Western Economics Forum
A Journal of the Western Agricultural Economics Association

Exploring the Potential for Innovative Water Management Strategies to Support Irrigated Farmland Transitions: Three Case Studies in Colorado

Rebecca R. Ford,[1] Daniel F. Mooney,[2] Rebecca L. Hill,[3] Madeline Wilson,[4] Martha Sullins,[5] Perry Cabot,[6] and Andy Seidl[7]

Abstract
This article examines the interconnected challenges of water scarcity and irrigated farmland transitions in Colorado. Through case studies from the Rio Grande, Arkansas, and South Platte Basins, we highlight the potential for innovative water management strategies to support new and beginning farmers and help preserve irrigated farmland.

Keywords: agricultural policy; beginning farmers; irrigation; water policy; water scarcity.

Acknowledgments: This work was supported by the Colorado State University Extension summer internship program (R.F.) and a grant on Arid Climate Water Management Strategies from the Platte River Water Development Authority (R.F., D.M., R.H.). The authors acknowledge helpful conversation and comments from many people, including Larry Brown, Amy Pacheco, George Whitten, Julie Sullivan, Jason VonLembke, Kelly Roesch, and the Central Colorado Water Conservancy District and Rio Grande Conservation Board.

Introduction

Ensuring resilient food and agricultural systems in the U.S. West will require addressing significant challenges, including aging farmer populations (Jablonski et al., 2022) and increasing water scarcity (Mancosu et al., 2015). Part of the solution will entail preparing current irrigated farms and ranches for succession and transition (Roberts, 2021), supporting new and beginning irrigated farmer entrants (Freegood and Dempsey, 2014), and identifying and promoting water management strategies that increase the chance of success for the next generation (Ingrao et al., 2023). The academic literature extensively addresses these topics separately but lacks interconnected examinations of how programs and policies addressing water scarcity may contribute to (or impede) successful irrigated transitions. Addressing them in tandem could help slow the loss of irrigated farms and land in this region.

---

[1] Undergraduate Student, Department of Agricultural and Resource Economics, Colorado State University, Fort Collins, CO
[2] Associate Professor and corresponding author, Department of Agricultural and Resource Economics, 275 Nutrien Building, Colorado State University, Fort Collins, CO 80523-1172, daniel.mooney@colostate.edu
[3] Extension Professor, Office of Engagement and Extension, Colorado State University, Fort Collins, CO
[4] Extension Area Specialist, Office of Engagement and Extension, Colorado State University, Monte Vista, CO
[5] Extension Regional Specialist-Front Range Region, Office of Engagement and Extension, Colorado State University, Fort Collins, CO
[6] Extension Professor, Office of Engagement and Extension, Colorado State University, Fruita, CO
[7] Professor, Department of Agricultural and Resource Economics, Colorado State University, Fort Collins, CO

Many prospective irrigated farmers and ranchers lack access to land or water rights, and purchasing these assets is often prohibitively expensive. Typically, they need to inherit land, borrow significant amounts, or gain access through leasing, options that are not always possible. Colorado is particularly relevant for this issue for two reasons. First, agricultural and water stakeholders in the state have a long history of exploring and implementing innovative water management programs and practices. Second, irrigated farmland values are relatively high and pose a significant barrier to entry for new and beginning farmers, averaging $6,620 per acre in 2023 (USDA-NASS, 2025).[1] A recent update to the Colorado Water Plan recognized the need to support new and beginning farmers through education, peer networks, and coordinating capacity building across agencies and organizations (CWCB, 2023).

Programs and policies that address short-term water scarcity may have long-term implications for land use and agricultural viability that could be unintended (e.g., further increase irrigated land values, or decrease irrigation availability) and increase the barriers to entry for prospective producers. For example, collaborative water sharing programs (formerly called alternative water transfers) have been proposed and implemented to varying extents in Colorado (CWCB, 2020). The effect of these programs on irrigated farmland values is not known, but if the value of water sharing payments increases, it could hypothetically increase land values. In contrast, farmland that faces irrigation restrictions from groundwater depletion management could decrease in value, lowering the barriers to entry. Similarly, working lands that have deed restrictions on non-agricultural uses often result in lower market values for exclusively agricultural uses, even though water rights are typically retained. Additionally, there may be opportunities for farmers to benefit from conservation programs potentially improving their bottom line by cultivating public and private benefits (Seidl et al., 2017, 2018). However, in these latter cases, new producers would need to adapt their production systems to remain viable, considering the limited irrigation resources.

Without strategies to support successful transitions, irrigated farming and ranching could grow further out of reach for prospective entrants. This article presents case studies from three Colorado river basins—the Rio Grande, South Platte, and Arkansas—and develops takeaways for further consideration. For each, we summarize the water scarcity context, describe a strategy for adapting to limited irrigation resources, and discuss local examples to illustrate how these strategies can relate to irrigated farmland transitions. The strategies we consider are regenerative agriculture to improve soil moisture utilization (livestock integration, crop diversification, etc.), irrigation technology subsidized through voluntary water sharing agreements to increase water use efficiency, and incubator farms on farmland preserved through land and water trusts.

Background

In 2022, Colorado had 36,056 farm and ranch operations and over 30 million acres of land in farms. Nearly half utilized irrigation, with irrigated lands representing just under 10% of all farmland (USDA-NASS, 2023a).[2] Among irrigated operations, about half earned 50% or more of their agricultural sales from irrigated crop and livestock products in 2023 (USDA-NASS, 2024). However, a recent downward trend in the number of irrigated farms and irrigated farmland

---

[1] Six states in the U.S. West had higher average irrigated land values than Colorado in 2023, with California the highest at $19,700. Wyoming was the lowest at $3,100 (USDA-NASS, 2025).

[2] In Colorado, land in farms is dominated by extensive production systems like dryland cropping and non-irrigated pasture and rangelands for livestock. The large share of income from the relatively small irrigated land area highlights the role of irrigated agriculture in farm viability.

between 2017 and 2022 stresses the need for continued focus on irrigated transitions (Table 1). A 2020 report revealed that 8% of Colorado's irrigated land has been lost in recent decades (CWCB, 2020). Irrigated land area could decline by an additional 400,000 to 500,000 acres by 2050 due to factors like urbanization, water transfers, and groundwater depletion; while, at the same time, farm and ranch demand for agricultural water could increase by up to 500,000 acre-feet due to climate-related adaptations (Water Education Colorado, 2024).

Table 1. Number of Farms, Land in Farms, and Irrigated Land in Case Study Basins

Statistic	Basin[a]	2017	2022
Total Farm Operations (number)			
	Rio Grande Headwaters	1,643	1,371
	Arkansas	7,438	6,333
	South Platte	16,925	15,737
Total Land in Farms (millions of acres)			
	Rio Grande Headwaters	1.29	1.10
	Arkansas	10.45	8.97
	South Platte	10.48	9.99
Irrigated Farm Operations (number)			
	Rio Grande Headwaters	1,149	1,371
	Arkansas	2,301	1,840
	South Platte	5,028	4,413
Irrigated Land (thousands of acres)			
	Rio Grande Headwaters	441.6	312.7
	Arkansas	315.8	245.4
	South Platte	953.5	783.2

a/ The basins correspond to watershed listings by Hydrological Unit Code (HUC) by Water Resource Region (USDA, 2024; USDA, 2019). The Rio Grande Headwaters (HUC 130100) is in the Rio Grande Water Resource Region, the Arkansas (HUC 110200) is in Arkansas-White-Red Water Resource Region, and the South Platte (HUC 101900) is in the Missouri Water Resource Region.

Preserving irrigated agriculture in Colorado is recognized as important because of its direct role in supporting farm viability and local economies. The loss of irrigation rights and conversion of land can negatively impact rural communities through decreased land values, diminished economic activity, degraded river ecology and recreation, and a disrupted sense of place (Holm, 2022; Hill and Pritchett, 2016). Working landscapes also provide substantial public good values that higher density land uses do not, including, for example: community separators, water filtration and regulation, wildlife habitat, climate regulation through carbon sequestration, unfettered views, historical or cultural benefits, and, potentially, recreation and tourism opportunities (Seidl et al., 2018; Angelo et al., 2021).

Aging Farmers and Farmland Transition Challenges

Between 2017 and 2022, the average age of producers in Colorado increased from 57.6 to 58.3 (Colorado Agricultural Statistics Service, 2020 and 2024).[3] The average age of new and beginning producers also increased from 47.7 to 49.0 over this period. Without a new generation ready and able to take over for retiring owners and operators, irrigated farms are at greater risk of being purchased as part of "buy and dry" transactions. This occurs when land with senior water rights is purchased, and the water is transferred to non-agricultural uses. The land is left permanently fallowed, used for rain-fed crops or pasture, or developed into housing or other non-agricultural uses. This process tends to happen gradually over time and, although it will likely always continue to some extent, could be slowed and managed to preserve more irrigated farming operations through the greater use of alternatives to permanent dry-up (DiNatale Water Consultants, 2013) and support for farmland preservation and transition (COFSAC, 2022).

Barriers to Entry for New and Beginning Farmers

One driver of these trends is that the value of land and water rights poses a barrier to entry for new farmers and ranchers. Many transitioning farms enter "buy and dry" transactions because neither the retiring farmers nor the next generation can afford to continue farming. They struggle to transition in a way that preserves irrigated agricultural use because new prospective farmers and ranchers cannot secure the necessary capital and water rights. Water rights, essential for irrigated farming, are among the farmer's most valuable assets and can provide financial support in retirement. The value of water rights is capitalized into the value of irrigated farmland. In Colorado, municipalities and other water users highly value senior water rights, and farmers often receive a premium for those rights. Another common outcome for transitioning farmland is for it to remain in agriculture but become part of a family or real estate trust, with the production responsibilities carried out by a non-owner operator. The ability for prospective new and beginning farmers to obtain loans to purchase land and water rights is also often constrained because lenders generally require several years of business records to qualify for financing.

Support for New and Beginning Farmers

Nationally, the USDA sponsors several initiatives to support new and beginning farmers. They include Young Farmer loans (i.e., producers under age 35) and support for natural resource conservation, climate-smart agriculture, and farm management. Additionally, the USDA Farm Service Agency [FSA] provides loans and guarantees to beginning farmers (i.e., those with less than 10 years' experience), allowing those potentially ineligible for commercial loans to start building a farming operation. Other state-level efforts are also ongoing. For example, a state Agricultural Future Loan bill was revised to reduce the barriers to entry for individuals who foresee owning agricultural land in the future. This change represented a success for supporting new farmers and ranchers as it helped them tackle capital, land, and water price challenges. At local levels, conservation efforts through entities like land and water trusts also assist new farmers and ranchers by addressing entry barriers. Water trusts are a specific type of conservation trust in the Western United States that collaborates with farmers, ranchers, and municipalities to buy and lease water rights to enhance stream flow and protect wildlife habitats. They also help operators invest in on-farm infrastructure to optimize water use. A 2022 report by the Colorado Food Systems Advisory Council (COFSAC) highlights additional ongoing programs and efforts in the state related to land and water conservation (COFSAC, 2022).

---

[3] This is a continuing trend. The average age of principal operators in Colorado in 1997 was 53.5.

Need for Innovative Water Management Strategies among New and Beginning Farmers

While programs and efforts that facilitate entry into agriculture for new and beginning farmers are ongoing, the available financial support is often insufficient to purchase land and water outright. As a result, they need to find creative ways to use resources strategically, conserve and stretch their water resources, and carefully manage their costs to remain viable while also building experience, equity, and business records to operate independently and expand over time. The implication is that the issues of farmland transition and identifying innovative strategies to manage water scarcity should be considered in tandem more often, especially in arid and semi-arid regions like the U.S. West. Although the water scarcity context in Colorado varies depending on geographical, legal, cultural, climate, and other factors, some state and regional efforts have sought to identify and address the challenges for irrigated farmland transitions.

The 2022 COFSAC report outlined recommendations for addressing these challenges. They included: establishing new grant/loan programs that address existing gaps or offer more flexible financing arrangements, exploring tax credit programs specifically designed to benefit new and beginning farmers, developing a beginning farmer land dataset including relevant pending and successful farmland transfers, and providing reduced-cost legal assistance, financial planning, and succession support for transitioning farms. Although water resources are discussed in the report, and a link between these challenges and water issues is mentioned, the report primarily focuses on financial, information development, and legal matters in discussing proposed support for new and beginning farmers.

Previous academic studies also examined this nexus. Hilimire and Greenberg (2019) discussed the water conservation behaviors of beginning farmers in the U.S. West. They found that most prioritized water conservation, with over 90% reporting using at least one conservation practice. The most common practices included improving organic soil matter, enhancing irrigation efficiency, and experimenting with drought-tolerant crops. Drought affected beginning farmers, leading to increased interest in water conservation. Moreover, a sense of stewardship and higher levels of education were strong predictors of using water conservation practices. They also highlighted the importance of social networks and their influence on spreading conservation strategies among beginning farmers.

Case Studies

To account for the variation in water scarcity contexts across Colorado, we present case studies from three major river basins: the Rio Grande, Arkansas, and South Platte (Figure 1). They highlight examples of innovative strategies that have potential for broader application in those basins, but are not exhaustive of all strategies being implemented or proposed. Moreover, the potential use of a particular highlighted strategy is not limited to that basin and may have potential applications in other areas across the state or the U.S. West more broadly[4].

[4] Other regions that also face water scarcity, like the Upper Colorado River Basin, are not discussed due to article length limitations.

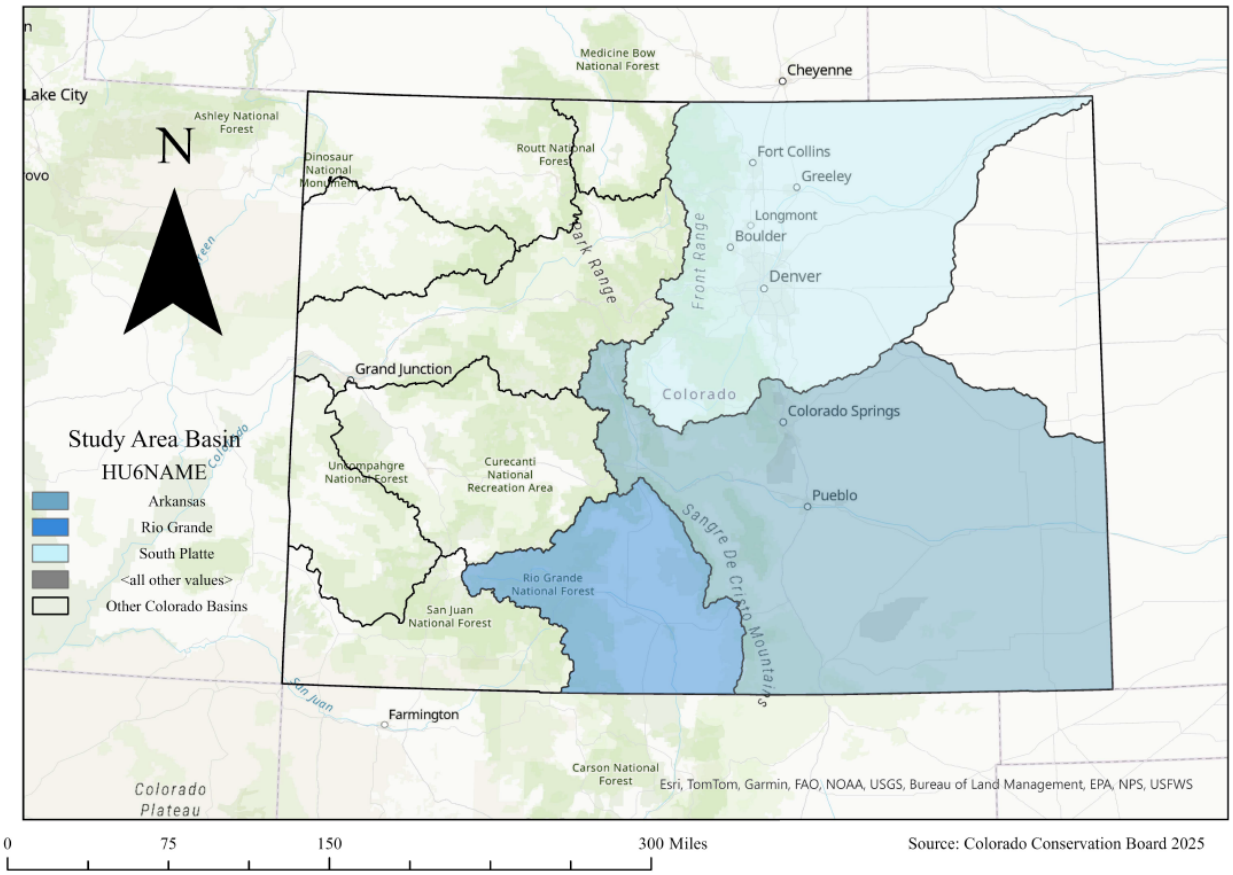

Figure 1. Map of Colorado River Basins with Case Study Locations Highlighted.

Case Study #1: Rio Grande

Background and Water Context

Located in the headwaters of the Rio Grande Basin, the San Luis Valley is one of Colorado's driest regions. Farming and ranching account for $340 million in annual sales and are responsible for 18% of regional jobs (Alamosa Citizen & Obmascik, 2021). It has 1.10 million acres of land in farms and 28% is irrigated (Table 1). The valley produces several agricultural commodities, such as cattle and beans; however, it is most well-known for potatoes. In 2019, 48,400 acres of potatoes were harvested in the San Luis Valley (USDA NASS, 2025). Irrigation largely depends on groundwater from aquifers; however, over-extraction raises concerns about long-term sustainability. Water levels have been declining and water withdrawals have exceeded recharge from diversions and natural sources in most areas.

The Rio Grande Water Conservation District (RGWCD) was formed to protect and develop water resources in the Rio Grande Basin (RGWCD, n.d.). They oversee recharge projects that return water to underground aquifers through recharge ponds and water banking. The RGWCD divided the valley region into 6 subdistricts to ease administration and conservation. Additionally, each subdistrict is governed separately with unique regulations since the aquifer of extraction differs.

Water resources in the San Luis Valley are scarce, even with the work of the RGWCD; necessitating a variety of strategies for new and beginning farmers and ranchers in the area to maintain viable farming operations while minimizing irrigation and preparing for additional restrictions due to the groundwater depletion and interstate compacts. Water and pumping costs are also a significant consideration. For instance, the largest subdistrict (Subdistrict 1) faces a huge increase in pumping fees, from $150 to $500 acre-foot in 2026–2027. This incentivizes limiting consumptive water use, especially for potatoes and alfalfa, which are dominant crops.

Water Management Strategy

An innovative water management strategy currently being explored in the San Luis Valley is to stretch limited irrigation resources by incorporating regenerative agricultural practices. They include crop diversification, building soil health, and integrating livestock that are important for maximizing limited water resources. Diversifying enterprises can benefit new and beginning farmers by helping to maintain cash flows during droughts while reducing dependence on water-intensive crops. Investing in soil health, with strategies like no- or low-till farming and promoting root biomass growth, enhances the soil's ability to absorb and store water (Lankford and Orr, 2022). This can reduce the need for external pumping, which lowers costs, and conserves water. For resource-limited farmers and ranchers, these practices could help them remain viable in challenging production environments while reducing water needs (Schattman, Rowland, and Keleman, 2023).

A 2019 report on Colorado agriculture by The Nature Conservancy (Smith, n.d.) focused on the potential link between regenerative agriculture and water scarcity. The report hypothesizes that regenerative practices can increase soil organic matter, enhancing the soil's water-holding capacity by improving soil structure, stability, porosity, and water retention. This could reduce the need for irrigation, thereby conserving water. However, it notes that most research on regenerative agriculture has been conducted in non-arid soils. More research is needed to confirm its effectiveness in soils like those in much of Colorado and the US West, with unique challenges like low soil organic matter and water deficiency. The report called for more pilot projects and long-term studies to validate these impacts in Colorado.

Although regenerative practices could benefit arid regions, the report also addresses other issues facing new and beginning farmers. Like other conservation practices, financial incentives are important for adopting regenerative practices by offsetting the initial costs and risks. They point out that middle-aged farmers are more likely to adopt regenerative practices because their relative financial stability allows them to assume some risk. However, they are still young enough to remain flexible in learning and implementing new practices. Incentive programs could help overcome financial barriers by providing funds or subsidies for purchasing equipment, covering the implementation costs for new practices, or compensating for potential short-term yield reductions. This could make it more feasible for farmers, especially those with limited financial resources, to adopt regenerative practices and realize long-term benefits.

Local Examples

Farms in the San Luis Valley have employed various strategies to maximize the use of water resources. The region's focus on potatoes and alfalfa involves supplying water to water-demand heavy crops. Therefore, regenerative agriculture and diversification of the enterprise are of the utmost importance to building sustainable farms, and even for ranches, which typically have a lower consumptive rate than traditional farming.

The Nissen farm is a 1,320-acre farm with eleven center pivot irrigation fields, growing potatoes, malting barley, and multiple cover crops. They are in the RGWCD Subdistrict 1, the subdistrict in the San Luis Valley, which has the most unsustainable aquifer depletion and lowest storage levels. These low levels have forced the RGWCD to extreme measures to ensure that the Colorado State Legislature keeps allowing pumping of the aquifer (Alamosa Citizen, 2024). This environment has incentivized farms like Nissen Farm to implement a variety of strategies, enabling them to run a potato and cover crop farm on limited groundwater resources (National Association of Conservation Districts, 2018).

Nissen Farms focuses on soil health practices: three-year crop rotations, cover cropping, reduced tillage, addition of cattle grazing, and focus on mycorrhizal activity. Their experience can serve as a baseline for other operations in the region also encountering limited pumping. The addition of cattle grazing of sorghum mixes, a cover crop planted to control nematodes, in combination with the other improvements adopted, has increased the organic matter in the sandy soils of the valley (National Association of Conservation Districts, 2018). The integration of livestock also allows for revenue diversification, which could help beginning farmers facing limited water supplies who may need to reduce their dependence on water-intensive crops.

The other subdistricts also work on strategies to maximize existing water resources. For example, the San Juan Ranch, of RGWCD Subdistrict 5, also employs a strategy of enterprise diversification and regenerative agriculture practices. Their strategies include a cow-calf to finished beef operation, raising certified organic grass-fed beef on Bureau of Land Management (BLM) and their private land, renting their land to other ranchers for seasonal grazing land, and even a mentorship program. Diversifying ranch operations helps to protect operators from risks associated with limited water resources by reducing reliance on water-intensive activities and incorporating new income streams.

While San Juan Ranch has senior water rights, it still faces water limitations and finds value in combining diversification with regenerative agricultural practices. Through its soil health initiatives, San Juan Ranch has increased its soil biomass, which enhances water retention. Maintaining native plant cover and employing no-till practices minimizes evapotranspiration and improves water infiltration, conserving soil moisture. Additionally, they teach cattle to consume native weeds and biomass, reducing the need for irrigated forage crops. This holistic strategy helps maximize the productivity of their ranch while mitigating the challenges posed by limited water availability. Using these strategies, the San Juan Ranch reduced its historic pumping levels.

Case Study #2: South Platte

Background and Water Context

The challenge of conserving irrigated farms is especially pressing in the South Platte Basin. This is partly due to current and anticipated urban growth in Colorado's Front Range region, home to about 85% of the state population. This region's longstanding reliance on irrigation is vital to the local economies, food systems, and river ecosystems. This basin has nearly 10 million acres of land in farms, with 7.8% of it irrigated (Table 1). Balancing these demands is complicated by over-appropriated water rights and periods of drought, which result in reduced winter snowpacks—a major source of irrigation water in this area. Addressing this challenge requires innovative approaches to water management that support sustainable urban development while protecting the region's agricultural heritage and economic stability. Here, irrigated farmland is at risk of both buy and dry transactions, and direct conversion to developed uses like housing.

Water Management Strategy

Other urbanizing areas of the U.S. have found success supporting new and beginning farmers through incubator farm programs. Incubator farms assist new and beginning farmers by providing access to farmland and other necessary facilities, assets, resources, and training. Typically, these farms are owned by a farmer support organization, public entity, or other group that offers low-cost or no-cost lease arrangements, making it easier for prospective farmers and ranchers to enter the farming profession.

The incubator farm model provides several benefits. By lowering capital requirements through leasing instead of outright ownership, incubator farms help new farmers overcome the large financial capital barriers to entry. They also lessen the need for extensive business records as a prerequisite to obtain financing, allowing participants to focus on building their operations. These programs can also offer valuable training in business planning, marketing, sustainable farming practices, and network building. Resources like greenhouses, irrigation systems, and storage facilities can sometimes be used collectively, further reducing the need for individuals to make large investments. This resource-sharing model makes farming more accessible for those with limited capital. Through incubator programs, new farmers can work toward eventual farm ownership. Several longstanding programs in other U.S. areas have successfully transitioned from participants to independent farm owners.

A potentially innovative approach to support new and beginning farmers by leveraging innovative water management strategies is the establishment of incubator farms on farmland irrigated by junior water rights, like well augmentation plans. Although this has not yet been implemented in this region, it could feasibly be implemented in spaces that currently separate growing urban communities where land is most at risk of conversion. It would require significant funding and collaboration among various organizations.

Local Examples

Several organizations operate incubator-type programs supporting new and beginning farmers and ranchers in Colorado’s Front Range Region. Examples include Poudre Valley Community Farms in the northern Front Range and Palmer Land Conservancy in the southern Front Range (Colorado Land Conservation Assistance Network, 2024). In addition, Colorado has an extensive variety and longstanding investment in working lands conservation using conservation easements to incentivize farmers and ranchers to voluntarily maintain working landscapes in perpetuity. Since 1995, Coloradoans have invested some $1.5 billion to conserve 2.4 million acres of Colorado’s working landscapes through direct payments and (tradeable) tax credits supported by an annual state budget allocation, the lottery through Great Outdoors Colorado (GOCO), and many county programs, stewarded by a network of non-profit land trusts (Seidl et al., 2023; Seidl et al., 2017).

Organizations that develop and manage irrigation water resources in the Front Range could partner with municipalities seeking to preserve agricultural land uses along the urban fringe of growing cities to meet open space and agricultural conservation goals. Additionally, they could collaborate with existing land and water trusts, local governments, nonprofits, and universities to utilize these farms as new farmer incubators by ensuring water availability and supporting infrastructure such as efficient irrigation systems. As these farms become surrounded by increasingly urbanized landscapes, opportunities to grow high-value products and increase the economic return per acre-foot of water (compared to growing conventional crops) could further help their economic viability.

An example of an irrigation water organization that provides access to well-augmentation irrigation services is the Central Colorado Water Conservancy District (CCWCD). They supply augmentation credits to farms that have a well already established in the CCWCD system. They supply many (>1000) of wells in this region, and irrigation water rights can sometimes be transferred between wells. For example, if a municipality purchased a farm with senior surface water and junior well augmentation water rights, a portion of those rights could be transferred out of agriculture. The remaining water and farmland could be placed in an easement to reduce development pressure. Additional irrigation augmentation credits for the well could be secured at a CCWCD water auction, for example, to supplement the existing supplies. To reduce the financial risk and start-up barriers for a new and beginning farmer, the land and farm could be owned by a municipality or farmer support organization and leased to a new and beginning farmer. However, water costs remain a significant issue. For instance, a recent allotment of 219 acre-feet of CCWCD irrigation water rights sold for over $1 million in November 2024.

Case Study #3: Upper Arkansas

Background and Water Context

Irrigated farmland losses from buy and dry have been particularly prevalent in the Upper Arkansas basin. This basin has nearly 9 million acres of land in farms, with 27% of it irrigated (Table 1). However, in recent decades, some counties have seen more than 90% of their irrigated acreage dry up (Smith and Booth, 2024). This trend is closely tied to urban growth in the Front Range, where water once used for irrigation is diverted to municipal uses to meet rising demand, especially in expanding cities like Aurora, Colorado Springs, and Pueblo. For instance, projections for the Colorado Springs region indicate that demand could increase by 33% by 2050 (K. Roesch, Personal Communication, 2023).

This poses a risk to irrigated agriculture within the Arkansas Basin. Interest in collaborative water sharing agreements that leave some irrigation water available for agricultural uses has increased due to the recognition of the adverse effects of reduced agricultural activity on local communities. Therefore, Farmers are interested in strategies that enable them to optimize the use of the remaining water supplies and remain economically viable.

Water Management Strategy

Interruptible Water Supply Agreements (IWSAs) are an example of water management strategy currently in use in this region.[5] They seek to balance agricultural needs with municipal water consumption, ensuring protection for both sectors in the face of limited water resources. Under these agreements, water is guaranteed for agricultural purposes for a certain number of years out of every ten years (e.g., five or seven), with the remaining years allocated for municipal use during watertight years (Waternow Alliance, 2019). Typically, ISWAs are structured to utilize temporary fallowing, crop switching, or limited irrigation techniques in years when the agreement is being exercised.

IWSAs hold significant potential for helping beginning farmers. The agreements can provide an alternative revenue stream by temporarily allowing farmers to lease water rights to municipal utilities. This additional income can be used to offset operational costs and fund irrigation infrastructure improvements without the burden of high initial investment costs or used for other

[5] The state provision establishing ISWAs was enacted in 2003, but insight and lessons derived from some of the first agreements with farmers are only recently becoming available.

priorities. Along with these benefits, ISWA can reduce economic development pressure on participating farmers' water rights because the permitted uses of the farm's remaining water are often restricted to agriculture. Some skepticism remains about the actual effectiveness of IWSAs in slowing irrigated farmland loss (Smith and Booth, 2025). Another challenge is that IWSAs may not be compatible with specific production systems (e.g., orchard farms) or marketing arrangements (e.g., multi-year product supply contracts), due to the untenable disruptions that entirely foregoing irrigation supplies in a given year would cause.

Local Example

The Wertz Project is a water-sharing agreement between the city of Colorado Springs and a local multigenerational farm. In typical years, the farm grows crops like alfalfa and teff grass on 12,000 acres of irrigated land. They entered a lease arrangement with Colorado Springs Utilities, where they irrigate under a 3 in 10 IWSA agreement. Seven out of ten years, they use water for irrigation. However, during three of those years, known as "off" years, the water is temporarily redirected to meet municipal needs.[6] In off years, they leave their fields fallow but receive financial compensation for temporarily transferring their water rights. This collaboration benefits the farm and the city, balancing water resources between irrigation and municipal use (Colorado Springs Utilities, 2022).

The financial incentives helped the farm install center-pivot irrigation systems in place of traditional flood irrigation. This upgrade has increased irrigation efficiency, allowing the Wetz farm to increase crop output (Colorado Springs Utilities, 2022). The increased production benefits their farm and contributes to the area economy, as much of their crop output is sold in the local market (K. Roesch, Personal Communication, 2023).

Summary and Takeaways

The issues of farmland transition and water scarcity are often considered separately; however, identifying water management strategies that can increase the chance of success for new and beginning farmers in the U.S. West is important. Promoting these strategies—and the policies and programs that support them—could help new operators remain economically viable, preserve irrigated farmland, and mitigate the adverse effects of farmland loss on local economies, communities, and ecosystems. We presented three case studies of innovative water management strategies in Colorado. They included: regenerative agricultural practices that integrate livestock and crop diversification to stretch soil water resources, modern irrigation technology subsidized through water sharing agreements to increase water use efficiency, and incubator farms on farmland preserved through land and water trust organizations.

The case studies show examples of strategies that interconnect the water scarcity and farmland transition challenges. However, given the diverse nature of these challenges across basins, there is no one-size-fits-all solution. As highlighted in the case studies, valuable lessons and success stories are available from entities, organizations, and individuals already working to address these combined challenges. A limitation of our study is that many additional tools for addressing these challenges also exist, which we do not comprehensively cover. We expect multiple farming strategies and policy initiatives will be needed within these regions.

---

[6] That is, water that would have been used for irrigation is instead directed through the canal system towards municipal storage facilities or treatment plants, or, withdrawn at an alternative point in the delivery system so that it can be directed to the municipality.

The case studies present several important takeaways. First, prospective farmers and ranchers should stay informed and explore water management strategies, agricultural policies and programs, and regulations pertinent to beginning producers. This includes understanding grant opportunities, financial assistance programs, and farm transfer support that may be available to help reduce the initial costs and complexities of entering agriculture. By proactively seeking this information, they can better navigate the regulatory landscape, access potential funding sources, and make more informed decisions about entering farming or ranching.

Second, new and beginning farmer advocates (Extension professionals, policy stakeholders, non-profit organizations, etc) should leverage local success stories and lessons. This can help recognize and disseminate valuable insights from individuals, organizations, and other entities already addressing the joint challenges of water scarcity and farmland transition. By documenting and sharing experiences, successes, and setbacks they can build a repository of knowledge that informs future priorities and policy directions. Workshops, case study databases, and storytelling platforms can engage audiences around these lessons and promote the diffusion of best practices. Organizations that support new and beginning farmers can play a critical role in helping navigate the financial and operational risks associated with irrigated agriculture. In addition to providing training and technical assistance, these organizations can help evaluate the extent to which a farm business model is viable within the constraints and opportunities of the water management strategies within the basin.

Last, regional and state-level water planning could directly integrate farmland transition considerations. This means that water policy development and implementation should focus on the immediate problem of addressing water scarcity on existing operations and understanding the long-term implications for agricultural viability and land use for the next generation of farmers and ranchers. Collaborative approaches among stakeholders—like retiring producers, new and beginning farmer organizations, and water resource managers—could create programs and policies that simultaneously address water management and farmland transition more effectively. This approach could increase the likelihood of success for new and beginning farmers by jointly lowering the barriers to entry and improving their operational viability. Examples of this approach could include expanded internship and apprenticeship programs to leverage the success strategies of existing farms.

References

Alamosa Citizen. 2024. Despite years of retiring wells, unconfined aquifer shows little sign of bouncing back. *Alamosa Citizen.* Available online at: https://www.alamosacitizen.com/despite-years-of-retiring-wells-unconfined-aquifer-shows-little-sign-of-bouncing-back/.

Alamosa Citizen & Obmascik, M. 2021. The water supply of the San Luis Valley faces pressure as never before. *The Colorado Sun*. Available online at: https://coloradosun.com/2021/08/29/san-luis-valley-water-diversion-drought-climate-change/.

Angelo, B., I. Cossitt-Glesner, A. Funk, A. Seidl, and G. Thompson. 2021. Preserving Agricultural Lands for Colorado's Future. Colorado Food Systems Advisory Council Issue Brief. Available online at: https://cofoodsystemscouncil.org/wp-content/uploads/2021/08/PreservingAgLands_Brief_v2.pdf.

Colorado Agricultural Statistics Service. 2020. 2019 Annual Agricultural Statistics Bulletin. Colorado Department of Agriculture, Denver, CO. Available online: https://www.nass.usda.gov/Statistics_by_State/Colorado/Publications/Annual_Statistical_Bulletin/Bulletin2020.pdf.

Colorado Agricultural Statistics Service. 2024. 2024 Annual Agricultural Statistics Bulletin. Colorado Department of Agriculture, Denver, CO. Available online: https://www.nass.usda.gov/Statistics_by_State/Colorado/Publications/Annual_Statistical_Bulletin/Bulletin2024.pdf.

Colorado Climate Center. 2017. Colorado Water Year 2017 Climate Summary. Colorado State University. Available online at: https://climate.colostate.edu/pdfs/CO_wy2017_report.pdf.

Colorado Food Systems Advisory Council (COFSAC). 2022. Conserving Agricultural Lands & Water. Executive Summary. COFSAC, Denver, CO. Available online at: https://cofoodsystemscouncil.org/wp-content/uploads/2022/04/ConservingAgLands_ExecSummary_final.pdf.

Colorado Springs Utilities. 2022. Agricultural Water Sharing: A Collaboration Story. Video. Colorado Springs Utilities, Colorado Springs, CO. Available online at: https://www.csu.org/water-service/agricultural-water-sharing.

Colorado Water Conservation Board (CWCB). 2020. Alternative Transfer Methods in Colorado: Status Update, Framework for Continued Support, and Recommendations for CWCB Action. CWCB, Denver CO. Available online at: https://dnrweblink.state.co.us/cwcb/0/edoc/212963/atm%20status%20report.pdf.

Colorado Water Conservation Board. 2023. Colorado Water Plan: 2023 Update. CWCB, Denver, CO. Available online at: https://cwcb.colorado.gov/colorado-water-plan.

DiNatale Water Consultants. 2013. Alternatives to Permanent Dry Up of Formerly Irrigated Lands. Denver, CO.

Freegood, J. and J. Dempsey. 2014. Cultivating the Next Generation: Resources and Policies to Help Beginning Farmers Succeed in Agriculture. American Farmland Trust. Available online at: https://www.whidbeycd.org/uploads/1/1/6/8/11683986/aft_bf_08-27-2014lo_1.pdf.

Hill, R. and J. Pritchett. 2016. Economic Impact Analysis and Regional Activity Tool for Alternative Irrigated Cropping in the San Luis Valley. San Luis Valley Development Resources Group & Council of Governments. Available online at: https://www.slvdrg.org/wp-content/uploads/2017/05/Economic-Impact-Analysis-and-Regional-Activity-Tool-for-Alternative-Irrigated-Cropping-in-the-San-Luis-Valley.pdf.

Hillmire, K. and K. Greenberg. 2019. Water conservation behaviors among beginning farmers in the western United States. *Journal of Soil and Water Conservation* 74(2):138–144.

Holm, H. Insights gained on agricultural water conservation for water security in the Upper Colorado River Basin. Research Report, Colorado Mesa University. Available online at:

https://www.coloradomesa.edu/water-center/insights-gained-on-agricultural-water-conservation-and-water-security-in-the-upper-colorado-river-basin.html.

Ingrao, C., Strippoli, R., Lagioia, G. and Huisingh, D. 2023. Water scarcity in agriculture: An overview of causes, impacts and approaches for reducing the risks. *Heliyon* 9(8).

Jablonski, B.B., Key, N., Hadrich, J., Bauman, A., Campbell, S., Thilmany, D. and Sullins, M. 2022. Opportunities to support beginning farmers and ranchers in the 2023 Farm Bill. Applied Economic Perspectives and Policy, 44(3):1177–1194.

Lal, R. 2020. Regenerative agriculture for food and climate. *Journal of soil and water conservation*, *75*(5):123A–124A.

Mancosu, N., Snyder, R.L., Kyriakakis, G. and Spano, D. 2015. Water scarcity and future challenges for food production. *Water* 7(3):975–992.

National Association of Conservation Districts. 2018. NACD. Available online at: https://www.nacdnet.org/soil-champs/southwest/erin-nissen/.

Roberts, M.L. 2021. Farm Management Instructors Expect More Farm Transitions in Coming Years. *Journal of ASFMRA* pp.29–34.

Schattman, R.E., Rowland, D.L. and Kelemen, S.C. 2023. Sustainable and regenerative agriculture: Tools to address food insecurity and climate change. *Journal of Soil and Water Conservation* 78(2):33A–38A.

Seidl, A., Swartzentruber, R. and Hill, R. 2018. Public benefits of private lands conservation: Exploring alternative compensation mechanisms. College of Agricultural Sciences, Colorado State University. Available online: https://hdl.handle.net/10217/192782.

Seidl, A., Anderson, D., Bennett, D., Greenwell, A., and Menefee, M. 2017. Colorado's Return on Investments in Conservation Easements: Conservation Easement Tax Credit Program and Great Outdoors Colorado: Executive Summary. 2017. Colorado State University. Available online at: https://warnercnr.colostate.edu/wp-content/uploads/sites/2/2017/07/ColoradoStateU_CE-ROI-study_web.pdf.

Seidl, A., C. Crossett, A. Greenwell, D. Bennett, and M. Menefee. 2023. Public returns to private lands conservation in Colorado: The Conservation Easement Tax Credit Program. Colorado State University. Available online at: https://cnhp.colostate.edu/download/documents/2023/CSU-ROI-study-2023-web.pdf.

Smith. S. n.d. Can Regenerative Agriculture Conserve Water in the Upper Colorado River Basin? Report. The Nature Conservancy. Available online at: https://www.coloradomesa.edu/water-center/forum/the-nature-conservancy--can-regenerative-agriculture-conserve-water-in-the-upper-colorado-river-basin_.pdf.

Smith, J. and M. Booth. 2025. Big city water buy-ups in the Lower Arkansas Valley are raising alarms as age-old battles erupt again. *Colorado Sun*, January 23, 2025. Available online at: https://coloradosun.com/2024/08/04/lower-arkansas-valley-water-rights/.

U.S. Department of Agriculture–National Agricultural Statistics Service (USDA-NASS). 2018. 2018 Irrigation and Water Management Survey. USDA-NASS, Washington, DC. Available online at: https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/Farm_and_Ranch_Irrigation_Survey/index.php.

U.S. Department of Agriculture–National Agricultural Statistics Service (USDA-NASS). 2023a. Census of Agriculture: 2022 Census by State – Colorado. USDA-NASS, Washington, DC. Available online at: https://www.nass.usda.gov/Publications/AgCensus/2022/Full_Report/Census_by_State/Colorado/.

U.S. Department of Agriculture–National Agricultural Statistics Service (USDA-NASS). 2023b. 2023 Irrigation and Water Management Survey. USDA-NASS, Washington, DC. Available online at: https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/Farm_and_Ranch_Irrigation_Survey/index.php.

U.S. Department of Agriculture–National Agricultural Statistics Service (USDA-NASS). 2024. 2022 Census by Watershed. Online Resource. USDA-NASS, Washington, DC. Available online at: https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/Watersheds/index.php.

U.S. Department of Agriculture–National Agricultural Statistics Service (USDA-NASS). 2025. Quick Stats Database. USDA-NASS, Washington, DC. Available online at: https://quickstats.nass.usda.gov/.

Water Education Colorado. 2024. Agricultural Use. Available online at: https://watereducationcolorado.org/water-101/water-use-conservation-efficiency/agricultural-use/#/.

Waternow Alliance. 2019. Alternative Transfer Methods: Flexible and Innovative Water Supply Alternatives. Available online at: https://waternow.org/wp-content/uploads/2019/07/Alternative-Transfer-Methods-A-Guide-for-Local-Leaders-in-Colorado-WNA.pdf.