# STATE OF COLORADO

**Colorado Water Conservation Board**
**Department of Natural Resources**
1313 Sherman Street, Room 721
Denver, Colorado 80203
Phone: (303) 866-3441
Fax: (303) 866-4474
www.cwcb.state.co.us



October 7, 2013

Dr. Jose Chavez, Ph.D.
Colorado State University
Extension Specialist-Irrigation Water Management
1372 Campus Delivery, Room B-210
Fort Collins, CO 80523-1372

**RE: Notice to Proceed – ATM Grant – Implementation of Deficit Irrigation Regimes: Demonstration and Outreach**

Dear Jose:

This letter is to inform you that the contract for the ATM grant request was signed on September 27, 2013. A signed original contract has been mailed to you.

With the executed contract, you are now able to proceed with the project and begin invoicing the State of Colorado for costs incurred through December 31, 2015. Upon receipt of your invoice(s), the State of Colorado will provide payment no later than 45 days. I wish you much success in your project.

Sincerely,

/s/

*Craig Godbout*
*Graduate Student Intern*
*Colorado Water Conservation Board*
*Water Supply Planning Section*
*1580 Logan Street, Suite 200*
*Denver CO 80203*
*(303) 866-3441, ext 3210 (office)*
*(970) 218-9407 (cell)*
*craig.godbout@state.co.us*

CMS #

# STATE OF COLORADO
# Colorado Water Conservation Board
# INTERAGENCY AGREEMENT
# with
# Board of Governors of the Colorado State University System acting by and through Colorado State University
# Contract Number C154244

**1. PARTIES**

This Interagency Agreement (hereinafter called "Agreement") is entered into by and between the Colorado Water Conservation Board (hereinafter called "Payor"), and the Board of Governors of the Colorado State University System acting by and through Colorado State University (hereinafter called "Payee"), who may collectively be called the "Parties" and individually a "Party", both of which are agencies or higher education institutions of the STATE OF COLORADO, hereinafter called the "State".

**2. EFFECTIVE DATE AND NOTICE OF NONLIABILITY.**

This Agreement shall not be effective or enforceable until it is approved and signed by the Colorado State Controller or designee (hereinafter called the "Effective Date"), but shall be effective and enforceable thereafter in accordance with its provisions.

**3. RECITALS**

**A. Authority, Appropriation, And Approval**

Authority to enter into this Agreement exists pursuant to State Fiscal Rule 3-3 and funds have been budgeted, appropriated and otherwise made available pursuant to Colorado Revised Statutes (CRS) 37-60-106 and 37-60-121, and Senate Bill 09-125 adopted by the 2009 General Assembly and a sufficient unencumbered balance thereof remains available for payment. Required approvals, clearance and coordination have been accomplished from and with appropriate agencies.

**B. Purpose**

This project seeks to demonstrate the feasibility of different methods of deficit irrigation. The grantee believes that transferring technology and educating water users and regulators is an important step in the adoption of deficit irrigation as a viable ATM.

**4. TERM AND EARLY TERMINATION**

**A. Term-Work Commencement**

The Parties respective performances under this Agreement shall commence on the later of either the Effective Date or August 30, 2013. This Agreement shall terminate on December 31, 2015 unless sooner terminated or further extended as specified elsewhere herein. Either Party may terminate this Agreement by giving the other Party 30 days prior written notice setting forth the date of termination. Upon termination the liabilities of the Parties for future performance hereunder shall cease, but the Parties shall perform their respective obligations up to the date of termination.

**5. STATEMENT OF WORK**

**A. Work**

Payee shall complete the Work and its other obligations as described herein and in **Exhibit A** on or before December 31, 2015.

**B. Goods and Services**

Payee shall procure goods and services necessary to complete its obligations. Such procurement shall be accomplished using Agreement Funds and shall not increase the maximum amount payable hereunder by Payor.

**6. PAYMENTS-MAXIUM AMOUNT**

The maximum amount payable under this Agreement to Payee by Payor is $124,734. Payor shall make payment for purchases of goods and services within 45 days after receipt of valid invoices from Payee. Payments shall be made by an interagency transfer in lieu of a State warrant whenever possible. The maximum amount payable by Payor to Payee during each State fiscal year of this Agreement shall be:

| |
|---|
| **$124,734 in FY 2014** |
| **$124,734 in FY 2015, minus any funds expended in FY2014** |

**7. RECORDS-MAINTENANCE AND INSPECTION**

**A. Maintenance**

During the term of this Agreement and for a period terminating upon the later of **(i)** the five year anniversary of the final payment under this Agreement or **(ii)** the resolution of any pending Agreement matters (the "Record Retention Period"), each Party shall maintain, and allow inspection and monitoring by the other Party, and any other duly authorized agent of a governmental agency, of a complete file of all records, documents, communications, notes and other written materials, electronic media files, and communications, pertaining in any manner to the work or the delivery of services or goods hereunder.

**B. Inspection**

Payor shall have the right to inspect Payee's performance at all reasonable times and places during the term of this Agreement. Payee shall permit Payor, and any other duly authorized agent of a governmental agency having jurisdiction to monitor all activities conducted pursuant to this Agreement, to audit, inspect, examine, excerpt, copy and/or transcribe Payee's records related to this Agreement during the Record Retention Period to assure compliance with the terms hereof or to evaluate performance hereunder. Monitoring activities controlled by Payor shall not unduly interfere with Payee's performance hereunder.

**8. CONFIDENTIAL INFORMATION-STATE RECORDS**

Each Party shall treat the confidential information of the other Party with the same degree of care and protection it affords to its own confidential information, unless a different standard is set forth in this Agreement. Each Party shall notify the other Party immediately if it receives a request or demand from a third party for records or information of the other Party.

**9. FAILURE TO PERFORM-DISPUTES**

The failure of a Party to perform its respective obligations in accordance with the provisions of this Agreement is a breach of this Agreement. In the event of disputes concerning performance hereunder or otherwise related to this Agreement, the Parties shall attempt to resolve them at the divisional level. If this fails, disputes shall be referred to senior departmental management staff designated by each Party. If this fails, the executive director of each Party shall meet and attempt resolution. If this fails, the matter shall be submitted in writing by both Parties, or either of them, to the State Controller, whose decision shall be final.

**10. NOTICE AND REPRESENTATIVES**

Each individual identified below is the principal representative of the designating Party. All notices required to be given hereunder shall be hand delivered with receipt required or sent by certified or registered mail to such Party's principal representative at the address set forth below. In addition to, but not in lieu of a hard-copy notice, notice also may be sent by e-mail to the e-mail addresses, if any, set forth below. Either Party may from time to time designate by written notice substitute addresses or persons to whom such notices shall be sent. Unless otherwise provided herein, all notices shall be effective upon receipt.

**Payor:**

| |
|---|
| Rebecca Mitchell, Section Chief<br>Water Supply Planning Section |
| Colorado Water Conservation Board |
| 1580 Logan Street, Suite 200 |
| Denver, CO 80203 |
| Rebecca.mitchell@state.co.us |

**Payee:**

| |
|---|
| Jose Chavez, Ph.D. |
| Colorado State University, Extension<br>Specialist – Irrigation Water<br>Management |
| 1372 Campus Delivery, Room B-210 |
| Fort Collins, CO 80523-1372 |
| Jose.chavez@Colostate.edu |

**11. GENERAL PROVISIONS**

**A. Assignment**

The rights and obligations of each Party hereunder are personal to such Party and may not be transferred, assigned or subcontracted without the prior, written consent of the other Party.

**B. Order of Precedence**

In the event of conflicts or inconsistencies between this Agreement and its exhibits and attachments, such conflicts or inconsistencies shall be resolved by reference to the documents in the order of priority: exhibits and attachments first; this Agreement second.

**C. Third Party Beneficiaries-Negation**

Enforcement of all rights and obligations hereunder are reserved solely to the Parties. Any services or benefits which third parties receive as a result of this Agreement are incidental and do not create any rights for such third parties.

Cms# 61303

## 12. SIGNATURE PAGE

**THE PARTIES HERETO HAVE EXECUTED THIS INTERAGENCY AGREEMENT**

*** Persons signing for Parties hereby swear and affirm that they are authorized to act on behalf of their respective Party and acknowledge that the other Party is relying on their representations to that effect.**

**STATE OF COLORADO**
**John W. Hickenlooper, Governor**

| **Board of Governors of the Colorado State University System acting by and through Colorado State University** | **Department of Natural Resources**<br>**Mike King, Executive Director** |
|---|---|
| Signature<br>By: David B Doty, Associate Director<br>Title: Sponsored Programs<br>Date: 9/19/13 | Signature<br>By: Rebecca Mitchell, Section Chief, Water Supply Planning Section, CWCB<br>Signatory avers to the State Controller or delegate that Grantee has not begun performance or that a Statutory Violation waiver has been requested under Fiscal Rule<br>Date: |

**ALL CONTRACTS REQUIRE APPROVAL BY THE STATE CONTROLLER**

**STATE CONTROLLER**
**Robert Jaros, CPA, MBA, JD**

**By:** _____

**Date:** 9/27/13

# Statement of Work

**WATER ACTIVITY NAME:**
Implementation of Deficit Irrigation Regimes: Demonstration and Outreach

**GRANT RECIPIENT:**
Colorado State University

**FUNDING SOURCE:**
Colorado Water Conservation Board

**INTRODUCTION AND BACKGROUND**
This project is focused on implementing deficit irrigation regimes as a viable ATM. The project has demonstration and outreach components, proposed in response to findings and recommendations of previous work in this field. Some of these recommendations, as outlined in CWCB November 2012 report, include:

- Continue to support demonstration/pilot projects to determine the feasibility of new concepts or techniques as needed (section 1.3.1, page 6).
- Produce educational materials that would assist a lay person with understanding water transfers.

**OBJECTIVES**
The specific objectives of the proposed project are:

- To demonstrate the feasibility (technical and economic) and resource-requirement of using selected water management techniques to quantify the water balance components and consumptive use under different deficit irrigation levels, on crops such as corn and sunflower, on clayey to sandy soil types, with pressurized and surface irrigation methods, and under different agronomic practices. Technical feasibility involves a practical, cost-effective monitoring approach and economic feasibility involves understanding and demonstrating crop water productivity, production costs and farmer incentives.
- To educate and train water users and regulators about using these techniques and their advantages and disadvantages (including limitations) through a variety of outreach and extension activities, such as publishing online and printed manuals including user-friendly spreadsheets, fact sheets, newsletters, and magazine articles; holding field days and a training workshop (video recordings to be made available online); and, creating a YouTube channel to upload short informational video clips.

**TASKS**

## TASK 1 – Demonstration

Description of Task

The demonstration component of this project will be carried out in collaboration with the Central Colorado Water Conservancy District (CCWCD), the Northern Colorado Water Conservancy District (Northern Water), and the USDA-ARS Water Management Research (WMR) Unit. Four available and proven techniques will be used to monitor water balance components (e.g., the reduction in crop consumptive use due to deficit irrigation and therefore potentially available for transfer to other uses), with the potential to be applied at field, farm, and ditch company levels. The feasibility and resource-requirement of each method will be evaluated for different crops, soil textures, irrigation methods, and agronomic practices. The demonstration sites will be located in the South Platte Basin, close to Greeley, La Salle, and Fort Collins (CSU ARDEC facility).

Method/Procedure and Deliverables

The following techniques will be used under this task.

*Field level:*

- Crop coefficient ($K_c$): This approach is suitable to estimate crop water requirement at different stages of growth. Under crop water stress conditions, a crop water stress coefficient ($K_s$) is used to reduce the potential crop water consumptive use ($ET_c = ET_{ref} \times K_c \times K_s$), computed from weather data, in proportion to the soil moisture deficit, where soil moisture deficit is modeled or measured. This method does not require complex modeling and the analysis can be performed in electronic spreadsheets (e.g. Microsoft Excel). A tool will be created and will be made available (along with a tutorial and manuals) through the internet (at the Colorado Water Institute and CSU Extension websites). Step-by-step explanation and hands-on experience will be also provided during a comprehensive workshop. The workshop will be coordinated and delivered with the participation of CSU Extension Water Team (e.g., Joel Schneekloth, Troy Bauder, Dr. Allan Andales, Dr. Reagan Waskom, and Dr. Luis Garcia).
- Canopy temperature (Tc): Previous studies have shown that canopy temperature is an effective indicator to determine crop water stress. Crop transpiration rate decreases as water becomes more limited in the root zone. Since transpiration is a major cooling process for plants, a decrease in the rate of this process translates into an increase in canopy temperature. By measuring canopy temperature, it is possible to quantify stress level, generate a crop water stress coefficient, and then calculate the transpiration rate using an estimate of reference evapotranspiration-ET (through weather data), all in a user-friendly spreadsheet format. This spreadsheet will integrate the Tc data obtained with the IRT sensor as well as the weather data from CoAgMet in an automated environment and will be made available to the public at no cost. Temperature measurements can be made using handheld Infra-red Thermometers (IRTs), which are now available at high accuracies and prices that are lower than most smart phones. In this demonstration project, three different handheld IRT models (varying in cost and sophistication) will be used to measure Tc on a biweekly basis. These IRTs include mobile and stationary units and will be all provided by CSU as in-kind contribution.

*Ditch level:*

- Landsat NDVI: Remote sensing images (multispectral) from satellites such as Landsat are processed by the USGS and made available to the public at no cost. Products such as the Normalized Difference Vegetation Index (NDVI) can be generated from these images by following a few simple steps. According to previous studies, NDVI can be directly related to crop coefficient. For example, Neale et al. (1989) conducted a comprehensive study between 1981 and 1986 at two sites near Greeley and Fruita, Colorado, and found that NDVI-based estimates can be used accurately to estimate corn Kc. The pixel size of NDVI images is less than 100 ft × 100 ft and temporal frequency of overpass is every 16 days, so they can be used to map water use over larger areas. The required analysis to generate NDVI maps and to convert them to distributed Kc is relatively simple and can be performed using open-source software packages that are available free of charge. A selected package will be made available to users (e.g., irrigation districts, water managers, etc.) along with a manual that describes the procedure and implementation steps.
- Landsat NDVI-surface temperature: NDVI images can be combined with Landsat surface radiometric temperature images to increase the accuracy of estimated water use. Compared to the NDVI method, the NDVI-surface temperature method requires a few more implementation steps. However, this method is still much simpler than other remote sensing methods and can be applied by a technician without the knowledge of solar radiation interaction with land surfaces. Landsat has a wide swath (115 miles). Therefore, a single image provides maps of Kc and consumptive use over large irrigated areas. This extensive spatial coverage makes the last two techniques appropriate for ditch level analysis. CSU engineering in cooperation with Northern Water is currently developing the ReSET (Remote Sensed ET) website for water user access that will show field-by-field computed ET from Landsat imagery and this platform could assist with the above ditch level analysis.
  A ground-based version of the NDVI product will be derived from data collected using a hand-held multispectral radiometer which has similar spectral bands as Landsat sensors. This product will serve as a verification of the quality of the Landsat product. Readings with the radiometer will be taken weekly to bi-weekly concurrently with IRT readings and neutron probe soil moisture readings on all fields and treatments/plots involved in the project.

The implementation practicability and functionality of each of the above methods will be determined by solving the root zone water balance, using soil moisture (volumetric water content). The water content data will be obtained using neutron scattering method, which is considered one of the most accurate methods of quantifying soil water content. Three to four access tubes will be installed at each field to a depth of 6 feet and soil water content readings will be taken on a bi-weekly basis using a neutron probe unit that will be made available to this project as an in-kind contribution. Comparing the neutron probe data with the results of each method provides an estimate of the reliability of each method, which will be evaluated in conjunction with the ease-of-application and resource-requirement to provide recommendations for their use in deficit irrigation implementation.

**TASK 2 – Outreach**

Description of Task

This project includes a strong outreach and extension component that will be implemented to disseminate information, to show results, and to educate water users on a successful implementation of deficit irrigation regimes as a viable ATM.

Method/Procedure and Deliverables

- *Field days*: One field day per year will be held at the demonstration sites indicated above to explain the effect of different deficit irrigation regimes on crop growth, as affected by varying soil textures and agronomic practices. The field days will most likely take place in July-August and they will be programmed for a period of 5-6 hours. Food and refreshments will be provided, along with printed material and talks on the barriers and potential of implementing deficit irrigation regimes. Efforts will be made to invite farmers, irrigation managers, state and federal agencies, etc. The CSU Extension Team will participate in talks.
- *Fact sheets*: fact sheets, articles in newsletters and magazines, as well as manuals on the technical and economic feasibility of the proposed techniques will be prepared and published. In addition, publications through this media and online will include managing deficit irrigation regimes and documenting consumptive water use (and resulting water savings due to reduced CU from deficit irrigation) on outlets such as the "Agricultural Water Conservation Clearinghouse" website of the Colorado Water Institute, CSU Extension website, as well as in printed format to be distributed among water users.
- *Spreadsheets*: User-friendly spreadsheets available through websites for computation of water use by Kc-Ks and Tc methods and for economic analysis of potential lease rates based on crop water productivity and production costs.
- *YouTube*: Educational short video clips will be created and uploaded to a YouTube channel. This will train viewers on different aspects of implementing deficit irrigation practices without requiring them to be present in the field.
- *Local conferences*: The outcome of this project will be presented to water users and farmers in general at local conferences such as the Central Plains Irrigation Conference/Expo, the High Plains No-Till Conference, and the Four States Irrigation Council Annual Meeting.
- *Training workshop*: A comprehensive one-day training workshop will be held at the end of this project (October-November of the second year) to provide participants with hands-on experience on how to use the utilized techniques for managing deficit irrigation regimes and for documenting water balance components. In addition, the workshop will include training on several methods to estimate and measure crop water use or ET. The workshop will be planned for 150 participants and it will be hosted at CSU. An instructive manual will be prepared and made available to the public along with the presentations and digital spreadsheets. Digital versions of the manual, presentations, spreadsheet tools, and a video of the workshop will be made available through the websites mentioned above. The CSU Water Team will help organize and deliver the workshop.

**PROJECT MANAGEMENT PLAN**

Each demonstration site will be managed independently to meet the specific requirements of that site, determined by the soil type, crop sensitivity to water stress, irrigation system, etc. Regular meetings will be held among all collaborators to communicate progress and limitations and to coordinate and plan

activities. These meeting will vary in frequency depending on the time of the year. More frequent meetings (every 2-3 weeks) will be held prior and during the growing season, while less frequent meetings (every 4-6 weeks) are required after the harvest.

**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.

## SCHEDULE

The following is the proposed schedule for this project.

| Task 1 | 2013 | | 2014 | | | | 2015 | |
|---|---|---|---|---|---|---|---|---|
| | 3Q | 4Q | 1Q | 2Q | 3Q | 4Q | 1Q | 2Q |
| Data collection | | | | | | | | |
| Data processing and reduction | | | | | | | | |

| Task 2 | 2013 | | 2014 | | | | 2015 | |
|---|---|---|---|---|---|---|---|---|
| | 3Q | 4Q | 1Q | 2Q | 3Q | 4Q | 1Q | 2Q |
| Field days | | | | | | | | |
| Edu. materials | | | | | | | | |
| Workshop | | | | | | | | |

## PROJECT TEAM

The following is a list of personnel on this project.

***Colorado State University***:

- Dr. José L. Chávez (PI, Assistant Professor and Extension Irrigation Specialist, Department of Civil and Environmental Engineering and CSU Extension)
- Dr. Saleh Taghvaeian (Co-PI, Research Associate, Department of Civil and Environmental Engineering)
- Dr. Luis A. Garcia (collaborator, Department Head and Professor, Department of Civil and Environmental Engineering)
- Dr. Aymn Elhaddad (collaborator, Research Associate, Department of Civil and Environmental Engineering)
- Dr. Allan Andales (collaborator, Assistant Professor and Extension Irrigation Specialist, Department of Soil and Crop Sciences, CSU, and CSU Extension)
- 
- Dr. Raj Khosla (collaborator, Professor, Department of Soil and Crop Sciences, CSU))
- Mr. Troy Bauder (collaborator, Extension irrigation specialist, CSU Extension, Department of Soil and Crop Sciences)
- Mr. Erik Wardle (collaborator, Research Associate, Department of Soil and Crop Sciences)

***Central Colorado Water Conservancy District***

- Mr. Randy Ray (collaborator, Executive Director)

***Northern Colorado Water Conservancy District***

- Mr. Jon Altenhofen (collaborator, South Platte Projects Manager)

***USDA-ARS Water Management Research Unit***

- Dr. Tom Trout (collaborator, Research Leader)

**Alternative Agricultural Water Transfer Methods – Grant Application Form**
**October 2010**

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**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**: Linda Loing

**Project Title**: Research Administrator, Office of Sponsored Programs, Colorado State University

**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

## REFERENCES

Neale CMU, Bausch WC, Heermann DF. Development of reflectance-based crop coefficients for corn. Trans. ASAE. **1989**; 32(6):1891-1899.

Taghvaeian S, Chávez JL, Hansen NC. Infrared Thermometry to Estimate Crop Water Stress Index and Water Use of Irrigated Maize in Northeastern Colorado. ***Remote Sensing***. **2012**; 4(11):3619-3637.

Taghvaeian S, Chávez JL, Altenhofen J, Bausch WC, DeJonge K, Trout T. Minimizing Instrumentation Requirement for Estimating Crop Water Stress Index and Transpiration of Maize. ***Irrigation Science***. **2013**; (Submitted, under review).

| Total Project Costs (annually) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | CWCB Contribution | | | Third Party Cost Share | | | |
| **PERSONNEL SALARIES** | **Year 1** | **Year 2** | **Total Sponsor Contribution** | **Year 1** | **Year 2** | **Total Cost Share** | **Total Project Costs** |
| *J. Chavez, PI, 0.5 month/yr* | *1,864* | *2,080* | *3,944* | *3,307* | *3,298* | *6,605* | *10,549* |
| *Fringe* | *440* | *497* | *937* | *780* | *789* | *1,569* | *2,506* |
| *S. Taghvaeian, Post-doc, 12 months, 9.5 months* | *27,716* | *20,821* | *48,537* | *12,324* | *12,291* | *24,615* | *73,152* |
| *Fringe* | *6,541* | *4,982* | *11,523* | *2,908* | *2,941* | *5,849* | *17,372* |
| TOTAL SALARY: | 29,580 | 22,901 | *52,481* | 15,631 | 15,589 | *31,220* | *83,701* |
| TOTAL FRINGE: | 6,981 | 5,479 | *12,460* | 3,688 | 3,730 | *7,418* | *19,878* |
| **TOTAL PERSONNEL:** | **36,561** | **28,380** | **64,941** | **19,319** | **19,319** | 38,638 | 103,579 |
| **DOMESTIC TRAVEL:** PI and/or Post-doc travel: Multiple field trips to Greeley, La Salle, and ARDEC (north Fort Collins) for workshop demonstrations; Local project related meetings and workshop organization; Colorado-based conferences (Four State Irrigation, CPIC, and High Plains No-Till). Costs include ground transportation, lodging, per diem, and registration fees. | **4,617** | **6,823** | **11,440** | **0** | **0** | 0 | 11,440 |
| **MATERIALS AND SUPPLIES:** Neutron probe access tubes and install; Lab consumables: tubes, cables, tapes, repair supplies | **4,360** | **687** | **5,047** | **0** | **0** | 0 | 5,047 |
| **OTHER DIRECT:** Field Days each year and Workshop in year 2. Costs include room/tent rental, video recording and editing, printed manuals, name badges, catering services, speaker ribbons, and brochures. | **4,137** | **9,434** | **13,571** | **0** | **0** | 0 | 13,571 |
| **TOTAL DIRECT COSTS:** | **49,675** | **45,324** | **94,999** | **19,319** | **19,319** | **38,638** | **133,637** |
| **INDIRECT COSTS (F&A): 31.3% MTDC** | **15,548** | **14,187** | **29,735** | **6,048.00** | **6,048.00** | **12,096** | **41,831** |
| **Third-party Cost Share Commitments** | | | | | | | |
| Central Colorado Water Conservancy District (CCWCD)<br>Northern Water (NCWCD)<br>USDA-ARS<br>West Greeley Conservation District (WGCD) | | | | *Applied to salary and fringe of S. Taghvaeian* | | | |
| Colorado State University commitment | | | | *Applied to salary and fringe of J. Chavez* | | | |
| **TOTAL** | **65,223** | **59,511** | ***124,734*** | **25,367** | **25,367** | **50,734** | ***175,468*** |

# STATE OF COLORADO

**Colorado Water Conservation Board**
**Department of Natural Resources**
1580 Logan Street, Suite 600
Denver, Colorado 80203
Phone: (303) 866-3441
Fax: (303) 894-2578
www.cwcb.state.co.us



March 20, 2014

Dr. Gregorio Cruz
National CIG Program Manager
USDA-NRCS
1400 Independence Avenue, SW, Room 0103-S
Washington, DC 20250

Dear Dr. Cruz

We are writing to express support for Brigham Young University's proposal entitled "*Decision support tools and innovative soil and water management strategies to adapt semi-arid irrigated cropping systems to drought*" as it is being submitted to the "*Conservation Innovation Grants Fiscal Year (FY) 2013 Adaptation to Drought Announcement for Program Funding*" lead by Dr. Neil Hansen.

Colorado Water Conservation Board (CWCB), hereafter CWCB, is interested in providing funds for the purposes of the project mentioned above. Our proposed contribution totals $124,734 from CWCB's Alternative Agricultural Transfer Methods Grant Program for the project titled *Implementation of Deficit Irrigation Regimes: Demonstration and Outreach* approved on May 15, 2013 to be used in categories of the PI's designation. The contribution will be contracted in a task order, made available during the grant period, and not consist of federal funds. The work to be funded will be of direct benefit to the above-referenced NRCS project and will be done under the direction of Dr. José L. Chávez. Our commitment will be administered through Colorado State University, who is a subcontractor on the project, with Dr. Francesca Cotrufo as CSU's lead scientist.

We understand that the match must be:

- verifiable from records
- not included as contributions for any other federally assisted projects
- necessary to complete the project's objectives
- allowable under applicable federal cost principles
- not paid by the federal government under another award
- provided for in the approved budget when required by the federal government
- incurred within the same time period as the project

We would be pleased to answer any questions as to our proposed match or our project participation.

In addition, CWCB is highly committed to this project as it leverages funds for current efforts towards water conservation efforts, demonstration and outreach in Colorado.

Sincerely,

Craig Godbout, Program Manager
Colorado Water Conservation Board
Water Supply Planning Section
1580 Logan Street, Suite 200
Denver, CO 80203
Office: 303-866-3441, x3210
Cell: 303-847-8061
craig.godbout@state.co.us

Rebecca Mitchell, Section Chief
Colorado Water Conservation Board
Water Supply Planning Section
1580 Logan Street, Suite 200
Denver, CO 80203
Office: 303-866-3441, x3217
Cell: 303-912-6597
rebecca.mitchell@state.co.us