STATE OF COLORADO

Colorado Water Conservation Board
Department of Natural Resources
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TO: Colorado Water Conservation Board

FROM: Todd Doherty, Water Supply Planning Section

DATE: January 11, 2012

SUBJECT: **Agenda Item 21, January 23-24, 2012 Board Meeting-**
Alternative Agricultural Water Transfer Grant Program
Quantification of Water Savings Benefits on Sub-Surface Drip Irrigated Alfalfa in the Grand Valley

Staff Recommendation
Please refer to the attached agricultural grant program summary sheet for staff recommendation.

Background
In 2011, the CWCB meetings the Board approved $1,490,276 in grants to facilitate alternative agricultural transfers out of a total $1.5 million, providing for a current balance of $9,724. The following grant application is from the Colorado State University/Colorado Water Institute's Colorado Agricultural Experiment Station and is requesting $9,611 to help fund a sub-surface drip irrigation test plot in the Grand Valley. Below is a list of projects funded during this current funding cycle with their grant requests, awarded and account balance.

Applicant	**Name of Water Activity**	**Total Request**	**Recommendation**	
TNC	Rotational Fallowing Mountain Hay Meadows	$132,000	$132,000	
CRWCD	Compact Water Bank	$180,000	$180,000	
LAVWCD	Farm Financial Planning Tool	$31,633	$31,633	
Colorado Water Innovation Cluster	Lake Canal Demonstation Project	$135,105	$135,105	
East Cheery Creek Valley WSD	Maintaining Ag Productivity on Formally Irrigated Lands	$111,030	$111,030	
Parker WSD	Lower S. Platte Irrigation Demonstation Project	$435,152	$320,166	
Lower S. Platte WCD	Water Cooperative--Technical Work	$260,477	$300,477	
Corn Growers	FLEX Market Model Project	$206,365	$158,365	
LAVWCD	Super Ditch Engineering (Application Withdrawn)	$254,067	$0	
UAWCD	Building and Assessing Accounting and Administration Tools for Lease-Fallowing in Colorado's Lower Arkansas River Valley	$125,000	$121,500	
CSU	Sub-surface drip irrigation in the Grand Valley	$9,611	$9,611	
				Balance Remaining
		$1,880,440	**$1,499,887**	**$113**

Alternative Agricultural Water Transfer Methods – Competitive Grant Program
Water Activity Summary Sheet
Agenda Item 21

Applicant: CSU/Colorado Water Institute; Colorado Agricultural Experiment Station

Water Activity Name: Quantification of Water Savings Benefits on Sub-Surface Drip Irrigated Alfalfa in the Grand Valley

Water Activity Purpose: Demonstration Project

Drainage Basin: Colorado

Water Source: Colorado River Basin

Amount Requested: $9,611

Matching Funds: $1,000 (plus an additional $8,970 in-kind contributions)

Staff Recommendation
Staff recommends approval of up to $9,611 from the Alternative Agricultural Water Transfer Methods Program to help complete the project, Quantification of Water Savings Benefits on Sub-Surface Drip Irrigated Alfalfa in the Grand Valley.

Water Activity Summary:
This study is a side-by-side comparison of furrow and sub-surface drip irrigation (SDI) on alfalfa over two years starting in 2012. The study will be performed on about 3 acres at the Fruita Research Center in the Grand Valley of Western 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 will hopefully provide commercial farms a profitable and proven alternative to the subdivision of Grand Valley agricultural land into smaller "ranchettes."

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 has the potential to increase.

Major Tasks:
TASK 1: Installation of SDI and monitoring equipment
TASK 2: Planting of alfalfa
TASK 3: Monitoring water use and loss
TASK 4: Yield Comparison
TASK 5: Outreach and reporting

Discussion:
Staff believes that higher efficiency irrigation systems may provide significant benefits to many river basins within the State. As mentioned in the application, some of the potential benefits include: reduced selenium and salinity loading, reduced consumptive use through a reduction in evaporation, increased crop yields and increased streamflows due to reduced diversion amounts. This demonstration project, if successful, will help test whether or not sub-irrigation drip is feasible for the typical West Slope soils. If successful, farmers may be more inclined to begin adopting SDI to gain higher crop yields. It also may be apparent that SDI does produce broader benefits (i.e. reduced selenium/salinity or instream flows) that warrant subsidies or other incentives to encourage more wide-spread adoption.

Issues/Additional Needs:
Please provide a more detailed description on the methodology proposed for comparing water quality for both the furrow and sub-surface drip irrigation methods.

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. All products, data and information developed as a result of this grant must be provided to the CWCB in hard copy and electronic format as part of the project documentation. This information will in turn be made widely available to Basin Roundtables and the general public and will help promote the development of a common technical platform.

In accordance with the Criteria and Guidelines of the Alternative Agricultural Water Transfer Methods Competitive Grant Program, staff would like to highlight additional reporting and final deliverable requirements. The specific requirements are provided below.

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 scope of work including a description of any major issues that have occurred and any corrective action taken to address these issues.

Engineering: All engineering work (as defined in the Engineers Practice Act (§12-25-102(10) C.R.S.)) performed under this grant shall be performed by or under the responsible charge of professional engineer licensed by the State of Colorado to practice Engineering.

COLORADO
DEPARTMENT OF NATURAL RESOURCES

COLORADO WATER CONSERVATION BOARD

ALERNATIVE AGRICULTURAL WATER TRANSFER METHODS COMPETITIVE GRANT PROGRAM

GRANT APPLICATION FORM

Quantification of Water Savings Benefits on Sub-Surface Drip Irrigated Alfalfa in the Grand Valley

Program/Project Name

River Basin Name

$9,611

Amount of Funds Requested

$1,000

Amount of Matching Funds

*** The deadline for Grant Applications is November 26, 2010 for consideration at the January 2011CWCB meeting.** It is anticipated that there will be one round of application submittals, yet if funds are not exhausted, the Board will determine when it will consider the next round of grant applications at their January 2011 meeting.

* In completing the application you may attach additional sheets if the form does not provide adequate space. If additional sheets are attached please be sure to reference the section number of the application that you are addressing (i.e., A.1. etc.).

Instructions: This application form must be submitted in electronic format (Microsoft Word or Original PDF). The application can be emailed or a disc can be mailed to the address at the end of the application form. The Alternative Agricultural Water Transfer Methods Competitive Grant Program, Criteria and Guidelines can be found at http://cwcb.state.co.us/LoansGrants/alternative-agricultural-water-transfer-methods-grants/Pages/main.aspx. **The criteria and guidelines must be reviewed and followed when completing this application.** You may attach additional sheets as necessary to fully answer any question, or to provide additional information that you feel would be helpful in evaluating this application. Include with your application a cover letter summarizing your request for a grant. If you have difficulty with any part of the application, contact Todd Doherty of the Water Supply Planning Section (Colorado Water Conservation Board) for assistance, at (303) 866-3441 x3210 or email at todd.doherty@state.co.us.

Generally, the applicant is also the prospective owner and sponsor of the proposed program/project. If this is not the case, contact Todd before completing this application.

Part A. - Description of the Applicant (Project Sponsor or Owner);

1. Applicant Name(s): Colorado State University: Colorado Water Institute; Colorado Agricultural Experiment Station

Mailing address:
Colorado State University Extension
Western Region Office
2764 Compass Drive / Suite 232
Grand Junction, CO 81501

Taxpayer ID#: 846000545

Email address: Denis.Reich@Colostate.edu

Phone Numbers: Business: 970-242-8683

Home: 970-201-8467

Fax: 970-241-3643

2. Person to contact regarding this application if different from above:

Name: Denis Reich

Position/Title: Water Resources Specialist

3. If the Contracting Entity is different then the Applicant, please describe the Contracting Entity here.

Marilyn Morrissey
Senior Research Administrator
Colorado State University
970-491-2375
Marilyn.morrissey@colostate.edu

4. Provide a brief description of your organization. The applicant may be a public or private entity. Given the diverse range of potential applicants, not all of the following information may be relevant. Where applicable and relevant the description should include the following:

    a) Type of organization, official name, the year formed, and the statutes under which the entity was formed, a contact person and that person's position or title, address and phone number. For private entities, a copy of the Articles of Incorporation and By-laws should be appended to the application.

    b) For waters suppliers, information regarding the number of customers, taps, service area, and current water usage, and future growth plans, water related facilities owned or used, funding/revenue sources (existing service charges, tap fees, share assessments, etc.), the number of members or shareholders and shares of stock outstanding or a description of other means of ownership.

    c) For other entities, background, organizational size, staffing and budget, and funding related to water that is relevant in determining whether the applicant has the ability to accomplish the program/project for which funding is sought.

    d) A brief history of the Applicant(s).

    e) Please include any relevant Tabor issues relating to the funding request that may affect the Contracting Entity.

The **Colorado Water Institute** (CWI), an affiliate of Colorado State University, exists for the express purpose of focusing the water expertise of higher education on the evolving water concerns and problems being faced by Colorado citizens.

The Colorado Water Institute (CWI) is authorized and funded by Congress and the Colorado Legislature. CWI is accountable to Congress via its annual appropriation, a required annual report, and a thorough congressionally mandated peer review conducted every five years under the auspices of the U.S. Geological Survey. Copies of CWI's Federal and State authorizing legislation are attached to the Annual Report PDF. CWI is operated, by law, as a state-wide water research institute, obligated to connect all water expertise in Colorado's higher education system with research and education needs of Colorado's water managers and users.

CSU Agricultural Experiment Station combines the research and outreach arms of Colorado State University to help sustain the state's natural resources and improve the food and fuel production from rural areas to the benefit of all Coloradans. Colorado agriculture is as varied as the state's climate and geography. The agricultural sector has developed in response to the different environments throughout the state. The irrigated and dry-land farms, orchards, ranches and feedlots of Colorado produce a diverse array of crops and livestock. These enterprises require expertise in many scientific areas to enhance profitability and protect the environment. Basic and applied research performed on Colorado Agricultural Experiment stations addresses the economic viability, environmental sustainability, and social acceptability of activities impacting agriculture, natural resources, in addition to food and fuel consumers in Colorado.

The passage of the Hatch Act in 1887 provided research at these institutions by authorizing a state agricultural experiment station for each state to support each land grant institution's educational mission. State

agricultural experiment stations are located in every state and territory, covering all the ecological, environmental and socioeconomic regions of the nation.

The Colorado Agricultural Experiment Station, an integral part of Colorado State University, was established in 1888 as a result of the Colorado General Assembly having ratified during the provisions of the Hatch Act. State and federal funds support the research program of the CAES.

The Fruita Research Center, like all CSU Research Farms has its own irrigation shares that allow for irrigation to be managed like other commercial agricultural operations in the region.

Colorado State University is a Public Institution of Higher Education and an 1862 land grant university.

Part B. - Description of the Alternative Water Transfer Program/Project –

1. Purpose of the Program/Project

   Please provide a summary of the proposed program/project, including a statement of what the program/project is intended to accomplish, the need for the program/project, the problems and opportunities to be addressed, the expectations of the applicant(s), and why the program/project is important to the applicant(s). The summary must include a description of the technical, institutional (i.e., how the program/project will be organized and operated), and legal elements that will and/or have been addressed by the applicant and proposed program/project. The summary should also discuss relevant project history, if applicable, and any other relevant issues.

Summary: The study is a side-by-side comparison of furrow and sub-surface drip irrigation (SDI) on alfalfa over two years starting in 2012 (with potential for more research beyond the completion of this study). The study will be performed on about 3 acres at the Fruita Research Center in the Grand Valley of Western Colorado. The study work plan will be completed under the supervision of the Colorado Water Institute and Agricultural Experiment Station staff.

Objectives: The study will test a series of SDI configurations (tape type, depth, and row spacing) for water savings, yield improvement, and water quality benefits (salt, nutrients, selenium) against furrow irrigation; the traditional irrigation system for the Grand Valley. The water budget and water quality comparisons are also of interest to the Colorado River District, prompting them to provide $1,000 in cash match for this project.

With savings and benefits quantified this analysis can educate local farmers and ranchers 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.

Also a delivery system has an opportunity to make significant jumps in conveyance efficiency with ditch-wide adoption of systems like SDI, since SDI is less dependent on gravity pressure and water levels in laterals to be effective.

Need: The program is needed to provide a profitable alternative to the subdivision of prime 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.

Additionally the initial steps for "buy and dry" has commenced in the area. Ute Water Conservancy District, the largest domestic water provider in the Grand Valley has purchased ranches in the Plateau Valley (near Collbran) to accommodate future water needs. If SDI can provide conserved consumptive use within the Grand Valley it could prevent or slow additional agricultural water purchases by local domestic water providers.

Problem: Innovative producers in the Grand Valley have been curious about SDI for a number of years but are hesitant to try it given the investment required (even with NRCS incentive payments) and the unproven nature of the technology on perennials (pasture, hay, alfalfa) in the poorly structured Western Colorado soils.

This study utilizes the land grant agricultural experiment station appropriately to reduce adoption risk by isolating the best SDI configuration for profitable irrigation of one of the West Slope's most sought after crops.

Expectations: Results are expected to show SDI will generate some on-farm water savings for alfalfa production; that alfalfa will be more profitable and productive under SDI than furrow irrigation; and that SDI will have significant water quality benefits over furrow.

The funding for this study will be used to leverage additional monies and match for an accompanying on-farm demonstration of SDI on alfalfa grown at Loma, Colo. The combination of basic research at the Fruita Research Center and applied research on-farm will provide a conclusive summary for all Grand Valley (and Western Slope producers) interested in more efficient and profitable alfalfa production.

Importance: Agriculture is a significant enterprise the Grand Valley and an important contributor to the Western Slope economy. While "buy and dry" transfers out of agriculture to municipal use are still in their infancy in Western Colorado, the amount of irrigation water committed to *commercial* agriculture is shrinking through purchase of ranch land for anticipated growth, and by subdivision of commercial farms into small acreages or "ranchettes." Recent advances in irrigation technology such as SDI may be a means to keep more West Slope commercial agriculture viable and retain agricultural land for food and fuel production.

Previous Studies
To the maximum extent possible, the results of any previous studies and investigation should be utilized and incorporated into the proposed program/project. The application for funding should include a brief summary of the results of previous studies and how they will be utilized.

Comparison of irrigation systems on alfalfa at Rogers Mesa Research Center 2006-2008. *USDA-SARE (Sustainable Agriculture, Research, and Education) project led by Colorado State University Agricultural Experiment Station in partnership with the Delta Conservation District and Bureau of Reclamation. The study compared irrigation efficiency and some performance parameters on Pioneer 53V08 alfalfa under furrow, solid set sprinkler, and sub-surface drip irrigation (SDI). SDI proved to be the most efficient, but neither water savings (in terms of consumption) nor water quality benefits were quantified.*

Water-Use Efficiency of Cool-Season Turf Grasses in Western Colorado 2000-2001. *DOI-USBR (Bureau of Reclamation) project led by Dr. Calvin Pearson at the Fruita Research Center. Project included sub-surface drip irrigation of turf and resulted in the installation of the filtration equipment that would serviced and put to use for the proposed project. The location for this turf study was exactly the same as for the proposed study (See 2a).*

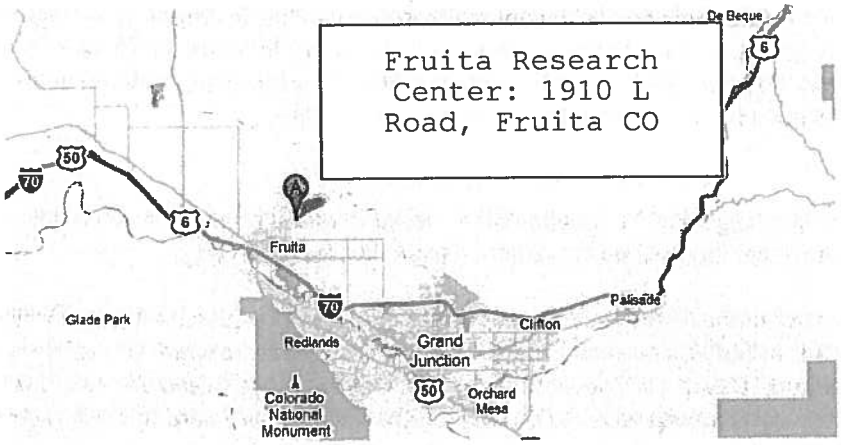
The proposed project will build on the efficiency evaluation established by the Rogers Mesa study with more precise consumed water to yield information in addition to conserved consumptive use and reduced salt, selenium, and nutrient loading to local waterways.

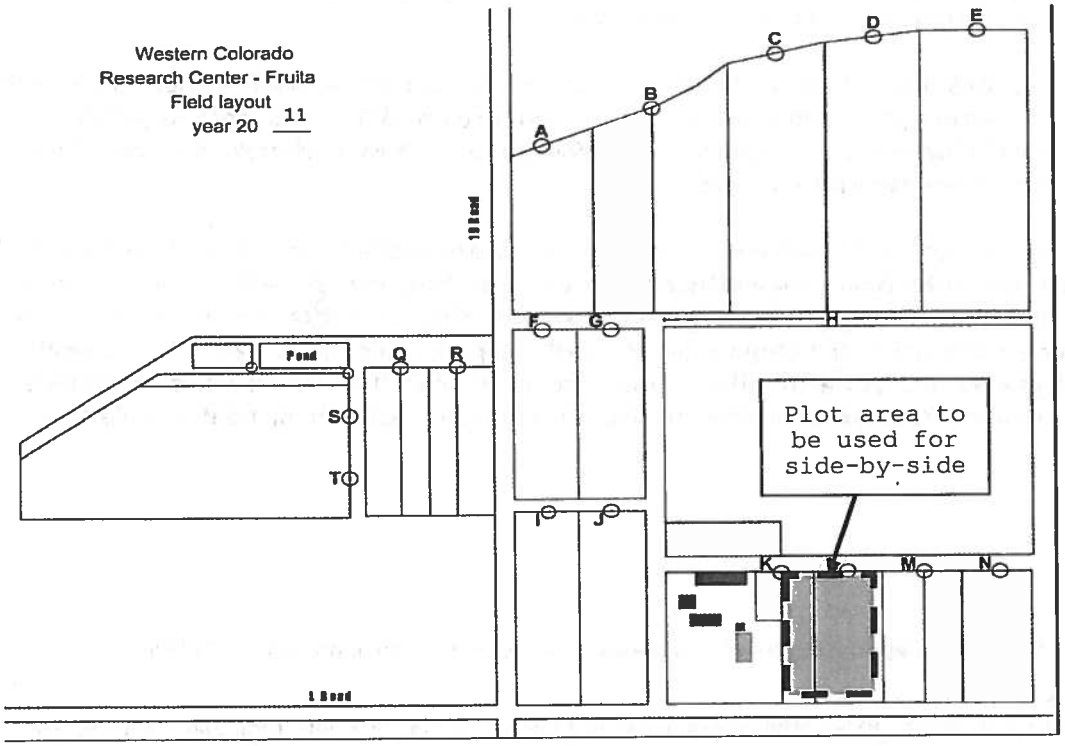
2. Study Area/Service Area Description

   a) A narrative description of the study area/service area including: the county, the location of towns or cities, topography, and locations of major surface and ground water features.

The study area will be at the 80 acre Fruita Research Center which is one of the two Western Colorado Research Center sites administered by the Agricultural Experiment Station of Colorado State University (manages 9 sites statewide). The Fruita Research Center is in Mesa County 2 miles north-east of Fruita at an altitude of 4,603 feet. Irrigation shares are supplied out of the Grand Valley Canal (Grand Valley Irrigation Company). The farm is managed by Research Director Dr. Calvin Pearson with two permanent staff.

b) An area map showing each of the items above, as well as the locations of existing facilities, proposed project facilities and boundaries of lands involved in the proposed program/project.





c) Information regarding the irrigated lands that are involved in the program/project. This must include a tabulation of total irrigated acreage, description of cropping types, crop yields, and total average annual water diversions for existing agricultural lands.

The study area will be approximately 3 acres at of the K and L fields at the Fruita Research Center. Irrigation at the Fruita Research Center is typically gated pipe or siphon tube.

The Colorado Irrigation Guide[1] indicates alfalfa consumes 36.2 inches of water during the course of an average season in the Fruita area. An efficiency of 50 percent is typical for furrow irrigation and 90 percent for sub-surface drip[2]. Hence water delivery will be approximately 78 inches for the furrow irrigated plots and 40 inches for the SDI irrigated plots. Across 3 acres, a season of irrigation will require 14.75 acre feet of water applied (9.75 AF for furrow, 5.0 AF for SDI). Due to the minimization of surface evaporation, water consumption should be lower on the SDI plots reducing the application amount further.

d) Information regarding the location of the new water use(s) that will be served by transferred water including the estimated number of users/taps and/or uses served.

Agricultural water use in the Grand Valley is not under the same pressures to be physically transferred to municipalities as it is in the Arkansas and South Platte basins. That said water use is still moving out of *commercial* agriculture. Despite the advantages agriculture has in the Grand Valley with climate, soils, cheap irrigation water, the costs associated with the region's remoteness are hard to offset without significant on-farm improvements. Hence as producers age and retire the norm is to subdivide commercial farms into small acreages or housing developments for retirement funds.

The advantages of SDI are first the yield improvements that can be achieved with less labor, and secondly the potential for conserving consumptive use by reducing surface evaporation. Additionally a greater adoption of SDI in the Grand Valley could improve conveyance efficiency to the point that less water is needed from the Colorado River to keep head gates primed.

Typically small acreages are 2 to 40 acres in size and tend to be managed for pasture or hay. Theoretically water use should be equivalent (same consumption on same crop per acre) to the pre-existing commercial farm since both are deemed agricultural uses. Typically mismanagement of water is higher on small acreages, meaning more water is diverted that isn't consumed which creates opportunities for lost water. These opportunities for lost water typically occur as weeds and evaporation from water pools that form due to excess application. Additionally housing density after subdivision is higher which raises demands on treated domestic water.

e) Socio-economic characteristics of the area such as population, employment and land use.

[1] Colorado Irrigation Guide. 1985. USDA: Conservation Districts of Colorado. Part 683: Crop Water Requirements.
[2] National Engineering Handbook – Irrigation Guide. Sept 1997. USDA: NRCS. Part 652 - Chapter 6: Irrigation System Design.

The Grand Valley is the dominant portion in terms of population and agriculture for Mesa County. The Grand Valley has a population of approximately 138,000 as part of the County's 147,000[1]. About 2,000[2] of the 58,750 members of the employed workforce in Mesa County are working directly on farms or ranches[3]. The agricultural acreage in the county is about 372,500 acres (about 1,767 farms, at 211 acres on average per farm).

As an indication of how land use is shifting in Mesa Co. (out of commercial agriculture), the land in farms in 2002 was about 385,250 acres (about 12,750 acres more than 2007) but number of farms increased from 1,599 in 2002 to 1,767 in 2007. This is consistent with a decrease in the average farm size from 241 acres to 211 acres across the same time period. These changes can be almost entirely explained by subdivision of larger commercial farms into housing development (loss of total acreage) or into small acreages (increase in farms, decrease in farm size)[4].

3. Description of the Alternative Water Transfer Method

   Please describe the type(s) of water transfers that will be examined/utilized (i.e., conceived transfer methods include, but are not limited to: 1) interruptible water supply agreements; 2) long-term agricultural land fallowing; 3) water banks;; and 5) purchase by end users with leaseback under defined conditions). In addition, please describe how the transferable consumptive use will be calculated and quantified, and how return flow patterns will be addressed/maintained.

The type of water transfers examined will be 4) **reduced consumptive use through efficiency** or cropping changes while maintaining historic return flows.

The consumptive use and efficiency for each irrigation treatment will be measured and calculated for individual irrigations and for the season. The surface water component will be measured by broad crested weirs with data loggers (both property of CSU Ag Experiment Station) while the groundwater component will be calculated using known soil type information[5] with soil moisture sensing equipment (property of Colorado Water Institute). These will be compared and validated with local CoAgMet weather station daily readings[6].

Maintenance of return flows is actually not necessarily desirable in the Grand Valley due to water quality concerns (salt and selenium). The Grand Valley is a surface water system so no wells or environmentally valuable wetlands are dependent on irrigation return flows to remain viable. Additionally the Colorado River Compact operates differently to the Arkansas River Compact and other river compacts in the state and irrigation return flows are not a factor in Colorado River Compact administration.

4. Program/Project Eligibility

[1] The 2010 National Census: http://2010.census.gov/2010census/
[2] The 2007 USDA-NASS Agricultural Census reported 1,947 workers hired by farms in Mesa Co. Additional casual labor is not included in this number.
[3] The 2010 National Census reports an unemployment rate for Mesa Co. (16-65 year olds) of 9.8%. It's important to note that many more individuals work in businesses that depend specifically on agriculture to remain profitable.
[4] Includes data from 2002 and 2007 USDA-NASS Agricultural Censuses.
[5] USDA Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
[6] http://ccc.atmos.colostate.edu/~coagmet/

Please describe how the proposed program/project meets each of the following eligibility requirements (please see Criteria and Guidelines for additional information regarding the alternative water transfer methods/strategies that qualify for funding). Note: If these requirements are addressed in other parts of the application you may simply reference the applicable section(s).

a) A description of how, if implemented, the proposed program/project will protect property and water rights.

b) Identified group(s) of agricultural users that are or may be willing to transfer a portion of their water and identified entity(s), group(s) or area(s) where the transferred water could or would be put to the new use and a description of the new use.

c) The program/project must at a minimum conceptually describe the technical, institutional, and legal elements of the water transfer. Grant monies may be used to address one or more of these elements. If grant monies are not requested for all three elements, the grant applicant must describe how the applicant has or intends to address the elements, which are not included in the grant request, through other efforts.

The project is designed to improve the economic return on Grand Valley water use in commercial agriculture. This in turn should increase the value and security of water rights among the local commercial farming community reducing the transfer of this water and land out of commercial agriculture.

Since leasing or transfers of irrigation water off of commercial agricultural land is not yet a significant factor in Western Colorado this project explores an alternative to *loss* of *commercial* agriculture. More specifically commercial agricultural land is being subdivided into land parcels that no longer participate in the traditional agricultural economy. Ranched acreage is also being purchased by domestic water providers in anticipation of future municipal growth. The purchased land will be fallowed in some manner when this water is eventually transferred to the municipal system.

New uses for conserved water as a result of increased SDI adoption in the Grand Valley could be municipal especially during peak demand periods; or dedicated to in-stream flows for the critical 15-mile and 18-mile reaches of the Colorado River.

d) If grant monies are proposed for use for legal assistance then the use of those funds shall be oriented toward advancing the knowledge of alternative agricultural water transfer methods and techniques; not for preparation of a specific water court case. The total requested funds for legal assistance shall not exceed 40 percent of the total grant request. In addition, grant monies proposed for use for legal assistance must be used to collaboratively address issues and concerns related to agricultural water transfer. Funds shall not be used to solely advance the cause of the project proponents.

100 percent of the funds received for this proposal will be put towards the alternative to agricultural water transfer, with no monies being spent on legal assistance or representation.

e) A minimum of a 10 percent cash match of total project cost (past expenditures and "in kind" can not be counted toward the 10 percent match).

$1,000 in cash will be provided by the Colorado River District

From: Dave Kanzer [dkanzer@cnwcd.org]
Sent: Friday, October 21, 2011 12:02 PM
To: Reich,Denis
Subject: RE: drip irrigation project in Loma/Fruita

Dennis–

Based upon my understanding of the proposal to study the use of drip irrigation technology by an agricultural producer in the Grand Valley, the Colorado River District is interested in participating in a limited fashion by providing some cost share monies and potential project administration.

In particular, the River District is interested in the project (a parallel side-by-side study resulting in comparative water balances performed at CSU's Fruita Research Center) for the following primary reasons and potential outcomes (among others):

A quantitative analysis of consumptive use and irrigation efficiency for different irrigation techniques
A quantitative analysis of irrigation efficiency with respect to induced deep percolation
An induced deep percolation related analysis of salt and selenium loading

Thanks for including us in this project. Please let me know if you need any additional information and how we might move forward.

- DK

5. Program/Project Evaluation Criteria

The following grant evaluation criteria will be used by the CWCB to evaluate and make recommendations to fund, partially fund or not fund a grant application. The criteria are aimed at advancing alternative transfer methods from the literature and studies to actual on the ground projects/programs that provide reliable water supply and sustain key elements of the agricultural area from which the water is transferred. The applicant should fully address and explain in detail in the application how, and the extent to which, the proposed project/program meets each of the criteria. However, it should be noted that the project does not have to meet all of the criteria to be eligible to receive funding and the criteria below are not listed in any order of important or priority.

a) The proposed project/program builds upon the work of former alternative water transfer methods efforts and addresses key areas that have been identified (e.g. reduced transaction costs, presumptive consumptive use, and verification/administration issues). For more detailed information on this work, please refer to the draft technical memorandum, "*Alternative Agricultural Transfer Methods Grant Program Summary of Key Issues Evaluation," July 16, 2010.*

The *identified* alternative to water transfer method examined in the proposed study is conserved consumptive use. The method for conserving consumptive use would be the use of SDI to reduce or eliminate surface evaporative

losses[1]. Alfalfa is a perennial crop so reduced tillage or mulching would not be a contributing factor in conserved water.

The *unidentified* alternative is increased economic resiliency in agriculture. While this is implicit in some of the other identified alternatives, *it is a more explicit concern on the Western Slope since agricultural land is often equally if not more sought after than its water.* By using improved irrigation water efficiency as a means to improve on-farm profitability, west slope agricultural ground is less likely to be subdivided and sold as a retirement measure for aging producers.

b) Preference will be given to projects that provide additional matching resources in the form of cash, past expenditures and in-kind contributions that are in addition to the required 10% cash match.

$1,000 from the Colorado River District. *See section 4 e).*

c) The proposed project/program has the ability/potential to produce a reliable water supply that can be administered by the State of Colorado, Division of Water Resources.

The primary purpose of the study is to determine how much otherwise consumed water can be conserved through use of SDI. If the study determined a consumptive use saving then this could be attributed to acres of SDI alfalfa grown in the Grand Valley area. It would be at the water court's determination if these savings were eligible for leasing/transfer and hence administration by the Division of Water Resources.

The Grand Valley is also home to the "15-mile reach" and part of the "18-mile reach." Both are identified as "priority river reaches" for endangered species recovery by the Upper Colorado River Endangered Fish Recovery Program[2] and both are between the diversion and return points for the majority of irrigation water in the Grand Valley. The benefit of high efficiency irrigation systems employed on-farm is the potential created for higher conveyance efficiencies across canal systems. The Grand Valley has already seen a number of canal improvements including ditch lining (for salt load reduction) and check structures to enhance delivery. Together with broader utilization of on-farm technology upgrades, these canal improvements can combine to divert less water leaving more water in these critical reaches. The less threatened endangered fish are by local water rights users the less vulnerable local water rights owners are to section 7 consultation of the Endangered Species Act.

d) The proposed project/program produces information that is transferable and transparent to other users and other areas of the state (i.e., would provide an example "template" or roadmap to others wishing to explore alternate transfer methods).

[1] Alternative Agricultural Water Transfer Methods Grant Program Summary. May 2011. Colorado Water Conservation Board – Colorado's Water Supply Future. Section 2.1.4: Reduced Crop Consumptive Use.

[2] Valdez, R.A. and P. Nelson. 2006. Upper Colorado River Subbasin Floodplain Management Plan. Final Report of Upper Colorado River Endangered Fish Recovery Program, Project Number C-6, Denver, Colorado. Chapter 5: Priority River Reaches.

The entire study would be conducted by Colorado State University staff. Colorado State University is Colorado's foremost public institution for unbiased scientific research addressing public need. All results and findings from the study would be published as an "SDI on alfalfa" template for use throughout the western slope (and rest of state where applicable).

Conserved consumptive use estimates are rare for SDI so this study will provide an initial estimate on the potential water savings that might result from a furrow to SDI upgrade.

e) The proposed project/program addresses key water needs identified in SWSI or as identified in a basin's needs assessment.

SWSI has identified a 22 thousand to 48 thousand acre feet shortfall in the Colorado Basin by the year 2050[1]. This is equivalent to dry-up of about 17 thousand to 37 thousand acres of irrigated land (based on a conversion of 1.3 acre feet of consumed water per acre of irrigated ground). Mesa County is the dominant county in terms of water use (absorbing between a quarter and a half of this irrigated land dry-up)[2]. 23,473 acres of alfalfa were irrigated in Mesa county in 2007[3] so this project has the potential to reduce projected dry-up of irrigated land in the region. Extrapolating this benefit to other (West Slope) basins, that impact would be even more significant.

f) The proposed project/program advances the preservation of high value agricultural lands. Value can be viewed as: the value of crops produced, the value the agriculture provides to the local community, and the value the agricultural area provides for open space and wildlife habitat.

Of the total irrigated acreage in Mesa county (64,272 acres) alfalfa accounts for about one-third and consistently has the highest acreage among irrigated crops. Alfalfa has good local demand as livestock feed which provides a degree of price stability not necessarily enjoyed by row crops like wheat and field corn. Alfalfa is a versatile crop that can be grown in many soil types, with a preference for deeper loamier soils i.e. the prime agricultural ground within the Grand Valley. Any enhancement developed in irrigated alfalfa has the potential to protect a significant portion of the region's agricultural ground, high value or otherwise.

Alfalfa is also a crop that is largely untested under SDI in Western Colorado. This study would be an important "early adoption" step for local producers, absorbing the increased cost that is usually associated with participating in early adoption of new practices.

g) The proposed project/program addresses water quality, or provides other environmental benefits to rivers, streams and wetlands.

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1 Statewide Water Supply Initiative 2010. Jan 2010. Colorado Water Conservation Board. Section 5: Consumptive Projects and Methods and the M&I Gap. Table 5.12 Statewide M&I and SSI Gaps in 2050.

2 Statewide Water Supply Initiative 2010. Jan 2010. Colorado Water Conservation Board. Section 5: Consumptive Projects and Methods and the M&I Gap. Table 5.12

3 2007 USDA-NASS Agricultural Census.

Salt and Selenium are the two primary water quality problems in the Grand Valley stretch of the Colorado River. Both are soil borne contaminants that are mobilized by irrigation water moving below the root zone. Salt is harmful to downstream irrigators, while selenium inhibits the reproductive cycle of endangered fish species. On-farm improvements in irrigation efficiency reduce the amount of percolating irrigation water responsible for mobilizing salt and selenium. SDI is an ideal on-farm improvement that when managed well should all but eliminate salt and selenium loading to the Colorado River.

Nitrogen occurs both naturally through decaying plant matter and synthetically through the addition of fertilizers. It is under increased scrutiny in Colorado as a waterway contaminant but also has been shown to chemically facilitate selenium mobilization as a component of selenium pollution. SDI also means lower nitrogen application rates resulting in lower leaching rates to waterways since fertilizers can be added in-line via "fertigation." Fertigation is a more precise and readily utilized medium of nutrient i.e. nitrogen application.

h) The proposed project/program increases our understanding of and quantifies program/project costs. This could include: institutional, legal, technical costs, and third party impacts.

There will be no institutional, legal, or third party impact costs from this project. A cost of SDI installation per acre will be included with the final report, though it is not expected to differ greatly from existing estimates around the state. See the program budget for estimation of program costs.

i) The proposed project/program does not adversely affect access to other sources of water (not subject to/participating in the program) where owners of these water rights may wish to pursue traditional transfer of their rights to other users.

This program will not impact other water rights holders in any way.

j) The proposed project/program provides a perpetual water supply for the new and/or alternate use and preserves agricultural production and/or helps sustain the area's economy from which the transfer is occurring.

The proposed project increases the long term economic resilience of alfalfa production in Mesa County with more consistent and higher yields. Any new water generated from the use of SDI would not be for transfer out of the Grand Valley area but could potentially be available for other uses along the Colorado River in Mesa Co.

The project should also demonstrate conserved consumptive use through the elimination of surface evaporation. This conserved use could potentially be employed by local municipal water providers such as Ute Water Conservancy, the largest domestic provider in Mesa County. Ute has already purchased ranches in the Plateau Valley for their water. While still being used for agriculture today, these purchases were made in anticipation of future growth. Conserved water generated by a significant acreage of SDI use in the Grand Valley could provide an alternative to transactions of this ilk in the future.

Additionally there is the potential for more water in the 15-mile and 18-mile priority reaches for the Endangered Fish Species program should less water be required in Grand Valley canals from broader adoption of SDI in the area.

k) The quantity of water produced by the proposed project/program. Preference will be given to programs that can address larger water supply needs.

Alfalfa consumes 36.2 inches of water during the course of an average season in the Fruita area. According to the United Nations approximately 10 to 20 percent of total evapotranspiration (in a fully established crop) is accounted for by surface evaporation[1]. If transpiration stayed equal when transitioning from furrow to SDI technology then approximately 3.6 to 7.2 inches of water could be generated per year by eliminating surface evaporation. It is likely that some of these savings will be offset by increased transpiration (a result of improved efficiency) but this study will help quantify what residual savings would be.

Few studies exist that attempt to estimate this difference, especially on alfalfa. While this project does not intend to address an identified water need beyond future shortfalls in supply, it has the potential to assist with identifying where agricultural water can help meet future demand without sacrificing profitability.

6. Statement of Work

Provide the proposed statement of work. On the following page there is an example format for the statement of work. You can use the example format or your own format, provided that comparable information is included. The statement of work should outline by task how the proposed program/project will be accomplished. It is important that the statement of work detail the specific steps, activities/procedures that will be followed to accomplish each individual task and the overall program/project and the specific products/deliverables that will be accomplished. The statement of work must include but not be limited to: task description, key personnel, budget, schedule and deliverables and the final report/project documentation upon completion of the water activity.

The statement of work will form the basis for the contract between the Applicant and the State of Colorado. In short, the Applicant is agreeing to undertake the work for the compensation outlined in the statement of work and budget, and in return, the State of Colorado is receiving the deliverables/products specified. Please note that costs incurred prior to execution of a contract or purchase order are not subject to reimbursement.

Please provide a detailed statement of work using the following template. Additional sections or modifications may be included as necessary. Please define all acronyms. If a grant is awarded an independent statement of work document will be required with correct page numbers.

[1] Allen, R.G.; et al. 1998. Irrigation and Drainage Paper No. 56. Figure 2. United Nations - Food and Agriculture (FAO)

Statement of Work

WATER ACTIVITY NAME – Quantification of water savings benefits on Sub-Surface Drip Irrigated Alfalfa in the Grand Valley

GRANT RECIPIENT – Colorado State University: Colorado Water Institute

FUNDING SOURCE - Alternative Agricultural Water Transfer Methods (CWCB); Colorado River District; and Colorado State University.

INTRODUCTION AND BACKGROUND

This study is a side-by-side comparison of furrow and sub-surface drip irrigation (SDI) on alfalfa over two years starting in 2012. The study will be performed on about 3 acres at the Fruita Research Center in the Grand Valley of Western 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.

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.

TASKS

Provide a detailed description of each task using the following format

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 equipment is already in place at the Fruita Research Center but needs cleaning and some minor repairs (costs for this detailed in budget); all to be provided in-kind by CSU.

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

Method/Procedures

Fruita Research Center staff will clean and service the filtration equipment and under the guidance of SDI vendors (GJ Pipe and Supply and Netafim). They will then 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 fields 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 onsite CoAgMet station 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

Roundup-Ready Alfalfa will be planted on both furrow and SDI irrigated treatments.

Method/Procedures

Fruita Research Center staff will use on-site planting equipment to seed the alfalfa once tape has been laid and creases cut. A fall dormancy 4 alfalfa variety with Roundup resistance will be used.

Deliverables

A consistent stand of alfalfa for the SDI comparison with furrow irrigation will be raised across all three acres of test plots.

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 all plot treatments will be carefully recorded throughout both growing seasons. 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 on station within 100 yards of the test site) 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 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 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 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 by appointment who want to learn more about the study.

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-month and 18-month progress reports to CWCB staff a larger mid-project report will be produced at the end of 2012 for CWCB and the Colorado River District. An end of project report will also be provided to CWCB and the Colorado River District.

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 two 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 typically 4 to 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

Total Requested: $9,611; Total Project Value: $18,581

	Year:	2012		2013 +4% inflation		TOTAL	
Task	Materials	Request	$Match	Request	$Match	Request	$Match
1a.	Drip tape, header, connections 1.5 acres	$3,875	$1,000*			$3,875	$1,000
1b.	Filtration Skid						
	New Media	$200				$200	
	Cleaning agent	$50				$50	
	Minor Repairs Seal replacement Wiring	$250				$250	
	MATERIALS TOTAL	$4,375	$1,000	$0	$0	$4,375	$1,000
	*Colorado River District						
	Operating Costs	Request	$Match	Request	$Match	Request	$Match
3a.	Monitoring Labor: $12/hr @ 120 hours per year	$1,440		$1,498		$2,938	
3b.	Labor Fringe	$190 (13.2%)		$185 (12.5%)		$375	
1,2,3,4,5.	Project Management: $27.55/hr @ 80 hours per year (from PI)		$3,023		$3,153		$6,176
	OPERATING TOTAL	$1,630	$3,023	$1,683	$3,153	$3,313	$6,176
	DIRECT COST TOTAL	$6,005	$4,023	$1,683	$3,153	$7,688	$7,176
	Indirect (25%)	$1,502	$1,006	$421	$788	$1,923	$1,794
	PROJECT COST	$7,507	$5,029	$2,104	$3,941	$9,611	$8,970

The project will also utilize equipment already in place at the Fruita Research Center that has a total estimated value of $2,200: SDI filtration skid, skid pump, monitoring equipment, planting and harvesting machinery, data-loggers, and seed. This equipment provides additional value to the work plan, especially to tasks: **1. Tape Installation, 2. Planting, 3. Monitoring, and 4. Yield analysis.**

Additional support will also be provided by Fruita Research Center staff for all five tasks of the work plan.

SCHEDULE

Provide a project schedule including key milestones for each task and the completion dates or time period from the Notice to Proceed (NTP). This dating method allows flexibility in the event of potential delays from the procurement process. Sample schedules are provided below. Please note that these schedules are examples and will need to be adapted to fit each individual application.

	2012				2013			
	Spring	Growing Season	Fall	Winter	Spring	Growing Season	Fall	Winter
1. Installation								
a, b, c. SDI								
d. Monitoring								
2. Plant								
3. Monitoring								
4. Harvest								
5. Outreach								
a. Reporting		6-month		Mid-Project		18-month		Final
b. Field Days								

PAYMENT

Payment will be made based on actual expenditures and invoicing by the applicant. Invoices from any other entity (i.e. subcontractors) cannot be processed by the State. The request for payment must include a description of the work accomplished by major task, and estimate of the percent completion for individual tasks and the entire water activity in relation to the percentage of budget spent, identification of any major issues and proposed or implemented corrective actions. The last 5 percent of the entire water activity budget will be withheld until final project/water activity documentation is completed. All products, data and information developed as a result of this grant must be provided to the CWCB in hard copy and electronic format as part of the project documentation. This information will in turn be made widely available to the public and help promote the development of alternative agricultural transfer methods.

Additional Information – If you would like to add any additional pertinent information please feel free to do so here.

The above statements are true to the best of my knowledge:

Signature of Applicant:

Print Applicant's Name: Denis Reich

Project Title: Quantification of Water Savings Benefits on Surface Drip Irrigated Alfalfa in the Grand Valley

Date: Tues November 29th 2011

Return this application to:

Mr. Todd Doherty
Colorado Water Conservation Board
Water Supply Planning Section
1580 Logan Street, Suite 200
Denver, CO 80203
Todd.Doherty@state.co.us

From: Fernandes, Pat
To: Reich,Denis
Subject: RE: SDI Phase I proposal
Date: Wednesday, November 30, 2011 8:27:24 AM
Attachments: NETAFIM_USA.gif
GROW_MORE_WITH_LESS.gif

Denis,
Here's some comments on this Alfalfa plot in Fruita:

Netafim USA is committed to the development of sub-surface drip irrigation in the production of Alfalfa and other often recognized commodity crops. With shortages of good, quality hay available due to an increase in exports to the Middle East and Japan and other countries with increased pressures to produce more and better quality hay for dairy and beef production, Alfalfa production has become even more important than ever before in my tenure in Agriculture. As one of the district managers with alot of Alfalfa production in my area (Arizona, New Mexico, Imperial Valley, W. slope Colorado and far west Texas), I have committed myself to the overall production of Alfalfa on sub-surface drip irrigation. There are several prominent growers in the desert Southwest who have many years of experience with SDI and are now taking that experience and applying it to crops like Alfalfa, Corn, Cotton and other seasonably rotated crops.

Hope this is of some help to you.

Pat

PATRICK FERNANDES
AG DISTRICT SALES MANAGER
NETAFIM USA
FAX: 520-316-8082
CELL: 520-431-3077

From: Reich,Denis [mailto:Denis.Reich@colostate.edu]
Sent: Monday, November 28, 2011 2:35 PM
To: Pearson,Calvin; Dave Kanzer; James Carter; Fernandes, Pat
Cc: Guccini, Wayne - Grand Junction, CO
Subject: SDI Phase I proposal

Calvin, Dave, Jim, Pat,

See attached for proposal to CWCB Alternatives to Ag Transfers grant program.

I'll submit this on Wed so please provide any comments you have before then.

Calvin, Jim, Pat, If you had time to send a short (1 paragraph) email of support that would be helpful to the proposal.
Thanks again to DK for important cash match from CRD.

I'll have the Phase II proposal for the on-farm component to CWCB's Water Supply Reserve Account grant program through the Colorado RT to you before we meet with Dennis Hardrick

(Loma producer) next week.

Cheers,
Denis

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This message and any attached files may contain private and/or proprietary information, and is intended only for the person / entity to whom it was originally addressed. If you are not the intended recipient, please notify the originator of the message. The content of this message may contain private views and opinions which do not constitute a formal disclosure or commitment unless specifically stated.

From: Kanzer, Dave
To: Reich,Denis
Subject: RE: drip irrigation project in Loma/Fruita
Date: Friday, October 21, 2011 12:00:58 PM

Dennis –

Based upon my understanding of the proposal to study the use of drip irrigation technology by an agricultural producer in the Grand Valley, the Colorado River District is interested in participating in a limited fashion by providing some cost share monies and potential project administration.

In particular, the River District is interested in the project (a parallel side-by-side study resulting in comparative water balances performed at CSU's Fruita Research Center) for the following primary reasons and potential outcomes (among others):

A quantitative analysis of consumptive use and irrigation efficiency for different irrigation techniques

A quantitative analysis of irrigation efficiency with respect to induced deep percolation

An induced deep percolation related analysis of salt and selenium loading

Thanks for including us in this project. Please let me know if you need any additional information and how we might move forward.

- DK

From: Reich,Denis [mailto:Denis.Reich@colostate.edu]
Sent: Friday, October 21, 2011 9:40 AM
To: Dave Kanzer
Subject: drip irrigation project in Loma/Fruita

Dave,

Here's the concept I sent to Shavano to get buy in from them.

Todd also asked for a short email from you explaining why the River District is interested in supporting this project. I think it's so he can help defend his decision to not give the Arkansas group all of the money left in the Alternative to Ag Transfers fund.

Let me know if you need anything else. I'll be around this afternoon if you want to discuss it at all.

Denis

Colorado River District

Protecting Western Colorado Water Since 1937

Todd Doherty
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203

November 29, 2011

Dear Todd,

I am writing you today to express the River District's support for Colorado State University's (CSU) proposed project, entitled: **"Quantification of Water Savings Benefits on Sub-Surface Drip Irrigated Alfalfa in the Grand Valley"** that is being submitted by CSU Water Resources Specialist, Denis Reich, for funding under the CWCB's Alternative Agricultural Transfer Methods Program.

Based upon my understanding of objectives of the proposed study (*e.g.*, to better the understanding of the costs, benefits and issues associated the use of drip irrigation technology by agricultural producers in western Colorado), the Colorado River District is committed to financially participate in this project by providing a cash match donation to CSU of $1,000.

Thank you for supporting this innovative study to address current and future agricultural water needs within the Colorado River District. Please contact me if you need any additional information on this matter.

Sincerely,

David Kanzer P.E.
Senior Water Resources Engineer

201 Centennial Street / PO Box 1120 • Glenwood Springs, CO 81602
(970) 945-8522 • (970) 945-8799 Fax
www.ColoradoRiverDistrict.org

From: Pearson.Calvin
To: Reich.Denis
Subject: SDI proposal
Date: Tuesday, November 29, 2011 8:17:58 AM

Denis,

I endorse the grant proposal entitled, Quantification of Water Savings Benefits on Sub-Surface Drip Irrigated Alfalfa in the Grand Valley. I will contribute my time and resources as noted in the proposal. I look forward to working with you over the next two years on this project.

Sincerely,

Calvin

Dr. Calvin H. Pearson, Professor
Research Agronomist
Colorado State University
Western Colorado Research Center
1910 L Road
Fruita, CO 81521
970-858-3629, ext. 2
fax 970-858-0461
website: www.colostate.edu/programs/wcrc