Advanced School on Microirrigation: A Novel Educational Model for Advancing Knowledge, Competence, and Intent to Adopt Microirrigation in the Western United States

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Introduction/Need for Innovation Or Idea

Western U.S. water challenges exert increasing pressure on environmental and institutional landscapes. Environmentally, recurring droughts, rising temperatures, and reduced snowpack drive groundwater depletion and land subsidence (Faunt et al., 2024). Institutionally, the region battles overallocated water rights (Womble et al., 2025) and fragmented governance (Holyoke, 2024), while urban expansion (Wilson et al., 2022) threatens resource allocation and aquatic habitats (Yarnell et al., 2022). Compounding these crises are population growth, farmland loss, and the demand to produce more food with fewer inputs and resources. These shortages force major agricultural shifts. In California (Ikendi et al., 2024) and the Colorado River basin, declining aquifers and reduced allocations compel farmers to abandon water-intensive crops (Bennett et al., 2023), intensifying regulatory friction and curtailing vital forage production (Prakash et al., 2026).

To preserve food productivity, growers must adopt water-efficient strategies like microirrigation (Ayars et al., 2024). However, knowledge gaps remain regarding technical management, economic viability, and scalability (Ikendi et al., 2024). Farmers require economic data, students and young professionals need hands-on experience, policymakers need impact studies for evidence-based incentives, and educators require training to bridge the research-to-field-application gaps. These issues compelled the irrigation researchers to initiate a microirrigation educational school. Cohesive applied research and extension programs must simplify complex system operations, ensuring microirrigation provides long-term resource efficiency, water productivity and security.

How It Works/Methodology/Program Phases/Steps

To foster novel knowledge transfer and accelerate advanced irrigation water management adoption, University of California academics and global partners organized the Advanced School on Microirrigation for Crop Production. Adapting foundational research from Ayars et al. (2024), a strategic coalition, including UC Cooperative Extension, Chile's CoTH2O Consortium, and the California Irrigation Institute, launched the initiative to address rising water constraints and demand for increased irrigation water productivity. The committee scheduled the five-day program from March 30 through April 3, 2026, capping attendance at 125 in-person participants while also offering remote streaming. The team mapped out a dual-phase curriculum integrating theory with regional applications.

Days 1-3 at UC Davis Conference Center featured classroom instruction on fundamentals of microirrigation, system design and operation, and management for various crops. The School also included two days of field and demonstration visits. Day 4 in the San Joaquin Valley focused on visiting a modernized water delivery systems and services, an irrigation automation service company, and fruit and nut orchards. Day 5 took the cohort to the Central Coast to evaluate drip and micro-sprinkler irrigation performance in wine grape vineyards, cool-season vegetables, and strawberries. To maximize the school's professional value, organizers aligned coursework with Irrigation Association standards and petitioned the American Society of Agronomy to award up to 28 Continuing Education Units. The team arranged for participants to receive a Certificate of Completion and a textbook (Ayars et al., 2024) for long-term field utility.

Results To Date/Implications

The program attracted 125 registered participants, including 107 in-person attendees and 18 remote participants through online streaming. Initially, 52 attendees completed the post-training survey (a 41.6% response rate). After screening the raw dataset to isolate fraudulent or automated responses (Pinzón et al., 2024), the final analytical sample consisted of 40 responses. Within this cohort, 31 (77.5%) completed the full five-day curriculum of classroom lectures and field tours, while 9 respondents (22.5%) attended only the three-day lecture block. Geographically, most respondents were based in the United States (62.5%), mostly representing California, Washington State, Arizona, Nevada, Georgia, and Nebraska. The remaining 37.5% represented 15 international countries: Canada, Mexico, Brazil, Chile, Argentina, Italy, Romania, Turkey, the Netherlands, Spain, Sweden, Egypt, Jordan, Iran, and Uzbekistan.

Attendees occupied interconnected professional roles, including researchers (37.5%), water resource managers (27.5%), extension educators (22.5%), irrigation practitioners or designers (20.5%), farm managers (20.0%), crop consultants (17.5%), farmers (12.5%), government agency representatives (10.0%), students (7.5%), equipment suppliers (5.0%), farmer association representatives (2.5%), and media professionals (2.5%). Respondents managed multiple crop commodities, including fruits (67.5%), vegetables (52.5%), vineyards (50.0%), nut crops (35.0%), forages (25.0%), and olives (20.0%), alongside a minor segment (15.0%) managing urban landscapes or agronomic crops, such as cotton, alfalfa, soybeans, maize, and cereal grains, as well as commercial flowers.

Participants indicated quantitative knowledge gains, reinforced by qualitative feedback. On a 5-point scale, they reported a 12.2%, gain in microirrigation fundamentals (from 3.64±0.94 to 4.25±0.63), a13.8% in system design and operations (from 3.14±1.01 to 3.83±0.84), and a 15.2% in crop-specific management (from 3.04±1.01 to 3.80±0.86). Participants also rated the usefulness at 4.12±0.86 out of 5 (very useful) and indicated they were 3.96±1.17 likely to adopt the practices. These metrics exist in participant experiences.

On system performance, a California farm manager noted that distribution uniformity testing stood out, stating, "*This has increased my motivation to dig deeper into evaluating my systems… and improving overall irrigation performance*." Similarly, a Türkish grower leveraged the salinity sessions, sharing, "*I have an almond orchard that suffered from salinity... I was able to identify our wrong practice… and learned the good practices to avoid the same problem*." Attendees rated teaching methods at 4.39±0.88 and logistics at 4.30±0.83 out of 5. A California farmer noted, "*The presentations were excellent… enabling them to teach and share their knowledge*." Meanwhile, a Romanian representative highlighted the dual value of the international setting, stating, "A part of the knowledge I can use immediately. Also, the social contact, the talks between sessions, are useful." These elements echo the school's success in delivering actionable science while fostering a vital global network on microirrigation.

Future Plans/Advice To Others

The School increased participants' knowledge, self-efficacy, and adoption intent. Blending mentorship with hands-on experience, this Extension model builds technical competency for resilient agriculture. Grounded in theory of planned behavior (Ajzen & Schmidt, 2020), the school addresses Western U.S. water constraints where microirrigation systems, if attentively designed, properly maintained, and adequately operated, ensure food security. Examining personal attitudes, norms, and capabilities bridges documented intention-behavior gaps (Sheeran & Webb, 2016), transforming passive water users into proactive managers (Kovacs et al., 2023).

Integrating local remote monitoring data with district automation shifts water management toward synchronized ecosystems, intensifying the demand for a workforce bridging software with hardware. Future technology deployment requires collaborative networks to co-create troubleshooting strategies. Future studies will monitor actual practices, and expansions are planned for Chile in 2027.

Costs/Resources Needed

The program's tiered enrollment accommodated various professional needs. Full five-day registration costs $1,000 for early-bird and $1,150 regularly. The three-day lecture track costs $850 early-bird and $975 regular. Standalone field tours were available for $150, while commercial equipment vendors secured dedicated marketplace visibility by purchasing exhibitor tables for $650 across the primary three-day lecture block. Also, good collaboration with irrigation experts.

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