
Statement of Work

WATER ACTIVITY NAME - Investigation of Water Savings, Water Quality benefits and Profitability of Sub Surface Drip on Alfalfa in Grand Valley

GRANT RECIPIENT – Colorado State University

FUNDING SOURCE – Water Supply Reserve Account: Colorado Basin Roundtable and Statewide funds (plus match)

INTRODUCTION AND BACKGROUND

This study is a side-by-side comparison of furrow and sub-surface drip irrigation (SDI) on alfalfa over four years starting in 2012. The study will be performed on 3 acres of sub-surface drip irrigated alfalfa alongside approximately 70 acres of furrow irrigated alfalfa (same plant date) on an agricultural cooperators ground in Loma, Colorado.

The program is needed to determine first how much conserved water SDI irrigated alfalfa provides. If significant it has the potential to be an alternative to municipal water providers over the purchase of additional farms and ranches for their water rights. Secondly it provides a *profitable* and proven alternative to the subdivision of Grand Valley agricultural land into smaller “ranchettes.” Small acreage owners are not motivated by agricultural production for profit but rather by the rural experience and lifestyle. The water stays in place but its use sees a shift away from commercial agriculture. If commercial agriculture has a more economic resilient means to raise one of the most popular crops in the basin, then it should slow the loss of (prime) commercial agricultural ground.

OBJECTIVES

The study will test and characterize a series of SDI configurations for water savings, yield improvement and water quality benefits. There is a potential for up to 20 percent savings (or 7.2 inches in the Fruita area) on water consumption through the reduction of surface evaporation that SDI provides. With savings and benefits quantified this analysis can educate local farmers, ranchers, and municipal water providers on the advantages of SDI. With a broader understanding of SDI the adoption of sub-surface drip in the Grand Valley among commercial alfalfa producers should increase.

TASK 1: Installation of SDI and monitoring equipment

Prior to planting alfalfa and a “nurse crop” of oats drip tape needs to be installed and connected to header and filtration equipment. The filtration skid will be rented from the Shavano Conservation District at a rate of \$1,000 per year.

Monitoring flumes (portable broad crested weirs), flow totalizers, and soil moisture equipment are on-hand with the Experiment Station and Water Institute staff and will be installed in conjunction with SDI tape as part of water quantity and water quality assessments.

Method/Procedures

The project team will relocate (from Montrose County), clean, and service the filtration skid. Team members will purchase and install a series of SDI configurations prior to planting alfalfa in both the SDI and furrow treatments. Configurations will be for determining optimum tape depth, tape spacing, emitter size, and emitter spacing. Western Colorado soils are relatively new to SDI so these four parameters are the key to matching water delivery with soil wetting properties and plant water requirements.

As tape is being installed soil moisture sensors will be installed in and below the root zone. Sensors will be spread from top to bottom of both treatments to account for the uneven wetting front of furrow irrigation.

Deliverables

Installation of SDI at the study site so as to fulfill the objectives of the study.

Flume readings and soil moisture sensors when correlated with soil type provide an understanding of water volumes applied to and below the root zone during an irrigation. Measured soil moisture volumes will be compared to the CoAgMet station (at Fruita Research Center) daily evaporation and transpiration records to provide overall efficiency and consumption determinations.

Deep percolation (below root zone) water amounts can also be correlated with known loading rates of salt and in a more limited fashion selenium and nitrogen.

TASK 2: Planting of alfalfa

Alfalfa (for seed) will be planted on both furrow and SDI irrigated treatments.

Method/Procedures

Fruita Research Center staff will work with the cooperating producer to seed alfalfa once tape has been laid and creases cut. Alfalfa (for seed) will be used which does not require a nurse crop.

Deliverables

A consistent stand of alfalfa for the SDI comparison with furrow irrigation will be raised across all 3 acres of SDI and 70 acres of furrow irrigation.

TASK 3: Monitoring water use and loss

From the first irrigation water amounts will be recorded in conjunction with crop growth stages and root depth.

Method/Procedures

Using a level transducer in field flumes and in-pipe flow totalizers , the irrigation amounts applied to SDI and furrow treatments will be carefully recorded throughout the growing season. Combined with water amounts measured in root zones and percolating below root zones a water balance will be used to calculate evapo-transpiration (ET). The local CoAgMet site (located within 7 miles) will also be maintained and monitored for calculated ET as a guide for separating evaporation and transpiration portions – which will be the key to determining seasonal conserved consumptive use.

Deliverables

A measure of water consumed by alfalfa on SDI and furrow irrigation treatments on first and second year alfalfa and the likely water savings, and water quality benefits to alfalfa grown under SDI.

TASK 4: Yield and Profit Comparison

The second year of alfalfa and a small series of harvested oat plots in the first year will be sampled to compare the relative yield value, quality, and biomass of each irrigation treatment.

Method/Procedures

Fruita Research Center staff will work in cooperation has plot harvesting equipment designed to bale small treatments of field crops including alfalfa for the purposes of comparing yield characteristics. These will be used to determine the relative differences between SDI and furrow irrigation.

Deliverables

Measures of yield biomass (tons), value (farm gate prices), and quality (protein content) will be taken on harvest samples. These measures can be then used as part of the return on investment comparison between SDI and furrow treatments. Biomass will also be used to validate measured differences in water consumption between treatments.

TASK 5: Outreach and reporting

Reporting will be issued to funding and partners as the project progresses and is completed. Field days at the Research Center will include a tour of the study. The demonstration will be made available to local producers who want to learn more about the study via field days. The study is also close to the road for local producers to observe as they drive by.

Method/Procedures

At the end of year one a report will be compiled of first year progress and results. At the end of the second year a full project will be completed. Fruita Research Center typically has at least one field day a year in which a tour of this study will be included.

Deliverables

In addition to the required 6-monthly progress reports for CWCB staff, larger end-of-year reports will be produced for CWCB, the Colorado River District, and CSU Agricultural Experiment Station. An end of project report will also be provided to CWCB, the Colorado River District, and CSU Agricultural Experiment Station.

Reports will describe in detail (across treatments):

- Crop water use
- Conserved consumptive use of SDI treatments
- Yield biomass, value, quality
- Water quality impacts
- Return on investment analysis (final report)
- Saved water implications (final report)
- Next steps (final report)

Condensed/modified versions of these reports will also be included in the annual technical bulletins published by Western Colorado Research Center and the Colorado Water newsletter.

Future Tasks

After four years there will be the opportunity to invest in further analysis of both furrow and SDI irrigated alfalfa. The life of alfalfa in the Grand Valley is as long as 7 years once established so additional study at a small annual cost (mostly monitoring and harvest labor) would be achievable.

Method/Procedures

The same methods described in Tasks 2, 3, and 4.

Deliverables

A larger data set which adds more credibility to data.

REPORTING AND FINAL DELIVERABLE

Reporting: The applicant shall provide the CWCB a progress report every 6 months, beginning from the date of the executed contract. The progress report shall describe the completion or partial completion of the tasks identified in the statement of work including a description of any major issues that have occurred and any corrective action taken to address these issues.

Final Deliverable: At completion of the project, the applicant shall provide the CWCB a final report that summarizes the project and documents how the project was completed. This report may contain photographs, summaries of meetings and engineering reports/designs.

BUDGET**Budget Table 1: Labor Costs – Field Technician**

Personnel: Rate:	Months \$12/hr	Fringe		Total Costs
Tasks 3 & 4	504			
Hours: 2012	144	13.2%		
2013-2015	120 x 3	12.5%;12.68%;12.85%		
Cost:	\$6,404	\$821		\$7,225

Budget Table 2: Total Direct Costs

Item:	Monitoring Labor	SDI Installation	SDI Materials	Outreach	Mileage	Total
Units:	504 hours	3 zones	3 acres	field days Pubs/Sheets	PI/Co-PI 8 trips	Without
Unit Cost:	\$12/hr	~\$3,000/zone	\$5,000		\$0.50/mi	\$match
Task 1 – Install Skid Rental	Cooperating Producer w/ Fruita Res Ctr	\$9,000	\$16,508 \$4,247			\$29,755
Task 2 – Plant						
Task 3 – Monitor	\$5,780					\$5,780
Task 4 – Comparison	\$1,445					\$1,445
Task 5 – Outreach				\$3,047	\$750	\$3,797
Total Units:	4 yrs pt time			2 field days 3 printings	692 mi	
Total Cost:	\$7,225	\$9,000	\$20,755	\$3,047	\$750	\$40,777

Budget Table 3: Total Costs

Total Direct Costs:		\$40,777
Indirect Costs:	Colorado State University (15% TDC)	\$6,117
Total Funds Requested:		\$46,894
Total CSU Match:	Colorado State University (14.7%)	\$8,101
Total Project Costs:		\$54,995

Accompanying study	CWCB – Alternative Ag Transfers	\$8,841
Accompanying study	Colorado River District	\$1,000

*Accompanying study information is for informational purposes only and does not represent quantified cost share for this requested funding.

Budget Narrative:

REQUESTED FUNDS: \$46,894 Matching Funds: \$8,101

*Figures in Years 2 - 4 have been adjusted for inflation at 4%, unless otherwise noted.

Personnel (\$7,225)

Funds are requested for a Field Technician (non-student hourly) for 144 hours in Year 1 and 120 hours in Years 2 - 4 at \$12/hr. This person will be responsible for monitoring the study in the field.

Fringe has been calculated at CSU established rates for non-student hourly of 13.2% in Year 1, 12.5% in Year 2, 12.68% in Year 3, and 12.85% in Year 4.

Travel (\$750)

Funds are requested in for mileage from Grand Junction to Glenwood Springs (173 mi/trip @ \$0.50/mi) to present to the Colorado Roundtable and at the River District Board Meeting in each of Years 2 & 4.

Supplies (\$16,058)

Funds are requested for sub-surface drip supplies such as headers, filters, valves, connectors, vents, and tape for sub surface drip (\$5,000 per acre for 3 acres). Funds are also requested for a pump, replacement pump seals, wiring (\$1,058).

Other (\$16,744)

Funds are requested for professional service of a project team for the SDI Tape Installation at \$3000/acre for 3 acres.

Funds are requested for rental of a filtration skid from Shavano Conservation District at \$1,000/yr.

Funds are requested for professional service of an electrician to wire skids @ \$75/hr for 6 hours.

Funds are requested to host a project outreach field day in each of Years 2 & 4 (\$1000 each - \$700 space rental and \$300 advertising).

Funds are requested for publications: Year 2 report (20 copies @ \$5 ea); End of project report (60 copies @ \$5 ea); Fact Sheets (100 copies @ \$1 ea).

Funds are requested for printing of a 2-fold brochure in Year 2 (50 copies @ \$2 ea) and again in Year 4 (100 copies @ \$2 ea)

Indirect Costs (\$6,117)

As of February 2012, the approved indirect rate for this proposal is 15% TDC.

CSU Match: \$8,101

*Personnel adjusted for inflation in Years 2 - 4 @ 4%.

CSU Personnel (\$6,429)

PI, Denis Reich (\$4,775/month) will contribute 0.25 months per year in Years 1 - 4 and fringe at 26.3% Y1; 26.6% Y2; 26.97% Y3; and 27.35% Y4.

Indirect Costs (\$1,672)

Indirect Costs have been calculated at CSU's federally negotiated rate of 26% MTDC.

EXHIBIT A

SCHEDULE

May 1 st 2012 to April 30 th 2016	2012		2013		2014		2015		2016
	Growing Season	Off-season	Growing Season	Off-season	Growing Season	Off-season	Growing Season	Off-season	
1. Installation									
a. SDI									
b. Monitoring									
2. Plant									
3. Monitoring									
4. Harvest									
5. Outreach									
a. Reporting				Mid-Project				Final	
b. Field Days									