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## ARTICLES

# The Ever-Evolving Farmer

## Why Colorado's producers must adapt to a more tenuous water supply and how they're making it work

By Joshua Zaffos

**As the calendar turned to 2012, Colorado's farmers and ranchers resumed their annual winter sport: watching mountain snowpack measurements and reservoir levels. A dry winter did little to bolster existing state water supplies. For weeks, heavy winds raked the eastern plains and western mesas, sapping moisture from the ground. Even though many reservoirs and lakes contained sufficient water, observers saw early indications of drought, reminiscent of the harsh conditions of 2002. Worst fears became reality as winter turned to spring, and then most of Colorado experienced its hottest summer on record, dating back to 1895.**

Along the Bessemer Ditch near Pueblo, Tom Rusler, whose family grows a mix of onions, pinto beans and corn and also raises cattle, was among many agricultural producers who didn't take anything for granted. After assessing the snowpack, reservoir levels and projected streamflows in the Arkansas River Basin, Rusler decided to fallow 30 percent of his family's fields. "We learned from the last decade, and we planned ahead," says Rusler.

Rollbacks in planting during dry years reduce short-term crop losses in a profession defined by its risks and unexpected costs. Longer-term adaptations in farming practices, crop rotations, water use and irrigation technology are helping farmers use water more efficiently, while innovative new partnerships are also exploring how farming can persist in the face of limited water supplies. Some strategies move farther afield: Rusler's past investments in an onion packing shed and equipment for processing and packaging beans have supported his family through the lean times.

Lessons for Colorado farmers and ranchers haven't come easy—or cheap. Nor have they all come soon enough to keep some farmers in business. In addition to lingering drought conditions, increased demands for water from communities and industry have combined to diminish supplies for irrigated farms. Amid the pressure, some farmers have sold off water rights to cities or energy companies, while others, including Rusler and his family, are forging ahead into the parched future.

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“We know there’s interest [in buying our water], and there are days when you think about that,” Rusler says, “but we’re so busy with how we make our living, we just keep our nose to the grindstone.”

### **Limiting Factors**

Farmers across the state share Rusler’s shrewd outlook and stick-to-itiveness; such an attitude is one more crop raised through tough times in a rapidly urbanizing landscape. Still, irrigated agriculture is already facing likely declines. Steady population growth is continually increasing communities’ demands for firm water supplies. At the same time, the expanding oil and natural gas industry is leasing surplus water that cities have stocked up, competing with farms that frequently lease the same supplies at a much cheaper rate.

Legal obligations to downstream states also constrain resources. Interstate water compacts and endangered species recovery plans mandate certain river flows reach beyond state lines. Additionally, groundwater wells in the Rio Grande, Republican and South Platte river basins have been shown to affect streamflows, leading to pumping restrictions and increasing demand from farmers seeking a more sustainable water source.

Such factors are partially responsible for the over-allocation of nearly every river system in Colorado, meaning that water rights held by expectant users exceed the actual supply of water available during most years.

Growing cities have turned to a “buy and dry” strategy in recent decades—purchasing farmers’ water rights and drying up agricultural lands to prepare for increasing demand. Such practices have played a role in drying up at least 400,000 acres—about 12.5 percent—of the state’s irrigated farmland during the last decade, though other factors, such as housing developments, have also contributed. Even though agriculture still accounts for approximately 86 percent of the state’s water diversions, both city utility managers and rural families now generally recognize that buy and dry is threatening the state’s agricultural legacy, food production and open space. The situation is especially dire throughout eastern Colorado: The South Platte Basin, which covers much of northeastern Colorado and the Denver metro area, counts nine of the state’s top 10 agricultural production counties, while the southeastern Arkansas Basin is the state’s next most significant agricultural region. These same regions are projected to house the majority of incoming residents.

### **Scaling Back**

Considering the outlook, it’s little wonder that farmers choose to focus on their field labors. But ignoring problems or resisting change isn’t an option. Families and farm operators have responded to the pressures of shrinking water supplies by updating agricultural practices and water management techniques to stretch their resources. One such shift has been a move away from more water-intensive crops.

In the San Luis Valley, unsustainable groundwater depletions led to restrictions on well pumping, threatening the region’s potato farmers. In response, the local water district instituted a fallowing program that pays farmers to idle fields or cap water use. “We’re afraid we’re going to run out of water completely,” says Anna Brownell, whose family grows certified seed potatoes as the Zapata Seed Company. Brownell, who has recently returned to the farm to work with her father and brother, says the family has conserved water by growing Sudan grass and radishes, instead of barley and wheat, as cover crops while rotating fields between potatoes. By carefully tracking water use during the growing season, the Brownells make sure they don’t exceed their legal share or have to pay for excess pumping. Operators in the valley who have failed to take similar measures have been forced to abandon potato fields mid-season after running out of water, losing large investments in seeds, fertilizer and labor.

In the South Platte Basin, Dave Dechant farms over 2,000 acres near Fort Lupton. Impacted by well-pumping restrictions and drought effects over the last decade, Dechant has halted irrigation on several fields and turned to

dryland farming on those acres using drought-tolerant crop strains and seeds. After growing mostly alfalfa— which is in high demand from regional dairies—Dechant has tried farming sunflowers and more corn and wheat in recent years since those crops use less water. He has also reduced his production from four to three cuttings of alfalfa.

The adjustments have allowed him to make the most of available supplies, but they've also complicated his operations. Fewer cuttings mean less income. Birds feasted on the sunflowers. During the harsh past summer, his dryland crops were a failure. If the dry conditions persist, Dechant says he'll be forced to plant even less alfalfa and turn off more sprinklers. "I don't want to sell my water, and I don't like seeing farm ground dried up to go to the cities," says Dechant, but he admits he's contemplated that outcome. Even if plans for new water storage in northeastern Colorado come to fruition, he concludes, "I don't see too bright a future for irrigated farming on the Front Range."

Researchers, however, are working to alter that outlook.

### **Experimental Savings**

A few miles outside the city of Greeley, where city blocks give way to cornfields and gas drilling pads, Tom Trout leads studies on U.S. Department of Agriculture experimental farmland. Trout, research leader for the USDA Agricultural Research Service's Water Management Research Unit in Ft. Collins, has managed the agency's 50-acre Limited Irrigation Research Farm in Greeley since 2006. "We believe the limiting resource in the future is going to be water," Trout says. "We're trying to figure out how to sustain productive irrigated agriculture with less water. It's a tall order."

Trout and other researchers have planted corn, wheat, pinto beans and sunflowers— common regional crops—and monitored how they've responded to different tilling practices as well as irrigation levels and techniques. Colorado State University scientists working on-site are also examining how different combinations and rotations of crops affect field productivity. CSU soil scientist Neil Hansen has demonstrated that an alfalfa farmer can use limited irrigation in spring and fall and let the crop go dormant in the summer and still achieve viable production. Such results are helping land managers optimize outcomes using less water, a strategy called deficit irrigation.

Instrumentation, such as infrared thermometers and weather stations, can track crop stress and measure temperatures, sunlight, wind and humidity to inform what conditions trigger harvest declines or increases in weeds. Trout says he can't yet offer prescriptions for deficit irrigation, but the research is already influencing on-the-ground operations around the state.

One major finding so far has been the benefit of strip tilling—a practice that disturbs a small percentage of the soil while leaving most of the past season's crop residue behind in the form of cornstalks and wheat stubble. Prior to the 2002 drought, most farmers carried out conventional tillage programs, fully clearing fields of leftover vegetation. Thorough tilling was easier for controlling weeds and managing ditches, especially since most fields were historically watered through flood irrigation where water is released in field-length furrows. While generally considered inefficient, flood irrigation dates back to the first generation of farmers who helped settle Colorado.

Strip tilling or no-till practices save labor and reduce fuel consumption and equipment wear, protect against erosion and crop stress, and increase crop yields. The leftover organic materials temper the sun's heat and reduce evaporation and runoff while increasing soil health. Strip tilling also captures and retains field moisture from snow in the winter and rain in the spring, which supports early season crop growth, so farmers can save their allocated water for later in the season, Trout says.

Many farmers across the state have adopted strip tilling and no-till strategies during the past decade, following the guidance of the USDA, county extension agents and seed companies, including Monsanto. The shift has been enabled by an increase in sprinkler and center pivot irrigation instead of conventional flood irrigation, also improving efficiency and tracking of water use. Technology has played a role, too: Some farmers utilize global positioning system (GPS) software when tilling, spraying or seeding fields to maximize the benefits of strip tilling.

### **Learning Curve**

The transition hasn't been without its challenges. "When you change to new practices, it's a learning experience," says Kent Pepler, president of the grassroots Rocky Mountain Farmers Union and a fourth-generation farmer in Mead, a small town near Longmont. Pepler, who raises about 500 acres of corn, wheat and alfalfa, points out that flood irrigation typically allows farmers who recognize crop stress to rapidly release water and boost field moisture during hot periods, while sprinklers can only apply water at a more limited rate. Additionally, installing center pivots is an expensive undertaking without financial assistance.

A fiercer critique from many farmers is that they do not benefit from incentives for more efficient irrigation. In fact, the consequences of greater irrigation efficiency along the lower Arkansas River have been increased costs to farm and ranch operators.

On about 1,200 acres south of Rocky Ford, Rollie Jacquart has coped with water shortages by planting more sorghum instead of alfalfa and corn. Sorghum uses about one-third less water than corn, Jacquart estimates, but he can still sell the crop to cattle ranches and feedlots.

Jacquart, like many other farmers, has installed center pivots on some of his fields, but says the move is about saving labor, not water. Because sprinklers apply water more efficiently to crops than flooding, less water percolates deeper into the ground to eventually return to the river system to be reused. That presents a problem for state water administrators who are responsible for sending a certain volume of water downstream to Kansas under the terms of an interstate water compact and related lawsuit. The river system—and others in the state—relies on those return flows to fulfill such obligations. Irrigators are caught in the middle, and local water districts and ditch companies must augment shortages by acquiring water from other sources.

Farmers with center pivot sprinklers have borne the brunt of this arrangement. Through a plan with the State Engineer's Office, which oversees water rights and resources, the Lower Arkansas Valley Water Conservancy District uses funds collected from irrigators to seasonally buy municipal water stored in reservoirs and deliver it to the river to boost flows. The plan has led to resentment from farmers, and as reservoir levels drop and supplies decline, it costs more to purchase the water. Rusler, among others, credits the district with doing a good job of administering the system. But farmers and ranchers say the plan discourages them from more widely installing sprinkler systems on all their fields. Certainly such consequences are among the reasons few farmers have considered even higher-efficiency drip irrigation systems, especially since they are expensive and require significant know-how.

The catch-22 in the Arkansas Basin hasn't gone unnoticed in other parts of the state either. "The problem you see in the Arkansas Valley is going to move north," says Pepler, referring to similar downstream obligations for the South Platte and Republican rivers that could trigger a comparable chain of events.

### **Staying in Business**

By August 2012, all of Colorado was suffering drought; severe and extreme conditions dominated 90 percent of the state, and many farmers had exhausted available water supplies. If a dry winter follows, reservoirs will be critically low. Water prices are projected to roughly double in 2013, hiking costs for irrigators.

On the Grand Mesa in western Colorado, fourth-generation rancher Carlyle Currier and others endured early summer heat and strong winds that dried out the ground even before cattle were moved onto pastures. Currier, who uses linear, or side-roll, sprinklers to irrigate, says reservoir storage helped dampen the drought's impact, but he still wound up with half his anticipated hay production and was forced to buy more forage. Widespread drought throughout the West and Midwest also raised the price of hay and other feed crops, further cutting into ranchers' bottom lines.

Volatile crop yields, commodity prices and other market effects are risks that agricultural producers must live with. Water scarcity and its consequences can exacerbate such risks, and when water, seed, fertilizer or feed costs rise and crop price drop, the loss in revenue and production ripple through local communities and the state economy.

Many producers protect themselves with crop insurance. Sam Sonnenberg, a Sterling-based crop insurance agent, says nearly 95 percent of Eastern Plains corn growers carry crop and hail insurance. The federally subsidized coverage provides protection if a catastrophic storm or pest outbreak occurs, or if yields don't meet farmers' average production. Due to this year's drought in Colorado and beyond, the industry is projecting record claims and payments, Sonnenberg says, surpassing last year's then-record figures.

But livestock and some crops, including alfalfa, are not eligible for the federally subsidized insurance packages, so decisions to plant alternatives to corn—and potentially conserve water—can expose operators to higher risks.

Ever-innovating to remain viable, farmers have teamed up with city representatives, water attorneys, engineers and environmentalists on several proposals to share water without selling off agricultural supplies, while also creating a new revenue stream for strapped land managers.

A pilot project with irrigators on Lake Canal will take a first crack at temporarily transferring water to the city of Fort Collins and environmental interests through an "interruptible water supply agreement." The city and The Nature Conservancy will pay \$30,000 for 60 acre feet of water from Lake Canal irrigators during certain years, but not more than three years each decade. The agreement, allowed through a 2003 law, will compensate farmers who lease their water without requiring approval from state water courts or compromising their future.

"It's all about how do we get valid research and, more specifically, transfer water from agriculture to other demands and not enhance the detrimental aspects of buy and dry," says Stephen Smith, an irrigation engineer with Regenes Management Group, based in Denver, which is facilitating the project.

Regenes Management Group will monitor the water transfers and impacts to farm fields using software developed in conjunction with the USDA Limited Irrigation Research Farm managed by Tom Trout. The data tracking will add to what researchers know about how fields respond to deficit irrigation, dryland farming or fallowing. Grants from the Colorado Water Conservation Board are supporting the

effort, which is slated to start in 2013. Another CWCB grant project involving Regenesys, in partnership with the Colorado Corn Growers Association, Ducks Unlimited and Aurora Water, is exploring a “flex market” for water, enabling willing irrigators to lease water to cities or other interests without permanently changing the legal use.

The infusion of revenue from water leasing can help families ride out dry times, while mitigating the costs of efficiency measures. Incoming funds can be used to purchase sprinkler or even drip irrigation systems, Smith says, and the USDA’s Environmental Quality Incentives Program, known as EQIP, will provide cost-share financial assistance for such improvements.

For now, many farmers are taking a wait-and-see approach; others express skepticism to the benefits of water leasing. One lingering problem is that farmers cannot halt production for a year without losing long-term customers or labor, says Rusler. Neither can fruit growers just turn off water for a season without losing orchards or vineyards.

Those concerns notwithstanding, farmers and ranchers recognize that something has to give. Even if a wet and snowy winter refills reservoirs, financial pressures to sell agricultural water and convert it for municipal or industrial purposes aren’t going to recede. Expansion of existing reservoirs and new storage projects may ease some of the strain, and many farmers and ranchers consider such developments essential. But additional storage won’t halt the growth—or overturn drought and climate trends.

Despite his doubts, Rusler encouraged his sons to follow him into agriculture and they are already helping with operations. This new generation of farmers and ranchers is budding all over the state, hoping to preserve rural family spreads and maintain Colorado’s food production legacy. At the same time, many rural children are choosing careers away from the farm, persuaded by their relatives to steer clear of agriculture’s inherent risks.

Ask 10 farmers for an opinion on the drought-constrained future of agriculture and you’ll hear back at least as many different viewpoints. There is fear and bitterness, along with poise and hope. Those rural streaks of independence also breed resilience and resourcefulness. “Farmers are unsung heroes when it comes to being businessmen,” says Pepler. “Morning to night, we live this stuff.”

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