

AUTOMATED GATED PIPE IRRIGATION SYSTEM

Presentation to the Colorado Cattlemen's Ag Water NetWORK

October 7, 2026

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SURFACE (FLOOD) IRRIGATION METHODS

Tarp Dams



Siphon Tubes



Gated Pipe



Surface irrigation is used on more than 83% of the world's irrigated area.

- Pereira, Gonçalves, Surface Irrigation, Oxford Academic, 26 Feb 2018

GATED PIPE IRRIGATION



Water source
channeled into
a line of pipe



A series of 30' pipe
sections laid out on
the uphill side of the
field



Manual Slide Gates
6 – 12 per pipe

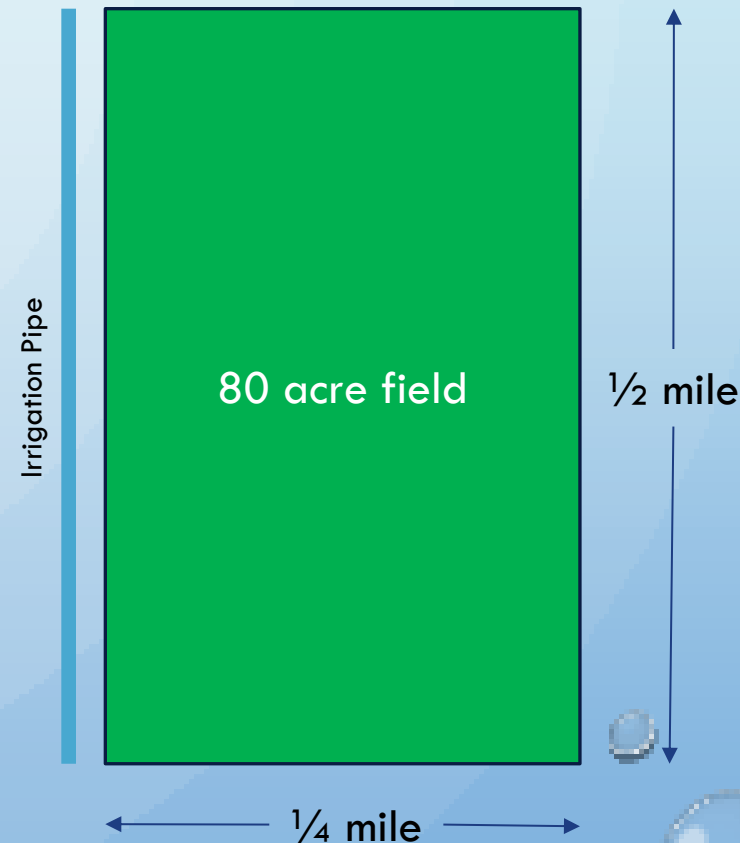
$\frac{1}{2}$ mile Irrigation Line

- 88 pipes
- 500 – 1050 gates

Depending on flow rate
limitations, gates are manually
opened in groups of perhaps
30 - 50 at a time.

This requires MANY set changes
and significant manual labor to
water the entire field.

SunGate Systems, LLC was
formed to address this issue
using automation.



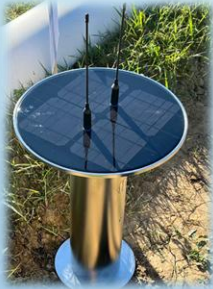
WHAT ARE THE PARTS OF AUTOMATED GATED PIPE?



Slide gates are replaced with motorized variable-open valves controlled from computer or phone



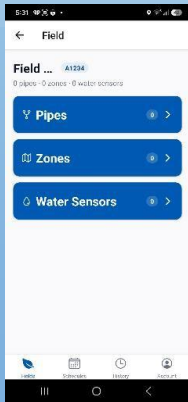
Each 30' pipe section is outfitted with a pipe controller, making the pipe an independent unit with power and communication



One field controller per installation, cellular connected



Optional end-of-row water sensors

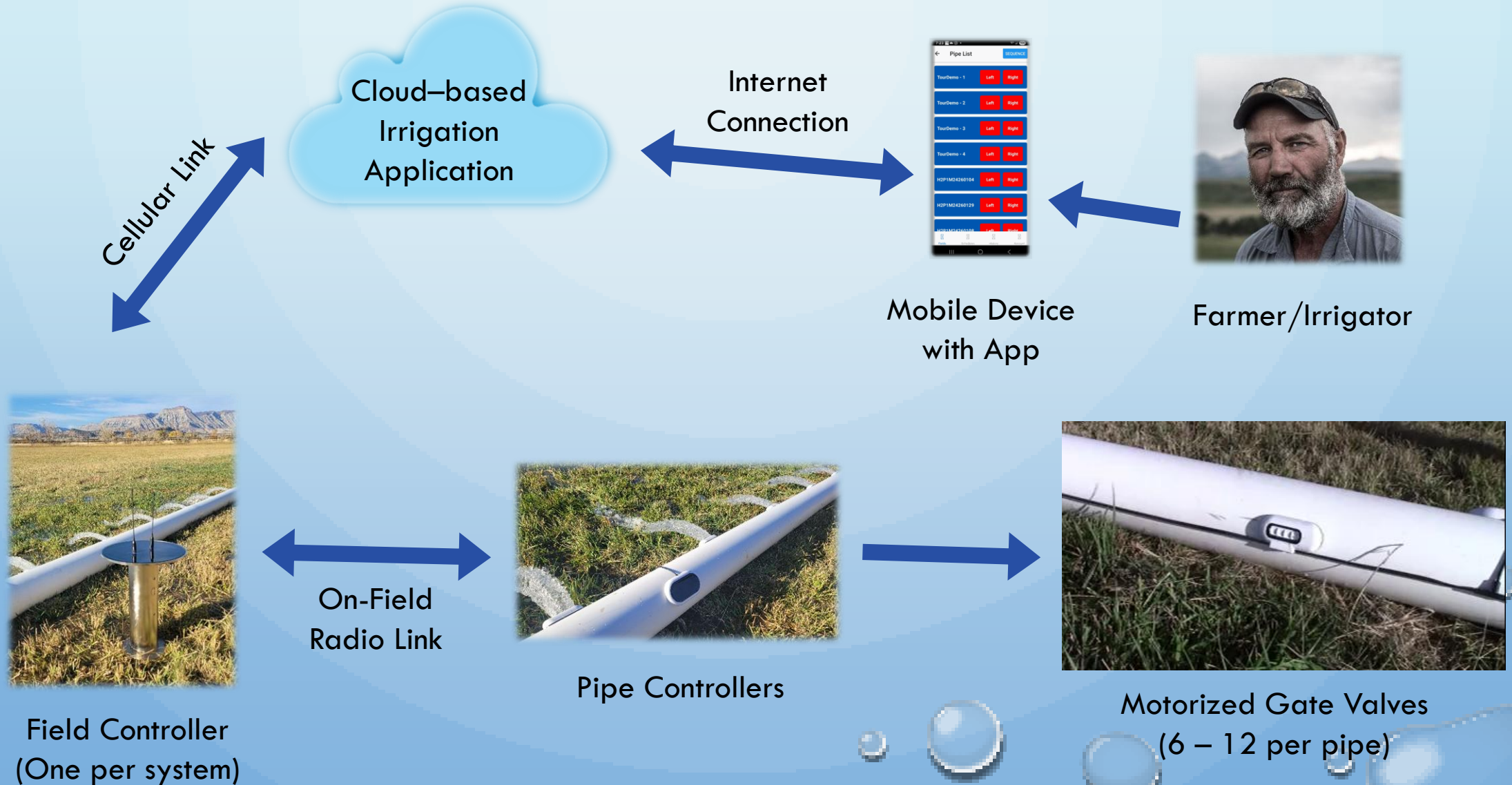


A mobile irrigation application to open/close gates, set zones and manage watering schedules



Available for retrofit of existing pipe, or preassembled on new 8" pipe

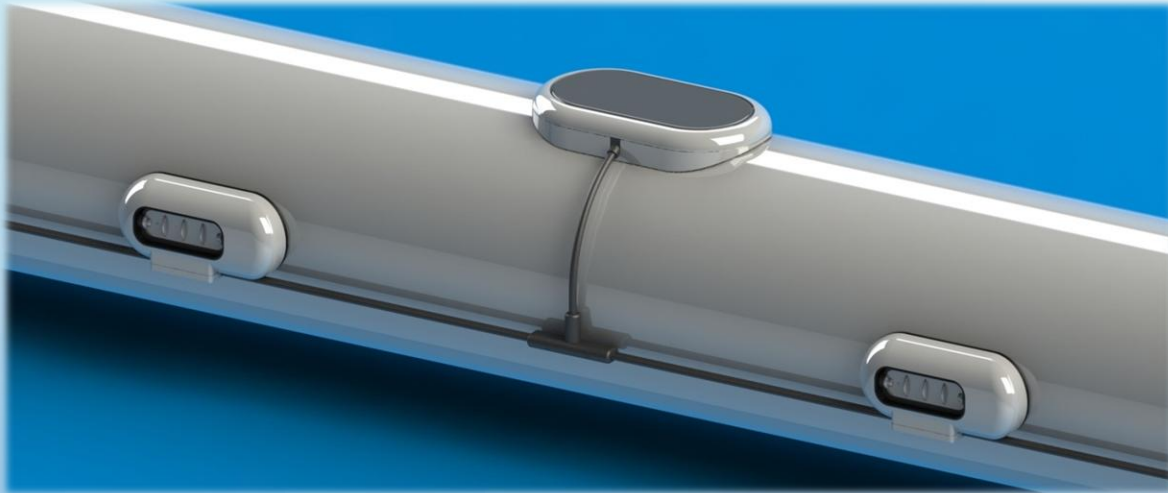
HOW DOES THE SYSTEM WORK?



OFFERINGS FOR AUTOMATED GATED PIPE

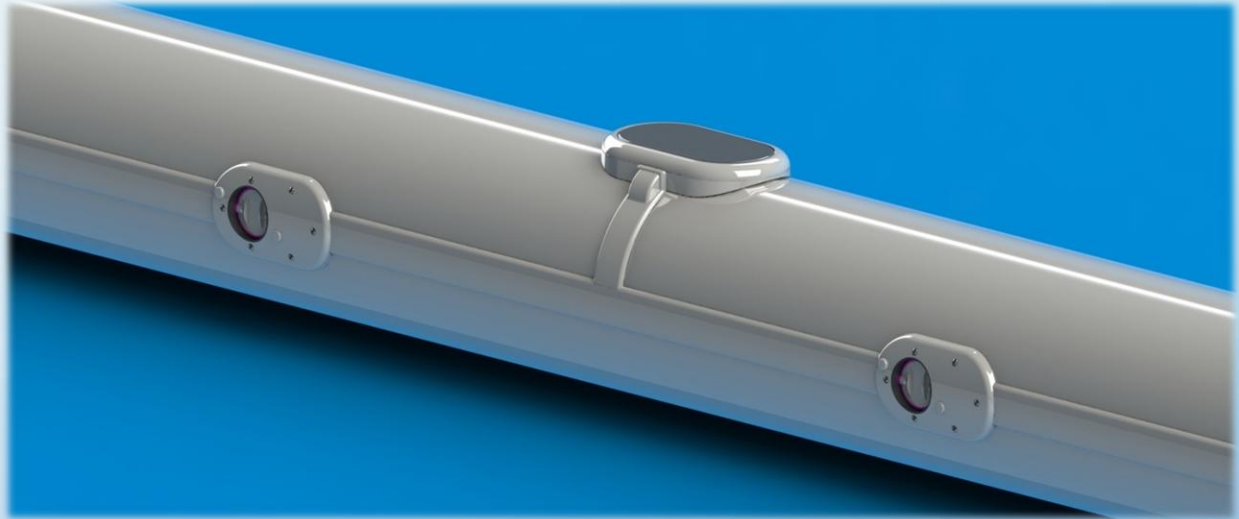
Retrofit Version (8, 10, 12 inch)

Low-cost, left/right gate control



Built-to-Order Preassembled Version (8 inch pipe only)

Ideal for siphon tube replacement
Low profile, fully concealed wiring



Wireless Retrofit Version (8, 10, 12 inch)

Independent Gate Control



Attach anti-erosion exit tubes

Compatible with preassembled or fully wireless gates



WHY AUTOMATED GATED PIPE

Reduced Labor, Economical

- Eliminates the manual labor involved with managing gate settings
 - Increased Time flexibility
 - Change irrigation sets based on field needs instead of morning/evening routine
- Near-zero operating cost, solar powered, maintenance free, and fully portable
- Brings Affordable automation to the practice of surface irrigation



WHY AUTOMATED GATED PIPE

Water Usage and Efficiency

- Better management of water resources
 - Can significantly reduce edge of field runoff
 - End-of-field water sensors trigger notifications and gate management
 - Allows for implementation of known best practices for surface irrigation
- Ability to increase crop yields while optimizing water usage
- Retains the benefits of deep percolation and return flows
- Enables implementation of better irrigation practices



SURGE IRRIGATION

Surging is the usage of periodic on/off cycles during the irrigation period. Surge irrigation operates on the principle that intermittent water application allows soil particles to consolidate, forming a surface seal.

Binary
Surge Valve



Benefits

- Overall water usage 53-75% of continuous
- Reduced runoff, from 16% for continuous to 10% for surge
- Increased wetting front advance rates
- More even infiltration down the length of the row
- More consistent soil moisture profile

- Humpherys, USDA ICID Bulletin 1989, Vol. 38 No. 2

Surging is not widely adopted

- Additional labor to manage it
- Field variation

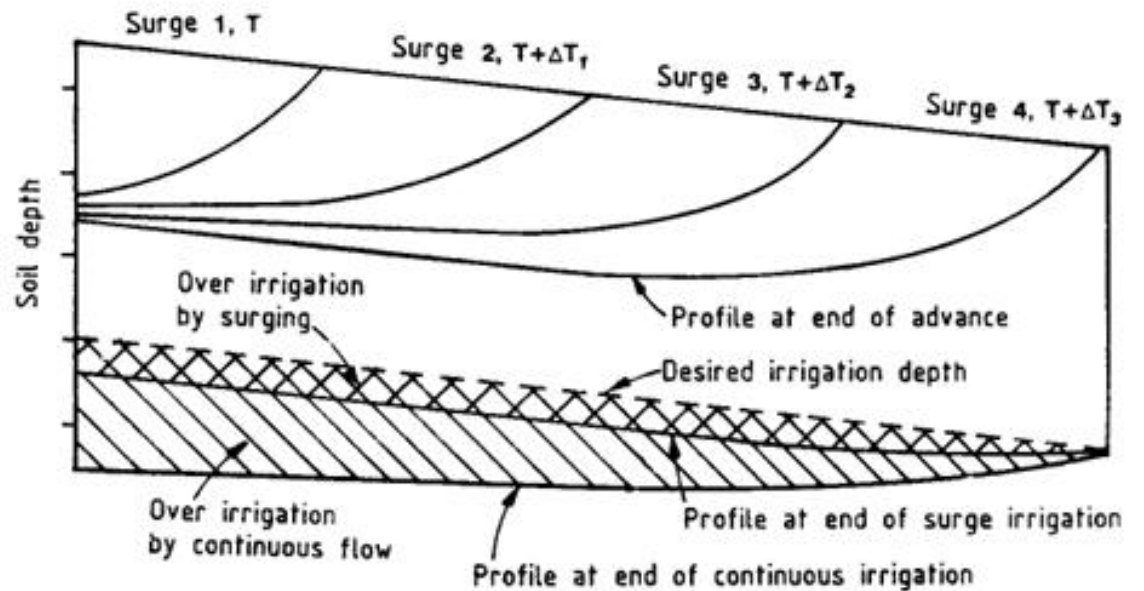


Figure 4. Diagram of cumulative infiltration profiles for surge flow with increasing on-times compared to that for continuous flow.

SURGE IRRIGATION: ADVANCE RATES

Graph showing the time to wet the entire furrow at 26 and 29 L/min flow with continuous vs. surge irrigation.

“To efficiently use the surge technique, irrigation systems must be automated.”

-Humpherys, USDA ICID Bulletin
1989, Vol. 38 No. 2, pg 43.

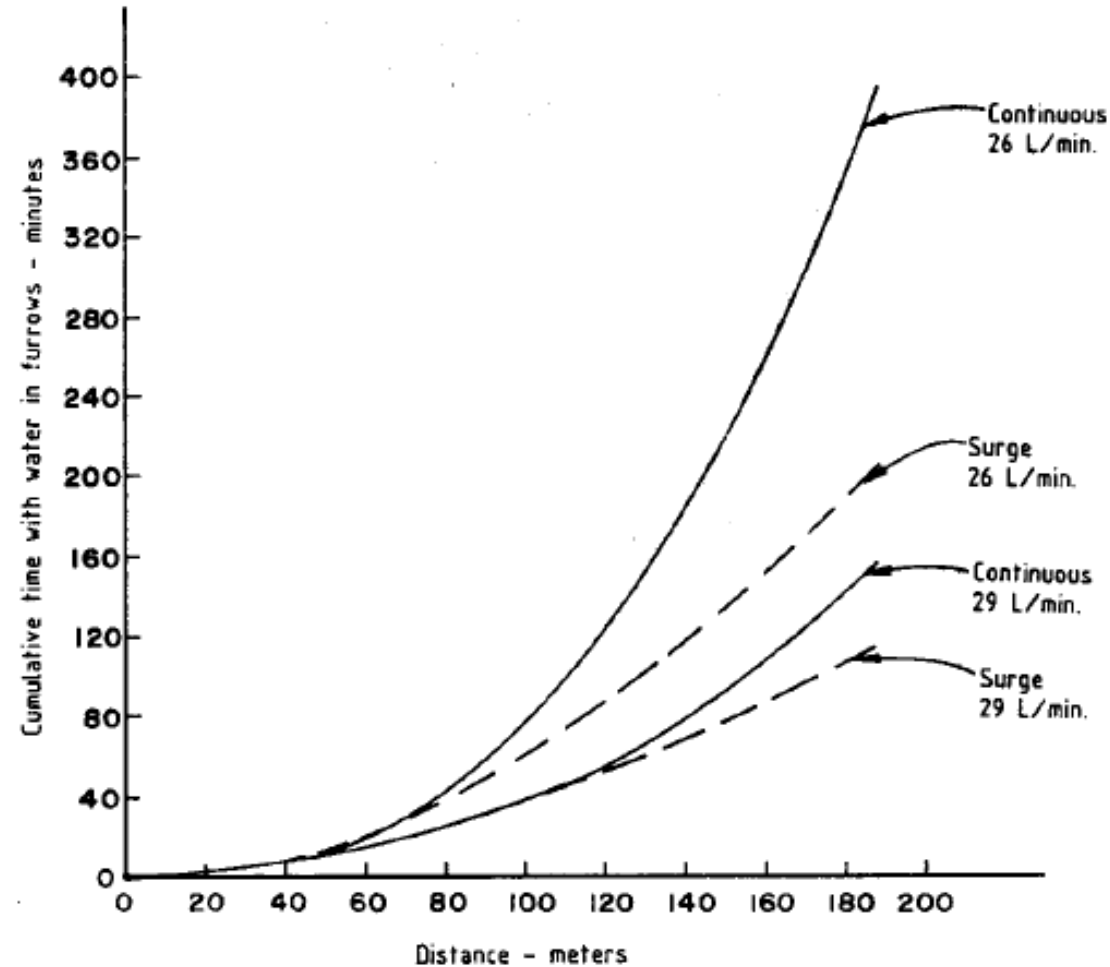


Figure 1. Advance curves for surged and continuous furrow streams on a silt loam soil near Kimberly, Idaho. Cumulative time for surged streams is the elapsed time minus the off-time.

SURGE IRRIGATION COMPARISON

Oregon Wheat Field Example

'Treasure' Spring Wheat

Table 1. Water application and runoff with conventional furrow and surge irrigation, Malheur County, OR.

	Conventional (ac-in/ac) (%)		Surge (ac-in/ac) (%)	
Water applied	24.7	100	12.0	100
Runoff	5.6	22.7	1.7	14.1
Infiltration	19.1	77.3	10.3	85.8

Sediment Losses: 1,383 lb/ac 406 lb/ac

No significant difference in grain yield or quality

'Stephens' Winter Wheat

Table 2. Water application and runoff with conventional furrow and surge irrigation, Malheur County, OR.

	Conventional (ac-in/ac) (%)		Surge (ac-in/ac) (%)	
Water applied	26.4	100	13.7	100
Runoff	0.8	3.0	0.5	3.6
Infiltration	25.7	97.3	13.1	95.6

Sediment Losses: 131 lb/ac 51 lb/ac

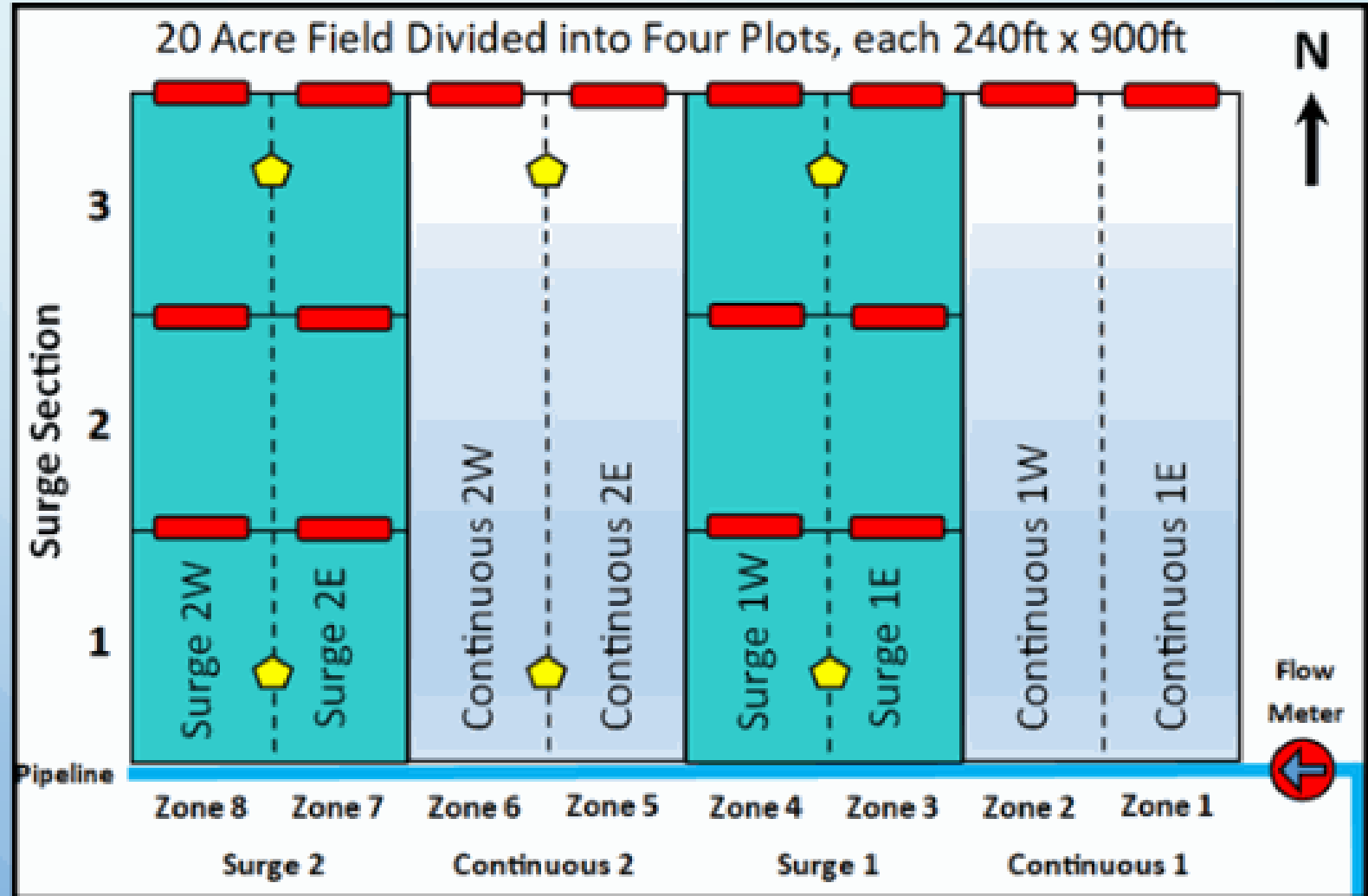
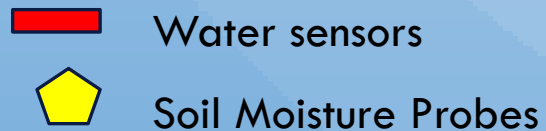
No significant difference in grain yield or quality

SURGE SETUP EXAMPLE: SIDE-BY-SIDE COMPARE

Study conducted in 2025 on a forage field in east Boulder County comparing surge and continuous irrigation practices.

Setup:

- Two sets of surge and continuous strips for comparison
- Field length of 900ft split into 3 surge sections
- Zone width: 4 pipes
- Soil moisture sensors
- Flow meter at inlet



SURGE EXAMPLE: SIDE-BY-SIDE COMPARE

Results:

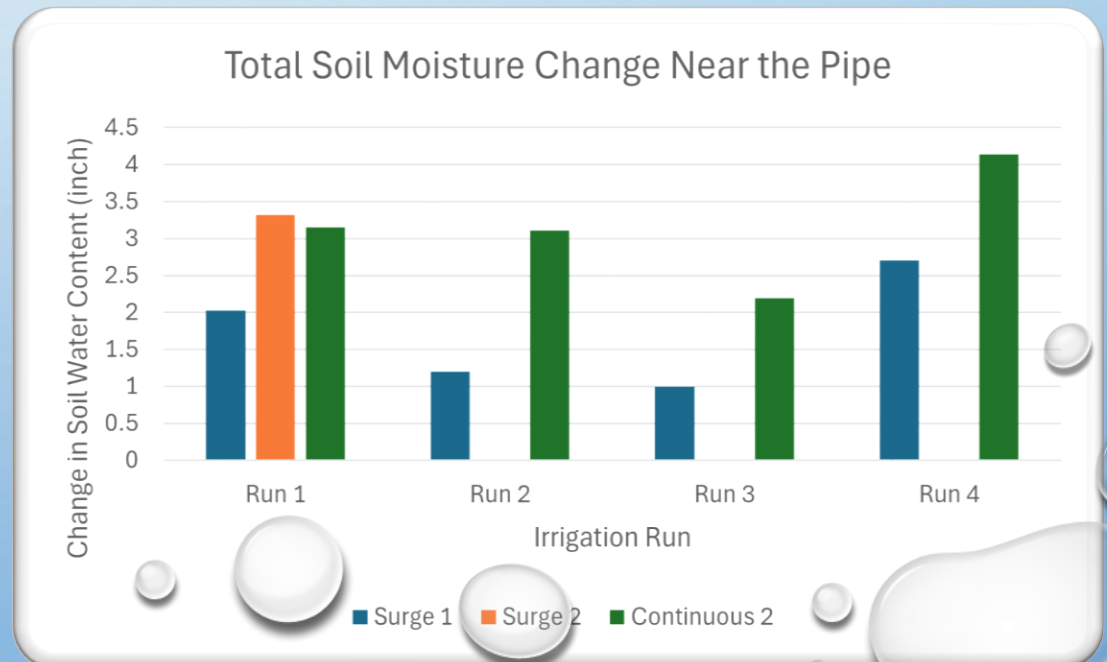
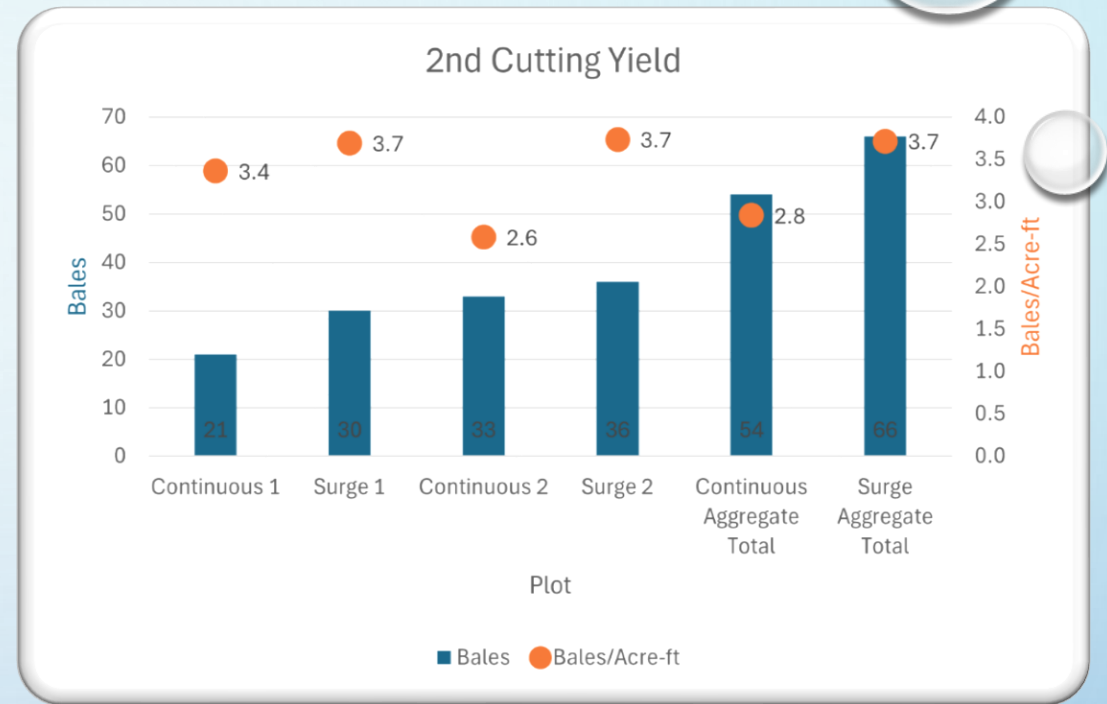
1. Surge sections used **75-80%** of the water
2. Surge sections yielded **0.9 bales** more per acre-ft of water
3. Significantly reduced soil saturation at the top end near the pipe.

Key Take-away:

- Automated Gated Pipe provides the tools to benefit from surge practices without added labor

Recommended Reading:

- USDA NRCS Part 623 Irrigation National Engineering Handbook, Chpt 4



ON-FIELD ACTIVITY AND TESTING

Field Demonstrations (2023)

Boulder County and Domenico Farms—Furrow irrigation on organic produce
Grand Valley (De Beque, CO) - Forage field

Grant Activity (2024—2025)

Colorado Water Conservation Board in conjunction with the South Platte Basin Roundtable—2024

Automated Gated Pipe Field Trials

Installed 4 systems at 3 farms allowing farmers to control irrigation sets remotely. Applications were on corn and forage.

Colorado Ag Water Alliance, the Longmont / Boulder Valley Conservation District—2025

Automated Gated Pipe Surge Study at Isabelle Farm

Demonstrated surge irrigation on forage resulting in less overwatering near the pipe, and increased yield per acre-ft of water applied.

Customer Installs Began (2026)



SOLUTION INVESTMENT

Investment: As low as \$170 / acre (based on 40 acres, 1/4 mile rows at 60" spacing)

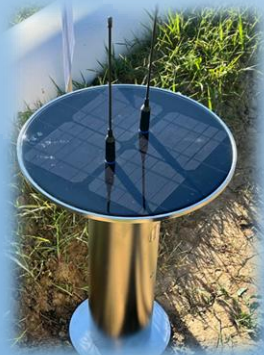
Annual Maintenance Fee: \$300

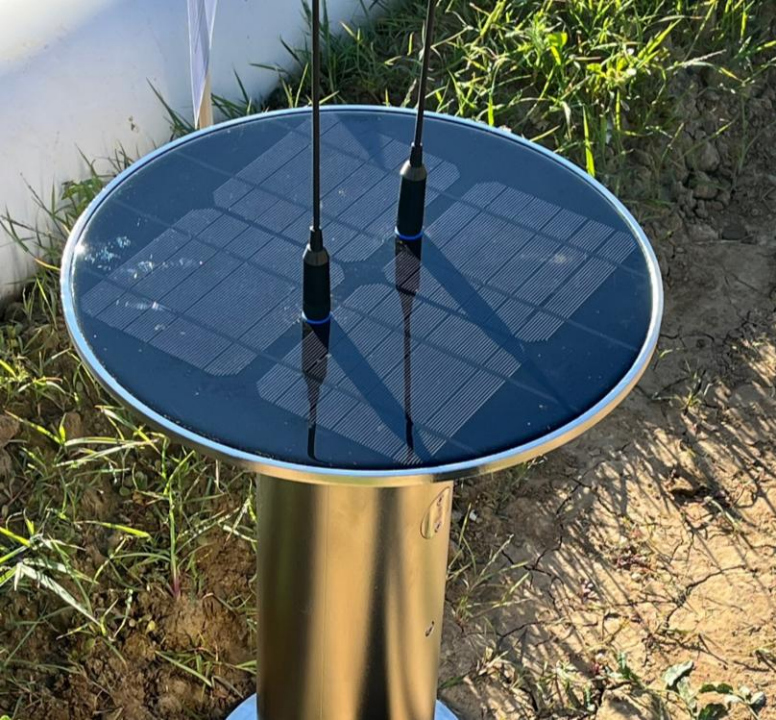
EQIP cost-share is dependent upon local project evaluation

NEAR-ZERO OPERATING COST

VARIABLES

- Number of pipes
- Gate spacing
- Number of water sensors
- Cost-share (NRCS, other grants)
- Dealer arrangements
- Retrofit or preassembled





AUTOMATED GATED PIPE

Enables Benefits In

- Reduced labor
- Water usage / efficiency
- Crop health
- Energy Usage
- Environmental stewardship

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Marketed under **SunGate Systems, LLC**

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Questions?

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