Improving Agricultural Water Management in Brazos G Region for Sustainable Farming

Section I. Administrative Requirements

Official name and address of the applicant

Texas A&M AgriLife Extension Service

400 Harvey Mitchell Parkway, Suite 300

3578 TAMU

College Station, TX 77845

Constitutional and statutory authority creating the applicant and under which the applicant currently operates

Texas A&M AgriLife Extension Service (formerly the Texas Cooperative Extension) is established as the State Cooperative Service Agency in Texas. It is administered by the Board of Regents of The Texas A&M University System under the State Law and the Federal Statute assigning cooperative extension agencies to the land grant college or university established in each state in accordance with the Smith-Lever Act of 1914.

Vendor ID number

The Federal Identification Number for Extension is 74-6000537.

Names and addresses of the individual or individuals with the legal authority to perform the acts of the entity, and title of position

Contract Office Contact:

Julie Bishop, Associate Executive Director Sponsored Research Services

400 Harvey Mitchell Parkway, Suite 300

3578 TAMU

College Station, TX 77845

Phone: 979-862-6777 Email: srs-awards@tamu.edu

Name, address, and title of the designated representative; also include phone number and email addresses

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An affidavit from the individual with the authority to act on behalf of the applicant, or a certified copy of a resolution adopted or minutes approved by the governing body with the authority to act on behalf of the applicant, which:

a. Identifies the amount that the applicant is requesting:

b. Authorizes the submission of an application on behalf of the entity

c. Designates an authorized representative to submit the application and perform all reasonable and necessary action in support of the application and, if approved by the TWDB, to perform the terms and conditions of the award of money from the Fund.

Letter of commitment for Texas A&M AgriLife Extension Service attached at the end of this application.

Description of the applicant's commitment to water conservation

Texas A&M AgriLife Extension Service plays a critical role with its education programs to encourage and facilitate the grower adoption of water conservation strategies. The Texas A&M AgriLife Extension Service Strategic Plan demonstrates the commitment of Extension to water conservation. Water conservation is included as a strategy in four of the plan's five Imperatives and is a major component of Goal 2.1 as shown below:

- Strategy 1.4.3 Conduct educational programming for turfgrass professionals and homeowners on the management and selection of water-efficient landscapes and irrigation systems
- Goal 2.1 Consumers, homeowners, agricultural producers, communities, and irrigation districts understand and adopt best management practices to protect water quality and enhance conservation so water supplies will meet future water needs in Texas that are essential for expanding agricultural growth, jobs, and the economy in both rural and urban areas.
- Strategy 2.1.1 Develop educational programs to promote efficiency and effectiveness of irrigation through improved timing and application of irrigation water on crop and forage land.
- Strategy 2.1.2 Demonstrate conservation tillage strategies to manage and conserve soil water

- Strategy 2.1.7 Develop and deliver education programs describing water resources and proper management of these resources.
- Strategy 2.1.9 Develop and deliver education programs on groundwater resources and management for clientele in groundwater conservation districts
- Strategy 3.1.7 Develop educational programs and resources for coastal communities focused on improving water quality and reducing water consumption through resilient, resource-efficient WaterSmart landscapes
- Strategy 5.4.1 Provide educational opportunities, such as programs, conferences, camps, newsletters for youth natural resource education (including water and wildlife).

Further, the project teams extensive experience in research, education and extension programs focusing on irrigation water conservation, as well as outreach programs with producers in Texas. The PI and co-PIs have published numerous articles on these subjects, presented at local, national, and international conferences and managed many grant projects related to this field. The PIs have a proven track record with grant/project management, including TWDB projects, meeting expected deadlines for quarterly reports, with appropriate outcomes to establish change among growers.

Section II. Project Information

Project Description, location, and personnel

Project Title

Agricultural Irrigation Conservation Education

Project Need

The 2021 Region G Water Plan projects additional demand of 292,082 acre-feet/year in 2070 to support future demands. Between 2020 and 2070, regional population is expected to grow by 83 percent. Planned transfer of agricultural irrigation to municipal and industrial uses combined with reductions in available supply will lead to unmet irrigation needs of 53,672 acre-feet/year by 2070.

Irrigation water conservation is expected to provide 19,138 ac-ft/yr by 2070 in the Region G planning area. 2021 Brazos G regional water plan (RWP) recommends a voluntary target reduction in water demand up to 7% by 2070 to ensure conservation in mainly irrigation water use as 20 counties in Region G planning area will face shortages between 2020 and 2070. According to RWP, conservation in irrigation sector can be promoted by implementing several best management practices (BMPs) and comprehensive educational outreach efforts are required for engaging Ag-producers and water managers to transfer knowledge related to advancements in water conservation and innovation in agricultural technologies that promote efficient application of water. Weather extremes such as drought brings additional challenges for water conservation effort in the region. The RWP recommends all entities to monitor and assess drought to improve their preparedness and decision making. Drought monitoring is imperative particularly for growers to understand the progression of drought and the interlinkage of drought intensity and crop water use to optimize the water use accordingly.

Project Summary

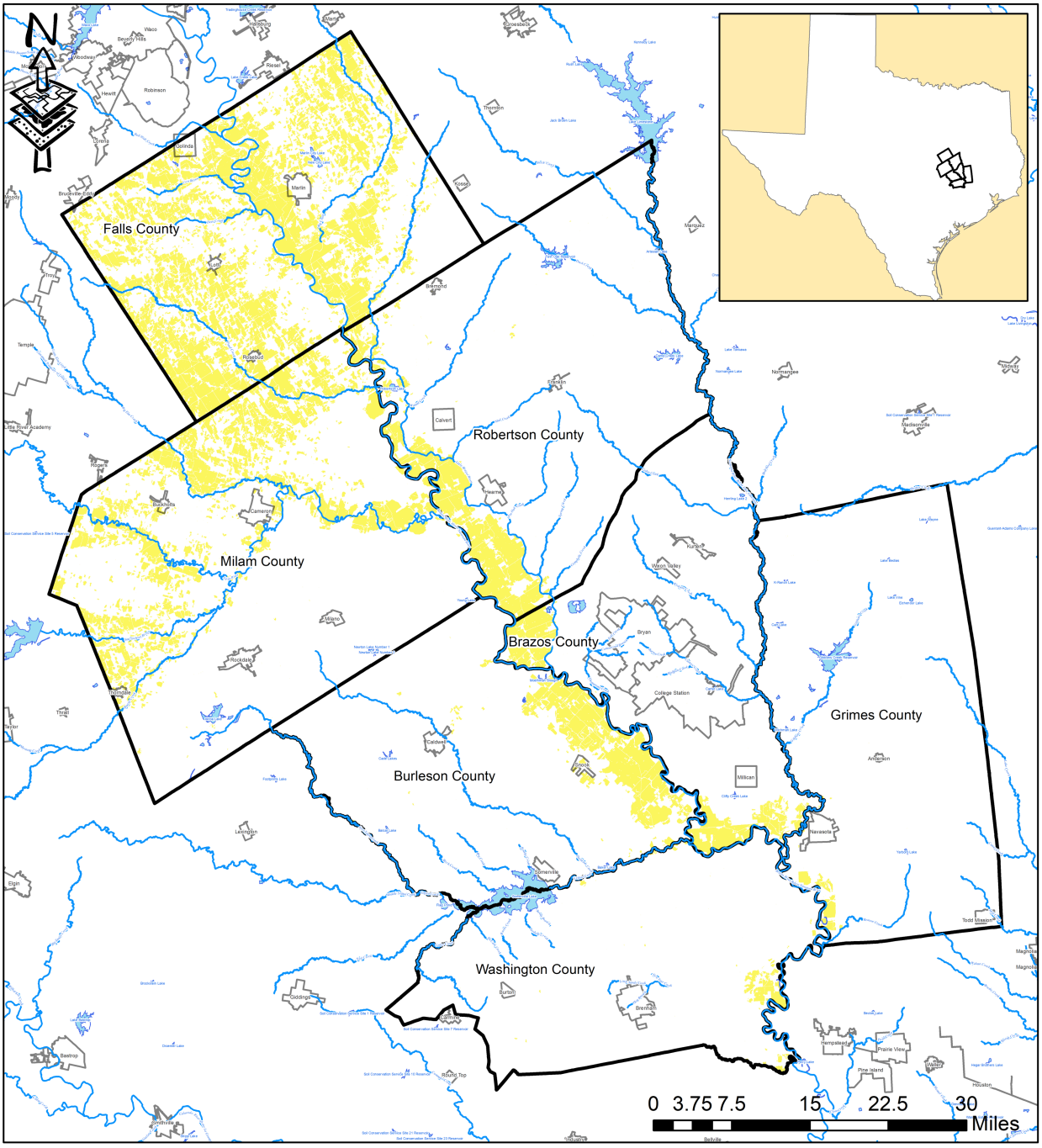
The proposed project will focus on delivery of training programs to improve the growers' capacity for adopting modern water conservation technologies that increase irrigation efficiency and reduces the non-consumptive water losses. Growers will be introduced to modern tools and resources to implement on-farm water conservation and quantify the impact of their efforts. Moreover, the project will aim at capacity-building of growers for drought monitoring and management for improving the resilience of irrigated agriculture to weather extremes (i.e., droughts). Long-term sustainability and profitability of water conservation will also be discussed under project activities.

TWRI will coordinate and administer the project in conjunction with AgriLife Extension, local partners including Bluebonnet, Brazos Valley and Post Oak Savannah Groundwater Conservation Districts; cooperating growers; and a variety of others. At least three grower education programs will be delivered by the project team in the Lower and Middle Brazos River Basin. At each educational event,

water conserving technology and practices, irrigation scheduling, available cost share opportunities (i.e. EQIP, WQMPs), and other relevant information will be discussed. These programs will address the need for increased awareness regarding advances in irrigation water management and technology and will serve to address irrigation conservation needs identified in the Region G Water Plan. Best management practices for conserving water will be the primary focus of discussion during programs and adoption incentives will be discussed in an effort to promote practice adoption.

Project Location

The proposed project will be conducted in the irrigated portion of the Middle and Lower Brazos River Basin (Brazos, Burleson, Falls, Grimes, Milam, Robertson, and Washington counties). The portion of the Lower and Middle Brazos River Basin that this project focuses on lies within the Brazos G Regional Water Planning Group (Region G). Irrigation water use makes up the second largest water use demand and currently accounts for approximately 40% of all water demand in Region G. Future irrigation demand is projected to decrease by 14% through increased conservation and conversion to other uses but is still projected to make up a significant portion of total water demand. AgriLife Extension and AgriLife Research are authorized to, and already do, conduct activities across the state, including the middle Brazos River counties.



Cropland in Brazos, Burleson, Falls, Grimes, Milam, Robertson, and Washington Counties, TX

Waterbodies
Creek/River/Stream
City Boundary
County Boundary

NLCD 2016 Land Cover

Cultivated Crops

Figure 1. Cultivated cropland in the counties adjoining the middle portion of the Brazos River

Qualifications of Technical Staff

Dr. Lucas Gregory is a PI for TWRI where he currently serves as an Assistant Director and quality assurance officer. He has extensive experience with successful project leadership and management, GIS, data analysis, ag systems management and water resources management. TWRI is extremely involved in addressing water issues in the Valley and currently manages eight projects that address water conservation and water quality across the region. It is estimated that he will spend 2% effort annually for this project.

Dr. Allen Berthold is a PI for TWRI where he currently serves as an Assistant Director. He has extensive experience with successful project leadership and management, water resources conservation and management, and program evaluation assessments. Dr. Berthold will lead program evaluation efforts to understand knowledge gained and quantify water savings. He will also assist in program development and delivery. It is estimated that he will spend 2% effort annually for this project.

Dr. Ali Ajaz is an Extension Irrigation Specialist that will play an integral role in the development and delivery of educational programming, technology demonstration, and program evaluations for this and other projects statewide. It is estimated that this person will spend 40% effort annually for this project.

TBD Soil Health Expert from Texas A&M system will focus on the adoption of soil health management systems on producers' farms through farmer-focused education and training. Also, soil health expert will include strategies to improve soil moisture retention in farmer trainings. It is estimated that this person will spend 5% effort annually for this project.

Other key project collaborators include: Post Oak Savannah Groundwater Conservation District; Bluebonnet Groundwater Conservation District; Brazos Valley Groundwater Conservation District; Dr. Dana Porter, Professor, AgriLife Extension Program Leader, and Associate Department Head in the Department of Biological and Agricultural Engineering (BAEN), who focuses on agricultural water management and irrigation; Dr. Guy Fipps, Professor and AgriLife Extension Agricultural Engineer for

Irrigation and Water Management who leads the Irrigation Technology Program, Texas A&M School of Irrigation, TexasET Network and website, and other irrigation programs and activities; Dr. Jason Krutz, Irrigation Specialist and Mississippi State Water Resources Institute Director conducts row-crop irrigation conservation programming throughout the Mississippi Delta in areas very similar to the Brazos Valleys and County Extension Agents. Officials from NRCS and other federal and state agencies with information on conservation incentive programs.

Budget Information

Project Total Cost

The projected costs for this project are $346,991.

The cost of each significant element of the program or project

TASK	DESCRIPTION	AMOUNT
1	Administration	-
2	Grower Education Programs	-
3	Irrigation Technology Demonstration	-
4	Public Education & Outreach	-
TOTAL		-

CATEGORY	LOCAL MATCH	TWDB AMOUNT
Salaries & Wages	-	-
Fringe	-	-
Travel	-	-
Other Expenses	-	-
Equipment	-	-
Subcontract Services	-	-
TOTAL	-	-

Budget Justification

Salary: PI Lucas Gregory, $86,771 annually at 2% per year with an annual 3% increase starting in year 1;

Co-PI T. Allen Berthold, $75,563 annually at 2% per year with an annual 3% increase starting in year 1;

Extension Irrigation Specialist Ali Ajaz, $60,000 annually at 15% per year with an annual 3% increase starting in year 2; TBD Program Manager, $59,064 annually at 8.33% per year with an annual 3% increase starting in year 2; TBD Soil Health Expert, $60,000 annually at 7% per year with an annual 3% increase starting in year 2

Fringe: Texas A&M AgriLife Extension's fringe rate is 18.2% * salary plus $746 per month.

Travel: Travel is budgeted for local mileage to the demonstration site for the Extension associate at $0.50/mile; for Extension personnel to travel to educational events in the watershed including 2 days per diem and 1 night lodging at the GSA state rates, $300 for airfare for two people; for TWRI irrigation specialist and PI to attend programs and visit demonstration sties in the LRGV for 11 trips, 2 people, 2 days, 1 night @ GSA per diem and lodging and mileage at $0.50/mile. In addition, travel funds will be used to collect field data and to disseminate the findings and experiences of this project at growers, Extension and professional conferences and meetings as well as mileage associated to the field days, workshops and visits to local farmers and ranchers.

Other Direct Costs – Materials & Supplies: Miscellaneous irrigation demonstration supplies ($2,000); Workshop supplies and office materials for preparing for workshops ($1,000)

Other Direct Costs: Irrigation Training Manual Printing ($3,375); Soil Moisture Sensors Service Fees ($1,800); Hyperspectral imagery for vegetation indices ($3,500), Communications Services ($3,000)

Equipment: 4 automated cloud-based soil moisture sensor networks for demonstration task ($10,200), 1 portable Ultrasonic water meter, 260 catch cans to perform irrigation audits, 300-Feet Open Reel Metal Frame Long Steel Tape Measure, Cordless angle grinder with battery ($1000 + $600 + $120+$300)

Contractual: Mr. Jason Krutz for services provided in delivery of furrow irrigation education programs

Local Matching Funds

Total in-kind matching provided is $78,500 as follows:

- In-Kind Post Oak Savannah Groundwater Conservation District grower conservation incentives

    - Up to $50,000 depending on number and efficiency upgrades implemented
- In-Kind Brazos Valley Groundwater Conservation District grower conservation incentives
    - Up to $15,000 depending on number and efficiency of upgrades implemented

Scope of Work

Task 1. Project Coordination, Administration, and Reporting

TWRI will coordinate and administer the project. An experienced team is organized to successfully deliver this project. This team consists of numerous AgriLife Extension personnel and a variety of local partners from the Brazos and Lower Rio Grande valleys.

Quarterly conference calls. To ensure timely completion of proposed work, quarterly conference calls with the project team will be held to discuss and coordinate project activities, project schedule, communication needs, deliverables, and other requirements.

Quarterly reports. TWRI will work with the project team to develop and submit quarterly activity reports to TWDB.

Develop and Submit Draft and Final Report. TWRI will work with the project team to develop a Final Report that summarizes activities completed and conclusions reached during the project and describe the extent to which project goals were achieved.

Task 2. Grower Education and Training Programs

In partnership with select irrigation districts and groundwater conservation districts, at least three grower education programs will be delivered by the project team in irrigated areas of the Middle and Lower Brazos River (potentially in Marlin, Hearne, and Mumford) on an annual basis. These programs will promote the adoption of water conservation practices and technologies that improve irrigation efficiency by engaging agricultural producers and through educational outreach in the form of field days, workshops, seminars, and demonstrations in classroom settings and on farms. The proposed tailored trainings will enable irrigators to measure and report water conservation performance metrics. The

farmers will also be educated on drought monitoring and the impacts of weather extremes on the crop yields to enhance their resilience to climate variability. In addition, irrigation audits will be conducted to engage ag-producers and water managers to discuss the potential of improvement in existing irrigation systems for reducing the water losses due to over irrigation and yield losses in areas receiving efficient use of irrigation water.

TWRI and AgriLife Extension will coordinate at least three Irrigation Training Programs in the Brazos Valley. These programs will be delivered in cooperation with local groundwater districts and County Extension Agents and will consist of specialists that will present on various topics including, but not limited to:

- Irrigation scheduling practices
- Innovative water conservation technology
- Irrigation systems audit
- Drought awareness
- Economics of conservation practice adoption
- Soil health management and moisture retention
- Conservation incentive programs

Materials will be printed and provided to participants. Extension Irrigation Specialists and others will assist with the Irrigation Training Programs coordinated by the TWRI. Workshops will emphasize on-farm water conservation practices. Economic considerations and cost-share programs available will be presented as well.

The Brazos Valley and Post Oak Savannah Groundwater Conservation Districts plan to encourage producers in their respective jurisdictions to participate in educational programming by offering financial assistant for upgrading existing irrigation technology to growers that attend program these programs. Local funding will be used for these incentives and will be used to match grant dollars.

Task 4. Public Education & Outreach

Media and Public Relations. The TWRI Communications Team will provide media and public relations support to the project team for news stories, event promotions, editorials, telling success stories, etc. within and beyond agricultural media. TWRI will work with AgriLife Extension and Research to develop applicable messaging regarding water conservation and management. The TWRI media platforms (website, Facebook, Twitter, Instagram, etc.) AgriLife Today, partner media platforms, local media, trade magazines, and other avenues as appropriate will be used to disseminate project information and educational materials. This will serve to further the reach of in-person program delivery and will promote water conservation in irrigation to a wider audience around the project region and state.

Project Timeline

Task	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
1. Administration	X	X	X	X	X	X	X	X	X	X	X	X
2. Grower Education		X				X				X		
4. Education & Outreach	X	X	X	X	X	X	X	X	X	X	X	X

Project Activities and Deliverables

- At least six irrigation conservation focused grower education programs including promotional materials, agendas, number of attendees, and program materials
- News releases and articles highlighting upcoming irrigation training events and irrigation conservation
- Press releases
- Quarterly reports
- Draft and final reports

Achievement of Solicitation Goals

This project is designed to directly achieve all three goals described in the grant's request for applications. Agricultural producers will be engaged throughout the program through educational events, technology demonstration field days and technology trainings. These educational programs and demonstrations specifically promote the adoption and tout the benefits of existing and innovative water conservation practices and technologies with an ultimate goal of encouraging producers to improve their irrigation systems based on knowledge gained during program delivery. These programs also prepare growers to cope with weather extremes, and drought-focused trainings reinforce their resilience to climate variability. The planned programs will be developed in consultation with local and regional partners and will be delivered with their support. These partners are also committing in-kind financial resources to further expand the reach of these programs and further promote conservation practice adoption.

Water Conservation Benefits

Water Conservation Recommendations and Strategies Identified in the Regional Water Plan

The 2021 Brazos G Regional Water Plan states in section 8.3 that "Research indicates that there is a strong relationship between knowledge of water sources and a willingness to conserve. Conservation is the most cost-effective means of securing future water supply. Brazos G believes strongly that water education is important and supports water conservation and public awareness programs at the state and local level." The 2021 RWP identifies several best management practices, for example, irrigation scheduling, volumetric measurement of irrigation water use, on-farm irrigation audit, etc. Moreover, the 2021 RWP for Region G encourages drought contingency planning for groundwater conservation district to better optimize the water use..

How Proposed Grant Facilitate the Implementation of Water Conservation Strategies

This project seeks to facilitate the implementation of aforementioned strategies by conducting agricultural water conservation focused education programs supported by financial incentives. Local incentive programs will provide a financial stimulus to irrigators in these regions to implement water-conserving technologies further expanding the impact of delivered education programs. Proposed activities will lead to increased adoption of irrigation water conserving practices thus supporting implementation of vital components of Region G Water Plan. Thus, conserving water needed for sustainable future growth, ensuring continued vitality of agriculture in the the Brazos Valley, and positively impacting the region economically and environmentally.

Estimated Baseline Water Usage

Estimated irrigation water usage in the project's focus areas is significant. In the Brazos Valley, irrigation demand is almost exclusively groundwater. Demands are quite variable from year to year as annual rainfall totals can vary greatly in amount and timing. Decreasing irrigation demand over time is also projected in these counties and is primarily due to increasing demands from other water uses, efficient irrigation water delivery systems, and higher costs associated with pumping water from deeper depths.

Table 1. Regional Water Plan Usage and Demands

	2010 Historical Use	2020 Demand	2070 Projected Demand
Brazos	35,541	26,050	20,438
Burleson	27,099	22,855	18,469
Falls	6,847	4,301	3,658
Grimes	275	0	0
Milam	3,494	5,081	4,875
Robertson	79,613	63,420	55,124
Washington	300	299	299
Brazos Valley Total	**153,169**	**122,006**	**102,863**

Expected Water Savings

An evaluation approach will be used to measure both knowledge and behavior changes of individuals participating in education programs. A pre-test/post-test evaluation strategy will be implemented at the beginning and end of select training programs. The pre-test will ask knowledge-based questions and the post-test will measure knowledge change of participants. In addition, the post-test will include 'intentions to change' questions that will focus on behaviors that participants should adopt based on what they have learned. A six-month follow-up evaluation instrument will also be administered to participants via online survey technology. Emails will be sent to program participants to determine which practices were adopted six months after the program. For those individuals that do not have email, traditional mailing techniques will be used to collect these data.

Construction Activities

No TWDB funding is requested for the construction of a conservation project.