The brave new world of agriculture

Sustainable farming and adapting to climate changes

By Maria Sundeen

SUSTAINABLE
A system that can indefinitely sustain itself without degrading the land, the environment or the people.

The 2012 drought drastically cut crop yields across several states. Low farm yields in the Midwest due to the drought led to the highest crop insurance payouts in history. Payouts (indemnities) for the year exceeded $16 billion, an almost 50 percent jump from the then-record $10.8 billion paid out the year before. This was followed by 2013, a year in which relentless storms pummeled the Midwest this past spring.

With the very likely possibility that a new Farm Bill will be enacted sometime within the next year, it is almost a certainty that many farm subsidies will be cut. Support for crop insurance remains strong; however, it continues to have significant opposition. The crafting of a new Farm Bill will determine food, fiber, conservation and energy policies for the next five years, if not longer, and with it, insurance policies that have protected farmers from such losses.

With this in mind, farmers and ranchers are actively researching and integrating methods that will ensure improved efficiencies, sustainability, and allow flexibility in the face of changing climactic conditions.

Addressing climate changes

Changes in climate and weather patterns may pose considerable challenges for the agriculture and forestry sectors. These challenges include thriving pests, increases in heavy rainfall, record droughts and wildfires, and off-season weather patterns—all of which costs billions of dollars in economic losses. In the years to come, scientists anticipate:

- **Increased carbon dioxide levels**
- **Higher temperatures**
- **Higher humidity**
- **More erratic and extreme weather events**
- **Greater risk of floods, drought and fire**
- **Rising sea levels**

According to a report released by the 25x25 Alliance Adaptation Work Group, "Agriculture and Forestry in a Changing Climate: The Road Ahead," released in January 2012, satellite data indicate that spring has been arriving nearly two weeks earlier in much of the U.S. during the last two decades. Nationwide, intense rainfall events are on the rise and the average U.S. tempera-

"As an Ohio farmer, the past few years have been especially difficult for raising crops. And I am not alone. Many farmers, foresters, and ranchers across the nation are adjusting their operations to cope with increasingly variable and unpredictable weather."

—Fred Yoder, former 25x25 Alliance Adaptation Work Group Chair and Past President National Corn Growers Association

ture has risen more than 2°F over the past 50 years. A recent report in the journal Science concluded that for the past three decades changes in climate have reduced corn yields worldwide, relative to a stable climate, by 5.5 percent and wheat yields by 3.8 percent. Additional research conducted by the group provides examples that some farmers have undertaken to accommodate the changing climate. These examples include:

- **Modifying pest control techniques**
- **Switching temperature control systems, and using soakers and misters rather than fans**
- **Implementing a waste/methane digester to convert waste to energy (for heat and cold)**
- **Modifying cover crops to combat heavy rains and erosion**

Many farmers now invest in community-wide weather stations which can provide them with the up-to-the-minute weather data, including wind, temperature, and relative humidity. This critical data can provide needed information to make successful management adjustments, such as shifting to nighttime burning or activating wind-driven fuel sources.

"Work with the weather you're given but use the best science, art, and technology with an eye to what's coming," North Carolina forest manager Jim Gray says. "Adapt or retire. Those are the options as I see it."

The 25x25 Alliance Adaptation Work Group is coalition of agricultural commodity groups, academics, policy specialists, conservation experts, and technical specialists convened to analyze and explore the impacts of a changing climate on agriculture and its potential for developing new sources of renewable energy. Originally convened to assist in meeting the national renewable energy goal set in 2004 - 25 percent of US energy from renewable sources by the year 2025 - the group's initial focus on renewable biofuels such as ethanol has since expanded to integrate the greater realm of renewable and continually replenished energy sources such as wind, sunlight, wind, rain, tides, waves and geothermal heat.

Addressing sustainability

According to the Sustainable Agriculture Research and Education (SARE) group, sustainable agriculture promotes farming practices and methods that are profitable, environmentally sound, and good for the community by harnessing new technologies and renewing best practices.

All of this is interdependent, says Dr. John E. Ikerd, Extension Professor at the University of Missouri. "An agriculture that uses up or degrades its natural resource base, or pollutes the natural environment, eventually will lose its ability to produce. It's not sustainable. An agriculture that isn't profitable, at least over time, will not allow its farmers to stay in business. It's not sustainable. An agriculture that fails to meet the needs of society, as producers and citizens as well as consumers, will not be sustained by society. It's not sustainable. A sustainable agriculture must be all three - ecologically sound, economically viable and socially responsible. And the three must be in harmony."

At Dixon Ridge Farms in Winters, CA, owner Russ Lester makes use of innovative infrastructure to ensure his farm's processing is as sustainable as the growing practices. His 1,400 acre organic walnut orchard won the 2012 U.S. EPA Sustainable Agricultural Champion Award while focusing on energy efficiency, renewable energy, water conservation, soil fertility, and integrated pest management (IPM) and organic methods.

Lester uses a 50kW biogas powered generator that converts the farm's walnut shells into energy. The farm generates two million pounds of shells per year that used to be sent to co-generating plants or ground up for organic mulch. He is now producing more energy from this system than he uses much of the year. He receives a credit, which he then uses during the energy-intensive harvest time. He also captures this system's heat, along with recycled heat from the walnut dryer, to replace propane. His propane costs have dropped approximately 40%. Additional efficiencies include proprietary freezing techniques, super-insulation, moisture control and a unique low pressure sprinkler system.

Dixon Ridge Farms is just one example of increasing

efficiencies while maximizing agricultural and energy output. Kansas rancher Steve Irsik found that producing new breeds of cattle helped to alleviate problems he had with weeds and the diminished grazeland due to prolonged drought periods. Irsik has also improved efforts to retain water for his cropland, maintaining no till plantings to absorb big rains and prevent runoff, as well as tapping into an underground reservoir.

Lester emphasizes making changes as nature changes. "After all, sustainability and farming certainly are not stagnant," he states.

Alternative sources of energy: agriculture as a provider

These examples show that farms, ranches and forests are well-positioned to make significant contributions to the development and implementation of new agricultural efficiencies and innovative energy solutions. Long known and respected for their contributions to providing the nation's food and fiber, an emerging opportunity exists for crop, livestock, and grass and horticultural producers, as well as forest land owners, to become major producers of another essential commodity: energy. While a myriad of solutions are on the table, harvesting energy from America's working lands is already occurring. Converting animal manure into much-needed bio-gas and electricity while simultaneously reducing nutrient loads that degrade water quality is one avenue of development. Growing bio-energy crops like perennial grasses and fast-growing trees, which don't require annual tilling of the soil or the application of fertilizer, allows farmers to significantly reduce the amount of sediment and nutrients that might otherwise end up in streams, lakes and estuaries that feed into the bay.

Farm energy programs can include construction of solar, wind and bio-gas electricity generation systems. Changes include retrofitting equipment, barns and other farm infrastructure to improve energy efficiency, and developing grazing programs to improve soil, water and air quality and wildlife habitat. Wind turbines provide additional and diversified income to land owners without disturbing ongoing agricultural or forestry operations, and solar facilities are typically installed on existing buildings. The list goes on and on. The opportunities for agricultural producers to streamline efficiencies and improve profits by deploying new and evolving technologies are immeasurable.

Transformation

Adapting agriculture to new technology-driven models will be no small task, however larger farms and ranches have already taken these opportunities. Since 2000, the production of energy from biomass, wind, solar, hydroelectric and geothermal energy has grown a remarkable 66 percent and consumption has jumped 67 percent.

According to Scott Faber, the vice president for government affairs for the Environment Working Group, farm subsidy programs grew out of a desire to provide a stable source of food during the Great Depression. As the demand for energy independence and economic efficiencies increases, farmers and ranchers may be forced to re-think the role of agriculture – as not only one of acquiring food and fiber, but also one of aggregating energy sources.

The changing climate, as well as looming changes in subsidies, will effectively force this transformation. As a result, agriculture will be necessarily thrust to the forefront of a new frontier.

Portions of this article were taken from the following sources:

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