, plus higher quality products for those who buy their products.

Most members of the Lancaster County Farm Fresh Cooperative in Pennsylvania have certified organic farms. The co-op has acquired a central warehouse to supply customers in Philadelphia and the co-op's growing local market. Photos courtesy CooperationWorks! and featured co-ops

have coordinated crop cycles, thus extending the co-op's product availability into a longer growing season and turning what could have been a divisive and competitive situation into one that enables them to increase market access and weave a tighter fabric of community. For more information, visit: www.lancasterfarmfresh.com.

Nebraska co-op links neighbor to neighbor

As interest in buying locally produced food grows around the country, farmers' markets are popping up in rural and urban settings. Schools and other institutions are incorporating local produce. Restaurants, even supermarkets, use the 'locally grown' label to attract consumers.

In Nebraska, those who produce food and their customers are forming cooperative 'food chains' to distribute locally.

All of these trends led a group of Nebraska farmers, ranchers and consumers to form a "multi-stakeholder" cooperative to provide not only new markets for locally produced foods, but also a distribution system. With technical assistance from the Nebraska Cooperative Development Center, they did just that.

Each month continues to bring new members and new products into the co-op. Members volunteer for delivery day, which includes pre-sorting individual customer orders. Working together, producers and consumers are learning more about one another and sharing a concern for their state's future.

Taking advantage of new technology, the co-op offers a Web-based ordering system. Food is delivered once a month to members' homes or nearby drop points. Depending on availability and seasonality, orders may include organic produce, grass-finished and grain-fed beef and pork, pastured poultry, eggs, jams and jellies, natural personal-care products, cheese, artisan breads and more.

As consumer interest in local food accelerates and the shipping costs of non-local food rise, the Nebraska Food Cooperative may play an increasingly vital role in the nutritional and economic health of its communities. For more information, visit: www.nebraskafood.org.

Georgia farmers build peanut plant

Tifton Quality Peanuts has just completed its first year of operation as a Limited Liability Company doing business as a cooperative. The 146 producers located around the state have not only avoided disaster in the wake of federal cuts in the peanut subsidy program, but have built a thriving business. They've even received an offer from an international company to buy all of their peanuts.

When several of the farmers approached the Georgia Cooperative Development Center to help them figure out how to add value to their commodity crop, they already had a shelling plant in mind. The Center stepped in to help them with their business plan. It took a lot of work and many hours spent talking to other farmers, but in the end they raised $6 million in equity to construct the plant. They also created more than 50 full-time jobs in a depressed rural area of the state.

Tifton Quality Peanuts now owns one of only two peanut shelling plants built in the United States in the past decade (the other, also in Georgia, is owned by another co-op). It uses innovative technology to control the storage atmosphere that reduces harmful toxins and avoids other problems common in older facilities.

By putting all their produce in one co-op 'basket,' farmers may offer more variety, a longer season, improved quality or other benefits.

Oh, and the deal with the big corporation that wanted to buy all their peanuts? The farmers declined, choosing to balance their market rather than sell to one customer. What they essentially said was: "From now on, we're going to be in control of our markets — and our future!" ■

Countrymark Co-op in Indianapolis had record earnings of $40.5 million last year. Photo courtesy Countrymark

Send items to: dan.campbell@wdc.USDA.gov

Record earnings, returns for Countrymark members

Regional fuel refiner Countrymark Co-op, Indianapolis, Ind., announced record earnings and returns to member co-ops at its annual meeting in Indianapolis, delivering on its fundamental promise: to exist to supply the members it serves. The co-op said $25.86 million will be distributed back to its member-owners, with a majority paid as member patronage refunds and revolved equity. Of the total, $18.86 million will be returned in cash and $7 million as equity credits. Countrymark closed fiscal year 2005 with record after-tax earnings of $40.5 million.

Improved operating efficiency, changes in production and an emphasis on positive commercial relationships helped the refinery, CEO Charlie Smith said. Referring to the devastating 2005 hurricane season, Smith said: "Throughout that crisis, not one co-op customer went without product. Last fall, nature unleashed circumstances where local ownership and cooperative membership immediately differentiated us from every other supplier. Our operations team, marketing staff and delivery professionals out in the field truly proved the advantage — and the commitment — they bring to co-op customers."

Countrymark has invested in a $40-million clean-fuel complex to deliver ultra-low sulfur diesel, and was one of the first refiners in the nation to promote soy biodiesel and ethanol blends, Smith said. "Last year, approximately 85 percent of all biodiesel marketed in this state was through co-op members. In renewable fuel leadership, as in all areas, action is how the co-op adds value for member owners."

Countrymark Co-op is owned and controlled by approximately 60 member cooperatives, and serves the energy needs of agricultural, industrial and commercial customers in Indiana, Illinois, Michigan and Ohio. It is the largest buyer of premium American crude oil from the Illinois Basin, and "proudly markets co-op-refined fuels that are 100 percent American made," Smith said.

Ocean Spray, Pepsi form strategic alliance

Ocean Spray and PepsiCo have announced a long-term strategic alliance in which Pepsi-Cola North America will market, bottle and distribute single-serve cranberry juice products in the United States and Canada under the Ocean Spray name. The agreement also includes opportunities for the development of new product innovations across multiple trade channels in the future.

"As the Ocean Spray cooperative moves to build its brand, we are seeking alliances to reach consumers more broadly and powerfully than ever before," says Ocean Spray President and CEO Randy Papadellis. "We're thrilled to re-establish our partnership with Pepsi and begin a fruitful, long-lived relationship."

Integration of single-serve juices into the Pepsi system will begin in 2007.

"This is a chance for both PepsiCo and Ocean Spray to turn up the dialogue on the health benefits of cranberries," said Dawn Hudson, president and CEO, Pepsi-Cola North America. "Over the past several years, we've built successful, mutually beneficial partnerships with strong brands like Lipton and Starbucks, and now we plan to work side-by-side with Ocean Spray to create a major healthy refreshment business focused on cranberries. When people think of cranberries, they think of Ocean Spray."

Pepsi distributed Ocean Spray prod-

Ocean Spray and Pepsi are working together once again. Above, Ocean Spray created a berry bog at Rockefeller Center in New York last year. Photo courtesy Ocean Spray

ucts during the 1990s, which helped the co-op gain access to the single-serve, convenience store market. But that arrangement began to unravel after Pepsi bought the Tropicana juice brand in 1998. In 2004, Ocean Spray members voted down a proposed joint venture with Pepsi, under which the soda giant would have essentially taken over the co-op's beverage business, reducing the co-op to the role of raw-product supplier.

According to the *New York Times*, at the high point of their previous relationship, Ocean Spray had $250 million in annual sales of single-serve products distributed by Pepsi. Last year, it sold less than half that amount in the single-serve market. The cranberry market has been a roller coaster ride for the past decade, with sales of $60 a barrel in 1996, but falling to $15 a barrel by 1999. This year Ocean Spray expects to pay about $40 a barrel. Ocean Spray posted fiscal 2005 gross sales of about $1.4 billion.

New pension law helps 50,000 co-op workers

Provisions included in the Pension Protection Act of 2006 (HR 4), signed by President Bush in August, will help preserve retirement benefits for more than 50,000 workers across the country employed by farmer-owned cooperative businesses.

The National Council of Farmer Cooperatives (NCFC) says the action helps to ensure that farmer cooperatives can continue to meet their obligations to their employees while not unduly stressing the financial health of the cooperative.

Provisions of the law, which were strongly supported by NCFC, put in place special transition rules for rural cooperatives, including farmer cooperatives that are part of multiple-employer plans. Much like a cooperative allows farmers to join together to purchase supplies or market their crops, multiple-employer plans allow individual cooperatives and related associations to pool their experience and reduce their cost to offer retirement benefits to their members.

"I would like to commend the House and Senate for passing this legislation, and President Bush for signing it," says NCFC President Jean-Mari Peltier. "Over 750 farmer cooperatives across the country will be able to keep their pension costs in check because of this new law. This is important because, as farmer-owned businesses, an increase in costs means a reduction in resources to allow farmers to capitalize on new marketplace opportunities and derive more of their income from beyond the farm gate."

NCFC is a national association representing America's farmer cooperatives. There are nearly 3,000 farmer cooperatives across the United States whose members include a majority of the nation's more than 2 million farmers, ranchers and growers. Additional information about NCFC can be found at http://www.ncfc.org.

WLF selects Utah site for new processing plant

West Liberty Foods LLC, of which the Iowa Turkey Growers Cooperative is the majority owner, has announced construction of a new facility in Tremonton, Utah, which will become the fourth plant for the Iowa-based meat processor and marketer. The complex will continue to emphasize food safety through its state-of-the-art design. WLF is a leading co-packer, private label manufacturer and food service supplier of sliced, processed meat and poultry products.

The new facility is expected to create more than 500 new jobs in Tremonton and the Box Elder County area. Production should begin in July 2007.

The new complex will consist of a 93,000-sqaure-foot fabrication facility and a 74,000-square-foot slicing facility. At full capacity, the plant will be able to further process more than 100 million pounds of protein products per year, in addition to 36 million pounds of chicken. These facilities will be the first of their kind in North America to cook and slice 120-inch-long slicing logs. No slaughter will take place on the premises.

"I couldn't be more pleased about West Liberty Foods' decision to make this very significant investment and expand its operations in Utah," said Utah Governor Jon M. Huntsman, Jr.

"This is an exciting time for our company as we branch out to the western marketplace," said Ed Garrett, WLF president and CEO. "The ready-to-eat chicken line will provide us the opportunity to introduce and service new product lines to our current customers." Garrett praised local and state leaders for their support of the project.

ACE honors Margaret Bau for her work with cooperatives

The Association of Cooperative Educators (ACE) has presented Margaret Bau, cooperative development specialist with USDA Rural Development in Wisconsin, with the ACE Award for Outstanding Contribution to Cooperative Education and Training. The award recognizes long-term or continuing contributions to cooperative education, such as the development of training materials, publications or leadership within the coop-

An architectural drawing of a new meat-processing plant West Liberty Foods is building in Tremonton, Utah. The plant will create 500 new jobs. Artwork courtesy West Liberty Foods

erative movement.

One of her many projects, Cooperative Care in Waushara County, Wis., was named the 2003 top rural initiative by Wisconsin Rural Partners and was named one of 15 finalists out of 1,000 in the prestigious, 2004 Innovations in American Government award, presented by Harvard University. Cooperative Care is a worker-owned, home-care cooperative of 88 home-care providers who help the elderly and disabled live independently by offering them dependable and cost-effective care while at the same time assuring the workers' earn living wages and have access to benefits.

Margaret Bau, center, deep in thought as she reviews the financial statements of Cooperative Care, a home health-care workers co-op in Wisconsin. Bau was recently saluted by the Association of Cooperative Educators (ACE).

As a USDA cooperative development specialist for the past six years, Bau has helped incorporate many other new cooperative businesses across Wisconsin. She provides technical assistance statewide to communities interested in organizing new cooperatives. While working to make individual cooperatives successful, she has also focused on developing and promoting cooperative business models that can be used across the country. To further this goal, she has spoken to diverse groups within Wisconsin and nationally, and has published numerous articles.

Prior to joining USDA, Bau was a research fellow with the Humphrey Institute of Public Affairs at the University of Minnesota who examined regional economies and industry clusters in rural Minnesota. She developed an interest in cooperatives while organizing a rural women's income-generating project as a Peace Corps volunteer in Costa Rica from 1988 to 1992.

The Association of Cooperative Educators (ACE) recognized five other individuals and organizations that have made significant contributions to cooperative education at its Aug. 4 awards banquet. The awards program was a highlight of the ACE Institute, held August 2–5 in San Juan, Puerto Rico.

ACE is an international membership organization that brings together educators and cooperators across cooperative sectors and national boundaries. Additional information about ACE can be found at: http://www.uwcc.wisc.edu/ace/ace.html.

Birds Eye to sell frozen-food plants

In order to concentrate more on its higher margin branded lines of frozen foods, Birds Eye Foods Inc. has announced plans to sell most of its non-branded frozen foods business. It will sell or close five food-production facilities during the next 18 months. The plants are located in Brockport, Oakfield and Bergen, N.Y., in Fairwater, Wis., and in Montezuma, Ga. These five facilities employ about 740 full-time workers.

Any facility not sold after its current production season will be closed between October 2006 and June 2007. Birds Eye also announced plans to close a food facility in Watsonville, Calif., which employs 550 workers, at the end of 2006.

Pro-Fac Cooperative Inc. — an agricultural marketing cooperative of about 500 fruit and vegetable growers — has been looking for a way to keep the Bergen and Oakfield operations open. Pro-Fac is a minority owner of Birds

Johanns, Bodman to address renewable energy conference

Agriculture Secretary Mike Johanns and Energy Secretary Samuel Bodman will be among the speakers at Advancing Renewable Energy: An American Rural Renaissance, a conference to be held Oct. 10-12 at America's Center in St. Louis. The conference is being hosted by USDA and the U.S. Department of Energy (DOE). The conference is designed to help create and strengthen partnerships and strategies necessary to accelerate commercialization of renewable energy industries and distribution systems, the crux of the President's Advanced Energy Initiative.

Leaders from government and industry will address renewable energy topics such as Building Supply and Distribution, Encouraging Demand, Adapting and Building Infrastructure and Creating Effective Market Models and Partnerships. Other speakers will include: Vinod Khosla, founder of Khosla Ventures and co-founder of Sun Microsystems; Robert W. Lane, chairman and CEO of Deere and Co.; Patricia A Woertz, president and CEO of Archer Daniels Midland Co.; James R. Woolsey, vice president of Booz Allen Hamilton and former director of the Central Intelligence Agency.

Attendance is open to the public. Anyone involved with renewable energy is encouraged to attend, including transportation, finance and investment officials, other federal and state government officials and elected officials. All attendees must register for the conference, including press, who may attend without charge. Attendees and press can register online at: www.technologyforums.com/6EN/.

Eye, and was the majority owner until a few years ago.

"Any opportunity must be economically beneficial to growers and consider the well-being of the communities where these facilities are located," said Batavia, N.Y., resident and Pro-Fac Board President Peter Call. "Pro-Fac's expertise lies in producing raw products, not in operating processing facilities," Call added. "So a partnership between the cooperative and an operating entity is an option that will be actively pursued."

Steve Wright, Pro-Fac general manager and CEO, added, "Once these opportunities and business options can be more fully investigated we will communicate additional details to our member/growers and other stakeholders. We see this as being a 'fast track' discovery process."

Birds Eye Foods is the largest company in the branded frozen vegetable category, but is the only remaining branded manufacturing company having a significant non-branded presence. Birds Eye Foods says it has received a number of unsolicited inquiries about the facilities. The decision to exit the non-branded business will also affect a number of administrative positions in offices in Rochester, N.Y., and Green Bay.

Bring it on Home *continued from page 14*

Awards are made on a competitive basis for the purchase of renewable energy systems and to make energy improvements. Since 2003, when the program was established, USDA has provided $87.3 million in grants and $34.3 million in loan guarantees to 844 applicants. A complete list of the grant recipients can be viewed at: http://www.rurdev.usda.gov/.

VAPG program, tax credits help producer-investors

The Value-Added Producer Grant program provides grants of up to $100,000 for business planning or feasibility studies, or up to $300,000 for working capital for any value-added agricultural activity, including renewable energy projects. Eligible applicants are independent producers, farmer and rancher cooperatives, agricultural producer groups and majority-controlled producer-based business ventures. In the past few years, many ethanol, biodiesel and wind energy projects have received funding through this program. Details for this program can be viewed at: http://www.rurdev.usda.gov/rbs/coops/vadg.htm. (See page 29.)

Tax credits for small ethanol and biodiesel producers have also been instrumental in enabling the expansion of farmer-owned biofuel facilities. Under current law, small ethanol producers (defined as those producing 60 million gallons per year or less) receive a 10-cents-per-gallon production-income tax credit on up to 15 million gallons of production annually. The credit is capped at $1.5 million per year per producer. The small ethanol producer tax credit promotes local ownership.

In 2004, the incentive was strengthened by allowing the credit to be passed through to the farmer owners of a cooperative. The legislation also allows the credit to be offset against the alternative minimum tax. In 2005, a similar tax credit was created for small producers of agri-biodiesel.

Wind energy projects have not enjoyed the same small producer benefit. Since 1999, farmer-owned ethanol facilities have more than doubled their share of total ethanol production, from 17 to 39 percent while only a very small fraction of wind energy projects are farmer-owned.

The Producer Tax Credit and accelerated depreciation are two general tax-based incentives that can only be used by wind project developers with a sufficiently large tax liability. Farmers and other local investors generally lack enough tax liability to get the full benefit of the PTC. This also means that forms of business organization that involve lower taxation, such as nonprofits and cooperatives, are less able to take full advantage of these tax-based incentives.

State policies for local energy ownership

The following two recent examples are some of the more aggressive policies for promoting local ownership of renewable energy facilities.

- **Missouri restriction of biofuel tax incentives to farmer-owned facilities.** In August 2006, Missouri Governor Matt Blunt announced that only majority farmer-owned ethanol and biodiesel production facilities would receive discretionary state tax incentives. "I am firmly committed to helping Missouri's farm families take advantage of the burgeoning ethanol and biodiesel industries," Blunt said. "Companies that are not farmer-owned are more than welcome to locate in Missouri, but I want to make clear that our state's commitment is primarily to our farm families who have been the bedrock of our state's economy for generations."
- **Minnesota Community Based Energy Development (C-BED) tariff.** For several years, Minnesota offered an incentive payment to locally owned wind energy facilities under a certain size. In 2005, the legislature enacted a new program known as the Community Based Energy Development (C-BED) tariff. C-BED allows for a unique electric utility payment structure that helps Minnesota community wind projects receive a higher tariff in early debt years in exchange for a lower tariff in later years. The Minnesota-based Institute for Local Self-Reliance (ILSR) explains in a report that the new C-BED tariff will allow project developers to profit and pay off their capital costs within the first 10 years of their contract with-

CHS to invest in Brazilian grain firm

CHS Inc. announced it is investing in a newly created Brazilian grain handling and merchandising company, Multigrain S.A. The new company will be jointly owned with Multigrain Comercio, a Sao Paulo, Brazil-based agricultural commodities business.

"We have continually increased our working partnership with Multigrain ever since opening our own marketing offices in Brazil three years ago," said John Johnson, CHS president and chief executive officer. "We are excited to formalize our business relationship even further with this knowledgeable and experienced Brazilian agribusiness. Our investment in Multigrain S.A. will bring CHS valuable competitive advantages and a significant opportunity for growth in our South American grain operations."

Founded in 1998, Multigrain Comercio's core business is origination of commodities in the central and northern regions of Brazil, the country's fastest growing agricultural areas. The company has some 390 employees at 18 locations. With a majority focus on exporting soybeans sourced from Brazil cooperatives and producers, Multigrain is also a leading importer of

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out the need for the state incentive payment.

To qualify, a C-BED project must be locally owned by Minnesota residents and projects must have support of the county board in which the project is located. All utilities are required to negotiate C-BED proposals, but no utility is required to purchase power from C-BED projects. With the availability of the new C-BED tariff structure, the ILSR concludes that locally owned, community-based wind projects could constitute more than 60 percent of all new renewable electricity coming on-line between 2005 and 2010. Xcel Energy, the largest Minnesota electric utility, recently announced its commitment to secure wind resources of up to 500 megawatts of C-BED energy by 2010. Other Minnesota utilities are currently pursuing C-BED projects.

While Minnesota is a leader in promoting community wind and Missouri is pushing the envelope in promoting local ownership of biofuel facilities, there is a whole array of federal and state renewable energy incentives that have an influence on the promotion of local ownership. A website with an inventory of federal and state renewable energy incentives can be found at: http://www.dsireusa.org/. An inventory of federal and state biofuel incentives and laws can be found separately at: http://www.eere.energy.gov/afdc/laws/incen_laws.html.

Business models for local ownership

According to the Renewable Fuels Association website, 25 of the 46 farmer-owned ethanol plants are organized as Limited Liability Companies (LLCs). The others are organized as partnerships or cooperatives. Some are organized as combinations. Many of the plants have non-farm investors. The National Biodiesel Board list shows that nine biodiesel facilities are organized as LLCs. Several soybean cooperatives also own plants.

The business model of choice in the U.S. ethanol industry has been the 'franchise' model. A few specialized engineering firms have standardized ethanol plant design and the project development process. These engineering firms guide farmer-investors through every aspect of plant development—from feasibility to plant opening and beyond, including financing, contracting, marketing, procurement and management.

A very small percentage of U.S. wind-generated electricity comes from farmer-owned turbines. However, as noted above, this is rapidly changing in Minnesota. Mark Bolinger, a research associate with the Lawrence Berkeley National Laboratory, has analyzed community wind business models in the *Energy Journal* article "A comparative analysis of business structures suitable for farmer-owned wind power projects in the United States."

High stakes

With a farm bill due next year and many pieces of energy legislation in different stages of consideration, this is now a high-stakes issue. A message from the website of Iowa Congressman Steve King nicely encapsulates some of the tone many rural legislators are taking:

"We have long lamented the small portion farmers receive of the value-added food dollars, a few cents of a $3 box of corn flakes, for example. However, we can give ourselves the chance to hold onto the value of turning our grain, wind and biomass into energy if we act now. Securing a commitment to ensure as much local ownership as possible is the key.

"We have great companies which have partnered with our communities and farmers to build many of our current facilities. It is the perfect model. We have the raw products and capital, and they have the expertise for design engineering, construction, management and marketing. We will continue to work together as ownership partners. Since the passage of the Energy Policy Act, all of Iowa has been abuzz with discussions of ethanol, biodiesel and wind energy facilities.

"When that discussion is going on in your community, you should ask how much local ownership is part of the proposal. If local farmers and local investors will not have a viable opportunity to become owners, you should consider a different business model that is in the best long-term interest of your community. If this isn't considered now, we will look back and again lament receiving a small portion of the end dollars generated by our labors, while others reap the real financial rewards.

"Without a doubt, just as our agrarian forefathers met this country's needs for food, present day farmers will meet this country's need for renewable energy. The question hanging in the balance is: "Who will share the real profits?" We have now hitched agriculture's wagon to an energy future. Let's keep our hands on the reins." ■

wheat and operates a small flour mill in Jundiai, Brazil.

Canada funding biofuels; supports role of co-ops

Canada is providing $11 million in initiatives designed to ensure farmers and rural communities have opportunities to participate in and benefit from increased Canadian biofuels production. The Biofuels Opportunities for Producers Initiative (BOPI) provides $10 million this fiscal year to help agricultural producers develop sound business proposals, as well as undertake feasibility or other studies to support the creation and expansion of biofuel production. The industry councils in each province and territory that administer Advancing Canadian Agriculture and Agri-Food (ACAAF) will be invited to deliver this new federal funding.

The government is also supporting biofuels opportunities through a one-time, $1 million addition to the existing Cooperative Development Initiative (CDI). This funding will provide support to individuals, groups and communities wishing to develop cooperatives as a way to take advantage of opportunities associated with biofuels and other value-added activities.

These initiatives flow from the 2006 budget, in which Canada invested an additional $1.5 billion in Canada's agriculture sector, tripling original commitments to the agriculture sector. Canada is committed to requiring an average of 5 percent renewable fuel content in transport fuel by 2010. AAFC wants to ensure that the 5-percent target is implemented in ways that result in the greatest possible benefit to the agriculture sector, including ownership of biofuels production facilities by agricultural producers.

Co-op leader Elroy Webster dies

Nationally recognized cooperative and agricultural leader Elroy Webster, a Minnesota farmer who helped drive historic joint ventures and mergers of U.S. agricultural cooperatives, died July 18 in Mankato, Minn., at age 72 following a lengthy illness. Webster, of Nicollet, Minn., retired as a director and former chairman of CHS Inc., in 2003 after five decades of involvement in cooperatives on the local, regional, national and global levels.

Elroy Webster

In 1998, he was instrumental in uniting the former Cenex Inc. and Harvest States Cooperatives to form today's CHS Inc., the nation's largest cooperative and a Fortune 200 company. Webster also helped lead the 1987 establishment of a landmark joint venture involving the agricultural supply businesses of Cenex and Land O'Lakes, Inc.

"Agriculture, cooperatives and rural America have lost a visionary, an unparalleled leader and a tireless advocate," said CHS Chairman Michael Toelle. "Elroy Webster clearly stands out as one of the most influential figures in these sectors over the last half century."

GROWMARK sales, income climb; record patronage going to members

GROWMARK Inc. had sales of $3.4 billion for the 2005-06 fiscal year, up more than $700 million from the previous year. The co-op had net income of $73.5 million, compared to $73.2 million in 2004-05. "While volume increases in seed and fuels have increased sales, energy price inflation drove much of the increase," Vice President of Finance Jeff Solberg said.

More than $49 million in patronage and refunds will be returned to

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Ethanol from Sugar *continued from page 28*

transportation circumstances and a declining sugarcane industry, Hawaii is aiming to become the first state with a sizeable sugar ethanol industry. In 2007, Hawaii state law will require that at least 10 percent of all gasoline sold in the state be blended with ethanol.

Co-ops would play major role

While the recent USDA report concludes that at current prices sugarcane- and sugar beets-to-ethanol would be profitable in the United States, many factors — especially the domestic price of sugar and the government's energy policies — will affect the future commercialization of sugar-to-ethanol in the U.S. USDA Chief Economist Keith Collins said at the release of the USDA report: "At some point in the future it may be worthy of commercial development. Technologically, it's possible. The question is: is it economically feasible?"

As pointed out by panelists at the recent International Sweetener Symposium, cost is the major hurdle and new technologies and government investment will be needed to overcome that barrier. Says Steve Williams, president of the American Sugar Beet Growers Association and member of the American Crystal Sugar Co. cooperative: "We're always open to new uses of sugar and will look very hard at ethanol. The question is: Will it be economical in the long term?"

The most promising scenario for sugar-to-ethanol appears to be linked to advances in cellulosic and "mixed stream" technologies, especially for sugarcane because of its broader cellulosic properties. In any scenario, it appears to be clear that if ethanol is to be produced from sugar, the facilities must be located at existing sugarcane or sugar beet plants because of transit cost limitations. This means that cooperatives will likely have a significant role in any commercialization of sugar-to-ethanol because of their dominance at the initial processing stages. ■

GROWMARK member-cooperatives. In addition, a special redemption of preferred stock has been authorized. In total, more than $60 million in cash will be distributed to members. This will be the largest amount of cash returned to members in the history of the GROWMARK System.

The Energy Division had a record year, with 1 billion gallons of refined fuel sold as a result of new supply sources, an expanded customer base and improved distribution. Propane volume in 2006 was hurt by another warm winter, but margins improved, with timely purchasing decisions and good price-risk management.

The co-op revamped its lubricants business with the acquisition of McCollister & Co., a lubricant-blending facility in Council Bluffs, Iowa, which will now blend the FS line of lubricants. Also acquired were the Archer and United lubricant brands. "The GROWMARK System will now go to market with three quality brands in a greatly expanded geography," Solberg says.

UPI Inc., the Ontario-based energy company jointly owned by GROWMARK and Suncor Energy Products Inc., is a major fuel supplier in the province. GROWMARK projects a dividend from UPI of $1 million for 2006, according to Solberg.

Plant food experienced a very difficult year, with historically high prices affecting demand and significant price depreciation adversely affecting inventory values. The Seed Division had an excellent year, topping $130 million in sales, an increase of $20 million from last year. "

Organic Valley reaches milestone

With the addition of its 800th organic farmer-member, the Organic Valley/CROPP cooperative now represents 10 percent of the nation's organic farmers, and 40 percent of the U.S. organic milk supply. Of its 800 members, 600 are dairy farmers. "Our steady growth shows that the marriage of organic agriculture and the cooperative model is a winning formula for family farmers who want to stay on the land, consumers who want delicious organic food and future generations who want a healthy environment," said George Siemon, CEO and founder of the co-op.

USDA announces $9.4 million in development loans, grants

Agriculture Secretary Mike Johanns has announced 25 loans and grants totaling more than $9.4 million to assist rural communities and businesses in 11 states. "These funds will help stimulate the economy, support renewable energy, promote business development and improve medical services in rural communities," said Johanns. "The projects funded will help to create or save an estimated 1,400 jobs,

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Fuel Farming *continued from page 7*

than $17 million. "We felt that we were so close to having it all that we decided to keep pushing to raise the entire $24 million," Utlaut recalls. Another 20 or so meetings later, they had it. The other $35 million needed was borrowed from AgStar, a Farm Credit System bank based in Minnesota.

A $500,000 Value-Added Producer Grant from USDA Rural Development was awarded in June 2004 — a crucial time when the co-op was low on operating funds and badly needed a cash infusion to buy corn and enzymes. "Not only was the money a great help, but it really helped our credibility by showing that we had the support of USDA, as well as the state of Missouri," Utlaut says.

The plant was running at full capacity within five days of start-up, and although rated as a 45-million-gallon plant, it has been averaging 53 million gallons. Utlaut credits plant Manger Billy Gualtney, who has a degree in chemical engineering and who formerly worked for Cargill, and his team for maximizing the plant's output. Having most of the key employees on site for two months before operations began was also well worth the extra cost, Utlaut stresses.

The plant has one mile of Union Pacific rail frontage, and 50 percent of its ethanol is shipped out by rail. The ethanol is sold through the Renewable Products Marketing Group, a cooperative of a dozen or so ethanol plants.

Perfect timing

MidMo's feasibility study estimated the early return on investment (ROI) would be about 15 percent annually. But with the opening coinciding with the run-up in ethanol prices, ROI for the first seven months was 31 percent. It will be even better this year, Utlaut says.

It's not hard to understand why the co-op board recently voted to double plant capacity. The board looked at several builders, but ultimately decided to hire Fagan again, even though it meant waiting until mid-2007 before the project could commence. The co-op will largely self-finance the expansion, using profits from the plant operations, which should continue unabated during the construction.

MFA Oil in Columbia, Mo., another farmer-owned cooperative, is working in partnership with MidMo to promote ethanol (see sidebar, page 8). Tom May, MFA marketing director, thinks the industry is still in its infancy. "We're just at the front gate. There has not always been a lot of good news for Rural America in recent years, but biofuel is good news."

Back on his combine outside Marshall, Brian Miles has no doubt of what May says. "We just bought this combine last year, and the list price [over $250,000] had gone up 25 percent since we bought the last one four or five years ago. The corn head was another $48,000 and the platform [for soybean harvesting] was $25,000. Our production costs just keep climbing. Yet corn prices still hover around $2 a bushel. We need something. I hope it's ethanol." ■

underscoring the Bush administration's commitment to strengthening our nation's economy."

The funds are being provided through USDA Rural Development's Rural Economic Development loan and grant program. Under the program, Rural Development provides loans and grants to USDA Rural Utilities Program borrowers, usually rural telephone or electrical cooperatives, which in turn provide loans to rural businesses and communities in their service areas. Rural Development will provide $4.1 million in grants and $5.32 million in loans to the successful applicants.

Projects being funded include a $450,000 loan to help construct and operate a farmer-owned, 40-million-gallon fuel-grade ethanol plant in Dunn County, Wis., which will create 35 new jobs. Another $300,000 will be provided to an electric association to provide a loan to Eden Valley, Minn., for construction of a new fire and rescue hall.

A complete list of the loan and grant recipients is available by going to: http://www.rurdev.usda.gov.

Co-ops & renewable energy theme of Minnesota conference

Development of bioenergy and other renewable energy resources, and the adoption of new environmental management practices, create tremendous opportunities — and challenges — in agriculture. What do these developments mean for new and existing farmer cooperatives? How can cooperatives better position themselves for future success in these key areas?

To explore and promote an understanding of these issues, the 9th annual Farmer Cooperatives Conference has been organized around the theme: Opportunities for Cooperatives: Renewable Energy and Environmental Management. The conference will be held Nov. 1–2 at the Sheraton/Minneapolis South in Bloomington, Minn. Conference attendees will hear presentations address such issues as:

- the impact of federal and state policies in agriculture and energy, including the 2007 Farm Bill;
- cooperative issues and opportunities in sourcing grain and marketing ethanol and bio-diesel;
- prospects for renewable energy resources such as wind, sucrose, switchgrass and whey;
- the Canadian experience with biofuels, and potential partnership opportunities; financing new business development;
- potential new member services in the areas of environmental management.

Updates on the conference and registration information will be posted at: www.uwcc.wisc.edu/farmercoops06. ■

Farm Credit System celebrates 90th

Rural America's customer-owned financial partner, the Farm Credit System, celebrated its 90th anniversary of service on July 17, the date when President Woodrow Wilson signed the Federal Farm Loan Act in 1916. Today, with more than $106 billion in loans financing agriculture and its related cooperatives, rural homebuyers, small community infrastructure and the export of U.S. farm commodities, the Farm Credit System is the oldest and largest financial cooperative in the nation.

"For 90 years, the Farm Credit System has been rural America's customer-owned partner, and we look forward to a bright future for U.S. agriculture and America's rural communities," said Wayne Lambertson, a Maryland farmer who currently serves as Chairman of the Farm Credit Council, the System's trade association.

The legislation President Wilson signed into law in 1916 created a system of 12 regional Farm Loan Banks that would grant loans to farm cooperative associations, allowing farmers to borrow from their local institution, using their land and improvements as collateral.

Today, the Farm Credit System is a network of 101 borrower-owned lending institutions and related service organizations serving U.S. agriculture and rural America. These institutions specialize in providing credit and related services to farmers, ranchers and producers or harvesters of aquatic products. In addition, the Farm Credit System provides financing for the processing and marketing activities of these borrowers as well as to rural homeowners, certain farm-related businesses and agricultural, aquatic and public utility cooperatives.

Unlike commercial banks, Farm Credit institutions do not take deposits. The System raises its funds through the sale of bonds in the nation's securities markets. As the System's customer-owners repay their loans, the bonds are retired and Farm Credit investors are repaid. The System's lending institutions are subject to full examination and regulation by an independent federal agency, the Farm Credit Administration.

"America's farmers, ranchers and rural communities have benefited greatly from the vision and foresight that went into establishing the customer-owned Farm Credit System," Lambertson said.

Broin's progress on this frontier has been encumbered by the same difficulties shared by Iogen and Abengoa. The conversion of the BFrac fiber fraction into ethanol has been hindered by the absence of an organism that will ferment C5 and C6 sugars simultaneously. The optimum pretreatment process will require the development (discovery) of an elusive multitasking ethanologen (fermentation-inducing agent).

Broin has already experienced some success in integrating other technologies into its plants. Broin's Project X (BPX), the company's own raw starch hydrolysis technology, has been successfully implemented on a commercial scale in 10 plants and the BFrac technology has been integrated into two. Given that BPX and BFrac are complementary processes, Broin's experience in technological integration could very well give it an edge in the integration of cellulosic ethanol.

DuPont takes a different approach

The $18.2 million equity investment DuPont project is titled: "Integrated Corn-Based Biorefinery." With help from Diversa, NREL, Michigan State University and Deere & Co., DuPont has taken a decidedly different approach in its cellulosic research-development-commercialization. DuPont expects to lead the way in developing a bio-refinery concept that converts both starch and lignocellulose to fermentable sugars for production of value-added chemicals and fuel ethanol.

DuPont has bio-engineered an organism to produce enzymes that break C6 sugars into a compound called Bio-PDO (a bio polymer, 1,3 propanediol), which is used to produce its Sorona-brand apparel fabric. Sorona was once made from a petroleum-based polymer. Bio-PDO is now expected to be the first of many future purified sugar products.

Exploiting the idea that "the cell is a factory" unleashes a seemingly boundless array of possibilities. This is essentially what happens in the fermentation stage of ethanol production. But just because the sugar is the feedstock doesn't necessarily mean that ethanol is the final product. DuPont uses both processes to make its cellulosic ethanol plant work — polymers, where the value lies, and ethanol as the plant's 'cash cow'. And just as with Iogen and Abengoa, DuPont will also build a power plant to burn the high-energy lignin generated in the pretreatment facility.

Don't ignore the synergies

The integration of cellulose process technology within existing dry mill (grain based) ethanol facilities seems to be the most practical approach to commercialization. It just makes sense to make use of the whole corn plant and get all the sugar from stalk and all, not just the starch.

continued on page 42

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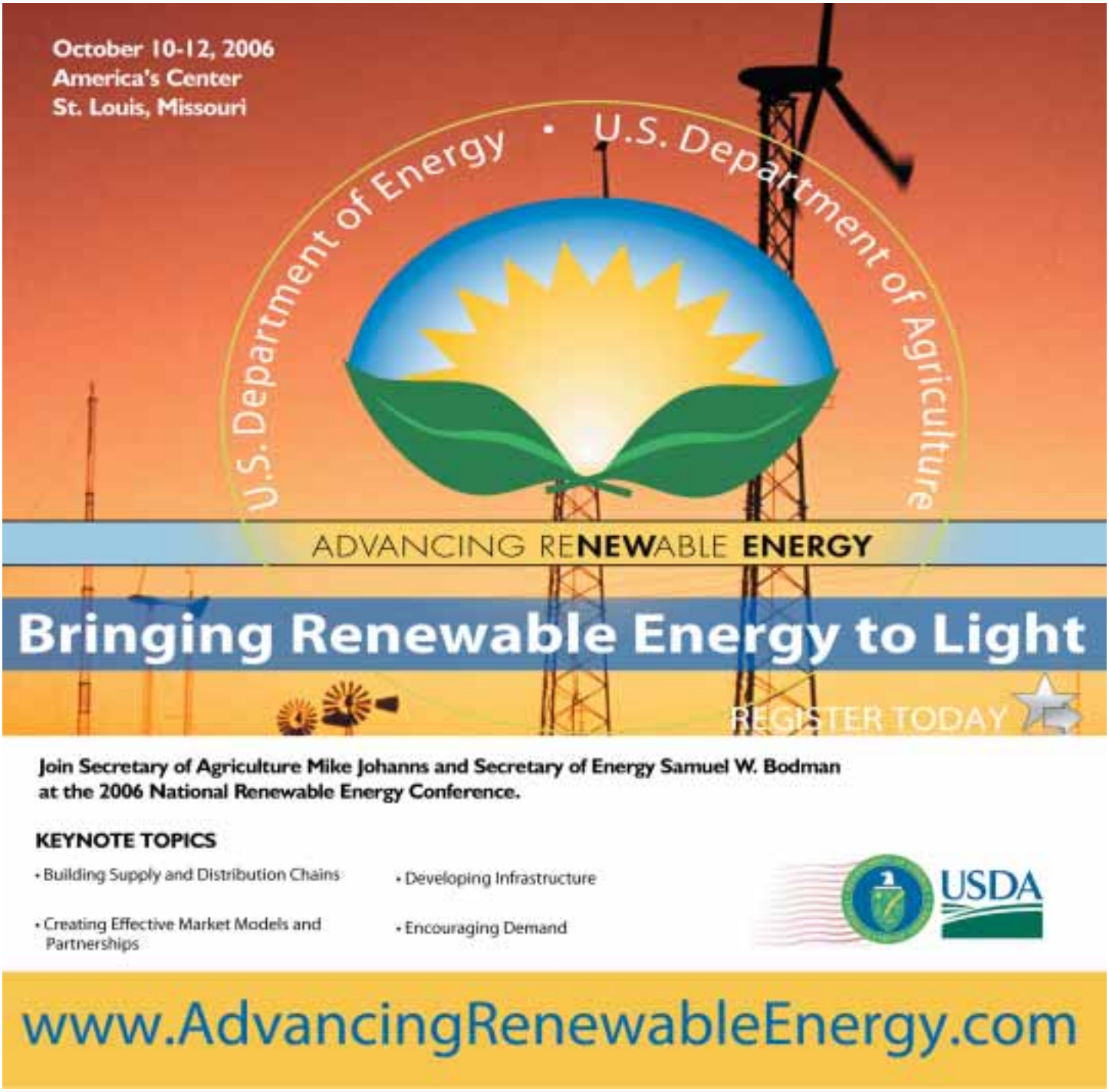
The primary differences between the dry mill fuel ethanol processing system and the cellulosic processes are the required pretreatment (hydrolysis). An ideal integrated facility would integrate the three key unit operations: hydrolysis (pretreatment), fermentation and distillation and share utilities and support systems, wherever possible. The glucose from starch and biomass processes would, of course, require bigger fermentation tanks. And a separate process would be required to use/preserve the recombinant organism necessary to ferment the pentose.

Perhaps the most practical approach at this moment would be to follow Broin's lead in recovering the corn fiber through the waste stream and produce ethanol from the lignocellulosic material. Processing the corn-fiber stream into ethanol will become increasingly attractive as excess supply continues to put downward pressure on distillers grain prices. Corn-fiber streams are typically comprised of 20 percent starch, 20 percent cellulose, and 25–30 percent hemi-cellulose — and priced below distillers grains.

Editor's note: For article references, e-mail anthony.crooks@wdc.usda.gov.



Community facilities essential for strong rural communities

By Greg Branum,
Missouri State Director
USDA Rural Development

As related in the cover story of this issue of *Rural Cooperatives*, we in Missouri are certainly excited about the developing biofuels industry in our state. We believe that overall it is having a strong, positive impact on our rural economy, and will provide even more benefits as more biofuel facilities are constructed.

USDA Rural Development is pleased that we were able to help support projects such as the Mid-Missouri Energy (MidMo) ethanol plant in Malta Bend with a timely Value Added Producer Grant (VAPG) of $500,000. That is just one of many awards made nationwide under this program to support producer-owned biofuels projects (see page 29). USDA Rural Development's Renewable Energy Systems and Energy Efficiency Program also provided more than $17 million this year to support 375 renewable energy efforts in 36 states.

But strong rural communities not only need ways to add value to their agricultural products, they also need good schools, medical facilities and so much more. USDA Rural Development promotes these types of essential public facilities through our Community Facilities Loan and Grant (CF) Program.

One example in the mid-Missouri area of how the CF program helps rural America is the I-70 Medical Center, about one hour east of Kansas City, in Sweet Springs, about 15 miles from the new MidMo ethanol plant. This medical center was the recipient of an $8 million CF grant, and one of four medical centers or hospitals financed in Missouri with USDA Rural Development CF funds during the last two years. The others are the Excelsior Springs Medical Center (northeast of Kansas City), the General John J. Pershing Hospital in Brookfield (in north-central Missouri) and Iron County Hospital in Ironton (about 100 miles southwest of St. Louis). Nationwide, during fiscal 2005, $729 million in CF Direct Loans, $194 million in CF Guaranteed Loans, and $55 million in CF grants was provided to construct more than 1,200 essential community facilities in rural America.

An $8 million Community Facilities grant from USDA Rural Development was used to build the new I-70 Medical Center in Sweet Springs, Mo. USDA photo by Dan Campbell

The I-70 Medical Center is a 28,333-square-foot, state-of-the-art facility that provides acute-care and emergency-care services to area residents. The 15 licensed acute-care beds provide health-care services to adult and senior in-patients.

The hospital also provides a variety of out-patient services, including surgery and diagnostic services. It also provides out-patient therapies, including physical, cardiac rehabilitation and emergency care. While not a trauma center, the I-70 Center provides much-needed medical services to both the area's senior population and the young.

The Community Facilities program has benefited more than 75 Missouri communities in the past year alone, with installation of more than 60 first-responder and early-warning systems. The CF program has also helped 10 Missouri cities acquire police, ambulance and fire or rescue vehicles. It has also helped fund the building of: a community center; two shelters for women suffering from domestic violence; a Head Start program building; a sheltered workshop and a 911 dispatch center.

For more information on the Community Facilities program, visit: www.rurdev.usda.gov/rhs/cf/cp.htm, or call (202) 720-4323, and see how it can help your community. ■

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