ARIZONA WATER CONSERVATION FACTSHEET

Conservation Strategies for Small-Scale Farmers

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THE UNIVERSITY OF ARIZONA
COOPERATIVE EXTENSION
WATER RESOURCES RESEARCH CENTER

wrrc.arizona.edu/conserve

Background

This fact sheet provides answers to frequently asked questions by small-scale and beginning farmers related to water conservation practices and management of farms on less than 50 acres.

Arizona is home to more than 12,700 farms smaller than 50 acres, representing approximately 76% of all farms in the state.[1] Agriculture in Arizona is increasingly characterized by smaller, newer, and more urban farming operations, reflecting broader changes in land use and agricultural markets.[2] This includes larger growth for female and indigenous producers. These farms are characterized by their environmentally friendly practices, as they generally rely less on large machinery and chemical inputs compared to industrial farms.[3] In the United States, over 90% of farms fall under the classification of small, generating less than $250,000 in gross annual income. Many of these operations are owned by first-generation, beginning, or part-time farmers who produce vegetables, specialty crops, livestock, and local food products. Small-scale operations make up 75% of agriculture in multiple counties. Practical water conservation strategies can help small-scale farms improve efficiency, reduce costs, and build resilience while supporting long-term agricultural sustainability.

Why Water Conservation Matters on Small Farms

Water is one of the most valuable resources on Arizona farms. Agriculture accounts for approximately 72–75% of Arizona's water use, and nearly all crop production in the state depends on irrigation (ADWR 2024; USDA 2024). As drought, groundwater declines, and Colorado River shortages continue, small-scale farmers face increasing pressure to make every drop count. Many of the systemic hurdles facing industrial agricultural producers also impact small-scale operations. These challenges fall into three general categories:

1. Climate

Traditional weather patterns have shifted to periods of high-intensity rainfall followed by rapid-onset dryness. These extreme fluctuations result in changing soil conditions, cycling rapidly between oversaturated and dry.[4] Practically, the increased average temperature and a shift in precipitation patterns means more stress on plants and less forage availability for animals.

2. Economic Barriers

Producers face difficult trade-offs between long-term water conservation investments and shorter-term profitability.[5] Farmers leasing land must weigh the investment in high installation costs against the economic uncertainty of future crop yields or water savings. Because the land is not owned, it is difficult to recoup benefits from investments.[6] According to USDA estimates from 2022, Arizona has approximately 1,227,159 acres of leased farmland.

Where are Arizona's Small-scale Farms

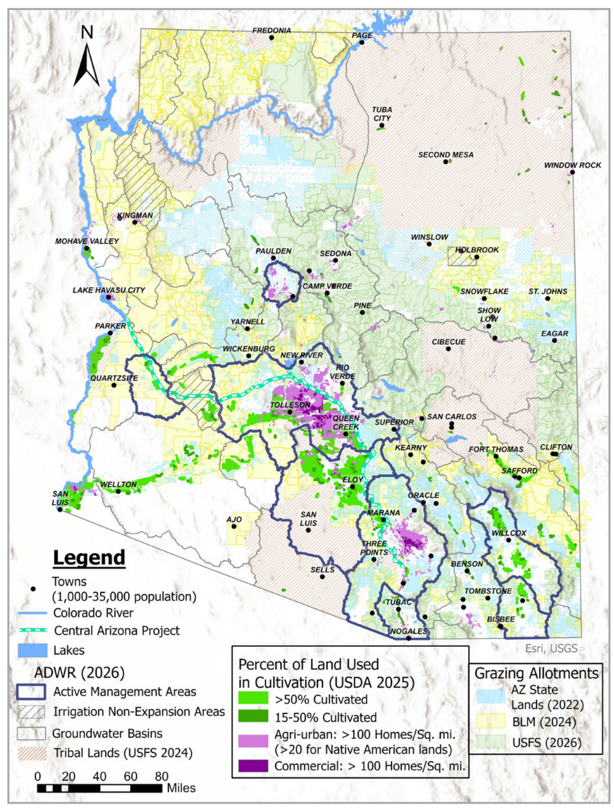

Figure 1: Small-scale farming, percent agriculture and state and federal grazing allotments (ASLD 2026, BLM 2024, USFS 2026, USDA 2025).

3. Water Supply Uncertainty

The reliability of groundwater or surface water irrigation supplies may represent a significant challenge to producers in some areas. As the operating rules for the Colorado River system undergo revision, Lower Basin states, including Arizona, face significant changes to water availability. This creates a challenging planning environment for producers: many fear that any water saved through efficient technology will simply be permanently diverted to non-agricultural sectors. Furthermore, there is a lingering concern that reduced water usage will inevitably lead to lower yields and diminished revenue.[7]

Despite the uncertainty, conservation practices have the potential to provide famers with stability and resilience. Many water-saving practices — such as fixing leaks, applying mulch, improving irrigation scheduling, and building healthy soils — can provide immediate benefits while helping farms adapt to Arizona's arid climate.

Arizona Water Rules: Does Your Farm Fall Inside an Active Management Area (AMA)?

Groundwater

Where a farm is located can have a major impact on how groundwater is regulated. Farms located inside an **Active Management Area (AMA)*** are subject to additional groundwater management requirements intended to protect long-term water supplies, while groundwater use in most areas outside AMAs are not regulated (Figure 2). Arizona also has **Irrigation Non-Expansion Areas (INAs)**, where irrigation of new agricultural acreage is prohibited, although existing irrigated lands may continue operating. Whether your farm is located inside or outside an AMA can affect: groundwater regulations, irrigation expansion opportunities, water-use reporting obligations, eligibility for certain water conservation programs, and long-term water availability.

Before drilling a new well, expanding irrigation, or making investments in agricultural infrastructure, farmers should contact the Arizona Department of Water Resources (ADWR) to understand the rules that apply to their lands.

Groundwater Uses Inside an AMA	Key Differences Outside an AMA
• Groundwater pumping is regulated by the Arizona Department of Water Resources (ADWR). • Agricultural groundwater use is limited to lands with historical irrigation rights or other authorized groundwater withdrawal authorities. New irrigation acreage is highly restricted. • Water use from larger wells must be measured and reported; the conservation requirements are the main aspect of the management plan compliance.	• Groundwater pumping is governed by Arizona's "reasonable and beneficial use" doctrine for pumping on owned land. • Well registration is required, but groundwater withdrawals are generally not subject to the same permitting or reporting requirements. • Many farmers participate in voluntary conservation and resource management programs in partnership with ADWR. • Expansion of irrigated lands is allowed unless the Land is located in an Irrigation Non-Expansion Area (INA).

Surface Water

Surface water is governed by the doctrine of "prior appropriation," where junior water rights are the first to be cut during periods of drought or shortages. Most users of in-state rivers are subject to court decrees that define priority rights. Two ongoing adjudications also are likely to affect the surface water rights of small-scale farmers. If you want to find out about surface water rights in your area, contact ADWR: **www.azwater.gov/surface-water-queries** or **https://www.azwater.gov/adjudications**

Strategies for Conservation

Irrigation Efficiency: Making Every Drop Count

Simple changes to irrigation practices are a good way small farms can conserve water, reduce costs, and improve crop health and yields. Many types of irrigation have their own benefits and costs.

Surface irrigation is the most common irrigation used in the arid west. It uses trenches to apply water to planted rows or flood level fields. It requires almost no equipment or increase in energy costs. When applied correctly, efficient systems can lead to conservation gains. Improvements for existing surface irrigation include:

- **"Furrow shaping"** modifies the shape and length of the channels between rows to optimize water flow and infiltration. Properly designed furrows can enhance water use efficiency, especially in unhealthy soils.
- **Lining irrigation** ditches applys concrete, plastic, or prefabricated plates to the interior of canals to prevent water loss. Research indicates lining and piping infrastructure can reduce losses due to evaporation or leaks.[9]
- **High flow gates** allow for the rapid and controlled distribution of water within a plot. These gates allow precision control of water distribution (when and where) to improve overall productivity, especially in periods of heavy or unpredictable rain.[10]

 *Denotes **definitions** which are available on the resources webpage for this factsheet.*

Sprinkler irrigation is a controlled application of water through a network of pumps, pipes, and spray nozzles.[11] These systems and micro-sprinklers can reduce water consumption compared to flood irrigation.[12] Its advantage is that water is distributed equally, generating efficiency improvements of up to 80%. It can be a useful substitute for furrow irrigation if applied to the care of juvenile plants that need to be watered more often than established plants as a grow-in period. Once mature and established, they can be watered less often as they adapt.[13]

Drip irrigation runs water through holed pipes that are buried or lie on the ground next to crops, dripping close to roots and stems (see Table below).

Benefits of Drip Irrigation	Challenges to Consider
• Uses 30–60% less water than conventional. • Delivers water directly to plant roots. • Reduces evaporation, runoff, and wind drift. • Reduces weed growth between crop rows. • Reduces plant diseases by keeping leaves dry. • Can improve crop quality and yields. • Fertigation compatible (fertilizer in water).	• Higher upfront installation costs. • Emitters may clog if water is not filtered properly. • Requires periodic maintenance and monitoring. • Dripline damage (e.g., rodents, wildlife, or equipment). • Not practical for some forage crops or large grazing operations. • Match system design to crop type and field conditions. • Fertigation systems require additional management and maintenance.

Water Saving Irrigation System Improvements

Timing Shifting irrigation to cooler hours (late evening or early morning) significantly reduces water loss caused by evaporation and wind. Research indicates that timing adjustments, combined with modern delivery systems, are correlated with irrigation efficacy.[14]

Crop conversion involves replacing high-water use crops with more drought or salt-tolerant crops better suited to heat and arid conditions. In the Southwest, this strategy is increasingly viewed as a primary strategy for long-term water sustainability.[15] For example, traditional and indigenous crops, such as tepary beans or heirloom maize, thrive in extreme heat and low-water-use environments.[16]

Quick Water Conservation Checklist

- ✓ Check irrigation lines and emitters monthly
- ✓ Irrigate during cooler times of day
- ✓ Monitor soil moisture before watering
- ✓ Fix leaks immediately
- ✓ Consider drip irrigation for high-value crops
- ✓ Apply mulch to reduce soil moisture loss

Soil monitoring uses sensors to measure real-time volumetric water content, allowing farmers to irrigate only when necessary. This data-driven approach alerts farmers to damaging soil conditions, salt buildup, or nutrient leaching, while generating water savings through modification to the timing and quantity of irrigation, leading to water savings.[17]

Cover crops are non-commercial plants grown during fallow periods to protect the soil surface from erosion. By increasing soil porosity and water infiltration rates, cover crops make more moisture available for primary crops.[18]

Water Saving Irrigation Tips	Irrigation Best Practices
Inspect Your System Regularly	• Check for leaks, broken emitters, and clogged nozzles. • Repair damaged hoses and lines promptly. • Monitor water pressure for even distribution.
Irrigate at the Right Time	• Water early morning or evening to reduce evaporation. • Avoid windy conditions when water can be lost to drift. • Adjust seasonally based on crop needs and weather conditions.
Water Only What Needs Water	• Use drip, micro-sprinklers, or targeted watering methods when possible. • Avoid overspraying non-crop areas. • Group crops with similar water requirements.
Monitor Soil Moisture	• Check soil moisture before irrigating. • Consider rainfall, temperature, and soil conditions. • Use soil moisture sensors to guide decisions.

High-Value, Low-Water-Use Alternatives

Controlled Environment Agriculture (CEA) encompasses a broad spectrum of technology, ranging from entry-level hoop houses to fully automated vertical farming systems. Within these environments, producers can utilize multiculture techniques that integrate diverse plant species or symbiotic plant-and-animal systems to maximize output. A critical metric for these operations is Water Use Efficiency (WUE), the ratio of water consumed to total biomass produced—where a higher WUE signifies superior resource management. This efficiency is heavily influenced by specific variables, including plant selection, nutrient solution depth, circulation frequency, and precise fertigation levels. Estimates presently suggest that hydroponics is 90% more water efficient than traditional soil-based agriculture and 60% more water efficient than drip irrigation. High-value crops such as microgreens, herbs, and vining vegetables like tomatoes and cucumbers, as well as a variety of leafy greens—including arugula, romaine, and butterhead lettuce—are particularly well-suited for these water-optimized systems.

Beyond Irrigation: Building Water-Resilient Farms in a Changing Climate

Arizona agriculture has always adapted to a dry climate, but today's farmers face new challenges. Continued drought, increasing temperatures, groundwater declines in some regions, and uncertainty surrounding future Colorado River water supplies are creating new pressures for farms of all sizes. Scientists project that Arizona will continue to experience warmer temperatures, more frequent heat waves, and increased pressure on water supplies. While no single solution can eliminate these challenges, small-scale farmers can take steps today to implement best practices for water conservation, reduce risk, and build flexibility and resilience for the future.

Water Efficiency Actions	Best Practices
Improvement of Soil Health	Healthy soils can absorb and store more water, reducing irrigation needs and helping crops withstand dry periods. Practices include: applying compost or organic matter, using cover crops during appropriate seasons, reducing soil disturbance when possible, and maintaining year-round soil cover with mulch or crop residue.
Capture and Reuse Water	Practices include: collecting rainwater from roofs and structures, reusing water for landscape irrigation, directing stormwater to planting areas or infiltration basins, or improving drainage to reduce runoff and erosion. See resources.
Upgrade Farm Infrastructure	Infrastructure improvements can increase irrigation efficiency and reduce water losses. Practices include: converting from flood irrigation to drip or micro-sprinkler systems, installing soil moisture sensors, automating irrigation scheduling, lining or repairing irrigation ditches, and laser leveling fields to improve water distribution on flood-irrigated cropland.
Diversify Crops and Income Sources	Diversification can reduce vulnerability to changing weather conditions and weather availability. Practices include: growing drought-tolerant crop varieties, expanding specialty crop production, participating in farmers markets or Community Supported Agriculture (CSA) programs, and exploring agritourism opportunities.

Getting Started

Many of Arizona's most successful small farms have found that combining efficient irrigation, healthy soils, and careful planning can reduce water use while supporting productive and profitable operations. Taking steps now can help ensure that Arizona's small farms remain resilient and productive for generations to come. Every farm is different, and there is no one-size-fits-all solution, but you do not need to figure this out alone. **Please use the QR code below or visit wrrc.arizona.edu/conserve to find additional definitions, resources, and references (corresponding to numbers in the text) used for the creation of this factsheet.**

Additional Definitions, Resources, and References

wrrc.arizona.edu/conserve

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