Texas AgriLife Research
Texas Water Resources Institute

Groundwater Nitrogen Source Identification and Remediation in the Texas High Plains and Rolling Plains Regions
FY 09 CWA 319(h)
TSSWCB Project No. 09-03

Quarter no. __4__ From __7.1.2010_____ through __9.30.2010_____

I. Abstract

The QAPP has been commented on by EPA and comments are being addressed. QAPP approval is expected the middle of next quarter. Preliminary work including preparations for sampling and assessment activities has continued in anticipation of the QAPP being approved. AgriLife Research has been collecting background data on well water quality and cotton plant tissue N content.

II. Overall Progress and Results by Task

TASK 1: Project Administration

Subtask 1.1: *TWRI, with input from Texas AgriLife Research and UT-BEG, will prepare electronic quarterly progress reports (QPRs) for submission to the TSSWCB. QPRs shall document all activities performed within a quarter and shall be submitted by the 15th of January, April, July and October. QPRs shall be distributed to all project partners and posted on the project website developed and hosted by TWRI.*

The following actions have been completed during this reporting period:

A. TWRI submitted the Quarter, Year 1 report to TSSWCB on October 13, 2010.

8% Complete

Subtask 1.2: *TWRI will perform accounting functions for project funds and will submit appropriate Reimbursement Forms to TSSWCB at least quarterly.*

The following actions have been completed during this reporting period:

A. TWRI has been working to establish project contracts, accounts and sub-contracts.

B. Expenditures thus far have totaled $40,531 or roughly 9% of total project funding.

9% Complete

Subtask 1.3: *TWRI will participate in meetings as appropriate in order to efficiently and effectively achieve project goals, coordinate monitoring efforts and summarize activities and achievements made throughout the course of this project.*

The following actions have been completed during this reporting period:

A. A meeting was held in Stephenville for all project personnel to address problems with the QAPP and develop a timeline for completion of the project.

12% Complete

Subtask 1.4: *TWRI will work with AgriLife Research and UT-BEG to develop a project final report summarizing the results of the groundwater nitrogen source identification and demonstration of nitrogen remediation strategies for submittal to the TSSWCB and EPA.*

The following actions have been completed during this reporting period:

A. No activity to report at this time.

0% Complete

TASK 2: Quality Assurance

Subtask 2.1: *TWRI will develop a QAPP for activities in Tasks 3-4 consistent with* EPA Requirements for Quality Assurance Project Plans (QA/R-5) *and the* TSSWCB Environmental Data Quality Management Plan.

All monitoring procedures and methods prescribed in the QAPP shall be consistent with the guidelines detailed in the TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415) *and* Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data (RG-416).

The following actions have been completed during this reporting period:

A. QAPP for the *Groundwater Nitrogen Source Identification and Remediation in the Texas High Plains in Rolling Plains Regions* was submitted to and returned by EPA with concerns.

B. EPA concerns are being addressed.

95% Complete

Subtask 2.2: *TWRI will submit revisions and necessary amendments to the QAPP as needed.*

The following actions have been completed during this reporting period:

A. No activity to report at this time.

0% Complete

TASK 3: Groundwater Nitrogen Source Identification

Subtask 3.1: *To quantify the changes between native rangeland sites and cultivated sites that are in close proximity to each other, UT-BEG will use data from the USDA Bushland site near Amarillo where an area of the research station has been maintained under rangeland management and is adjacent to cropland.*

The following actions have been completed during this reporting period:

A. UTBEG reviewed previous drilling results in the region to determine optimal locations to sample for C and N.

10% Complete

Subtask 3.2: *UT-BEG will quantify organic carbon and total nitrogen in the native and cropland profiles to quantify the reduction in organic carbon from the native to the cropland site. These data will be used to determine if changes in organic carbon and nitrogen can account for the increased nitrate found in profiles under cropland.*

The following actions have been completed during this reporting period:

A. UTBEG reviewed existing borehole data on nitrate to determine optimal locations for this sampling effort and have obtained locations to drill in a rangeland site near Texas Tech University.

10% Complete

Subtask 3.3: *UT-BEG will also examine carbon-13 isotopes on the organic carbon which may provide insights on the impact of the shift from native vegetation to cropland on the relative proportions of soil organic carbon derived the native system versus the cultivated system. Utilization of long-term CRP land may also be employed.*

The following actions have been completed during this reporting period:

A. No activity to report at this time.

0% Complete

Subtask 3.4: *Mass balance analyses will also be conducted by UT-BEG, in collaboration with USDA-ARS, to evaluate the relative inputs of nitrogen from different sources. These results should be applicable to the entire Texas High Plains Ogallala and the Rolling Plains Seymour Aquifers.*

The following actions have been completed during this reporting period:

A. Compiled data from existing databases to evaluate sources of nitrogen in the Rolling Plains aquifer.

10% Complete

Subtask 3.5: *Nitrate derived from mineralization of native soil organic matter does not constitute a continuous input to the system and should move through the groundwater system as a pulse. UT-BEG will evaluate this process through mass balance analyses.*

The following actions have been completed during this reporting period:

A. No activity to report at this time.

0% Complete

Subtask 3.6: *Historical records of agricultural practices will be examined for dryland and irrigated sites by UT-BEG to determine relationships between nitrogen application rates and subsurface inventories. Based on these data and findings from UT-BEG, Texas AgriLife*

Research will develop recommendations on nitrogen application rates for farmers (Subtask 4.6).

The following actions have been completed during this reporting period:

A. No activity to report at this time.

0% Complete

Subtask 3.7: *UT-BEG will assist Texas AgriLife Research with determining BMPs related to nitrogen fertilizer applications for producers.*

The following actions have been completed during this reporting period:

A. No activity to report at this time.

0% Complete

Subtask 3.8: *UT-BEG will evaluate nitrate input from mineralization of SOM. This mineralization mechanism with subsequent release of nutrients forms the basis of the crop's nutrient requirements in the northern portion of the Texas High Plains and may contribute substantive amounts of nitrate to the system. UT-BEG will supplement existing data by drilling additional boreholes in Lynn County where extremely high groundwater nitrate contamination is found.*

The following actions have been completed during this reporting period:

A. TWRI and UTBEG have contacted local CEA and NRCS Soil Conservationist to help identify producers to provide drilling sites.

5% Complete

TASK 4: Evaluation and demonstration of Nitrogen Remediation Strategies

Subtask 4.1: *AgriLife Research will establish a 2.5 acre block under subsurface drip irrigation cropped to cotton at the Chillicothe Research Station to demonstrate and document benefits of irrigation water N crediting to area farmers.*

The following actions have been completed during this reporting period:

A. Cotton has been established for the year 1 growing season.

30% Complete

Subtask 4.2: *At Chillicothe, AgriLife Research will demonstrate nutrient management strategies based on the crop's agronomic (1) N requirements, (2) N and P requirements, (3) N requirement minus irrigation N credit, (4) N and P requirement minus irrigation N credit, and (5) control (N from irrigation water only) on plots cropped to cotton under subsurface drip, furrow, and overhead irrigation.*

The following actions have been completed during this reporting period:

A. No activity to report at this time.

0% Complete

Subtask 4.3: *AgriLife Research will collect and analyze soil samples from a depth of 36 inches following each growing season. Soil samples will be analyzed by AgriLife Research at Vernon for nitrate, ammonium, total N, and P. Irrigation water samples will also be collected weekly throughout the irrigation season at demonstration sites and analyzed for nitrate. AgriLife Research will also conduct an economic analysis of different nutrient management practices (Subtask 4.2), demonstrating the most cost-effective BMP.*

The following actions have been completed during this reporting period:

A. No activity to report at this time.

0% Complete

Subtask 4.4: *Based on findings from UT-BEG (Subtask 3.6), Texas AgriLife Research will develop recommendations on nitrogen application rates for farmers. Texas AgriLife Research will also work with UT-BEG to determine BMPs related to nitrogen fertilizer applications for producers. Texas AgriLife Research will provide these recommendations on application rates and BMPs via development of a technical report and fact sheet (see Subtasks 4.5 and 4.6 below) to Texas AgriLife Extension Service personnel, local soil and water conservation districts, NRCS personnel, TSSWCB personnel, Texas Water Development Board staff, underground water conservation districts, certified crop advisors, and directly to farmers to ensure delivery of these recommendations.*

The following actions have been completed during this reporting period:

A. No activity to report at this time.

0% Complete

Subtask 4.5: *AgriLife Research will host a minimum of 1 field day at the demonstration site. Additionally, project results will be presented at the Beltwide Cotton Conference and American Society of Agronomy meetings. The Beltwide Cotton Conferences speed the transfer of new technology to U.S. cotton producers and other industry members. Coordinated by the National Cotton Council (NCC) and its cooperating partners, this annual forum is recognized as the global champion for cotton technology transfer. Regionally, project results will be presented at the annual meetings of the Texas State Support Committee of Cotton Inc. in Lubbock and the Texoma Farm and Ranch Show in Wichita Falls. These regional meetings are well attended by producers, industry, and commodity board members. Finally, at least 3 workshop/stakeholder meetings will be held to discuss nitrate and irrigation strategies. AgriLife Research will work with UT-BEG to develop handouts, presentations, and posters (as appropriate) describing results along with other educational materials for the Texas High Plains and Rolling Plains regions for use at the field day, regional and national meetings, and workshop/stakeholder meetings. Specifically, at least one fact sheet is planned for development on recommendations on nitrogen application rates and BMPs. These materials will subsequently be made available to AgriLife Extension and others as listed in Subtask 4.4 above for use at other venues in the region and distributed to farmers.*

The following actions have been completed during this reporting period:

A. Held field day for AgriLife administration and resident directors from around the state.

5% Complete

Subtask 4.6: *AgriLife Research will work with TWRI and UT-BEG to develop a technical report and refereed journal publication summarizing results of the demonstration and groundwater nitrogen source evaluation for further technical transfer and incorporation into the final report submitted to the TSSWCB and EPA.*

The following actions have been completed during this reporting period:

A. No activity to report at this time.

0% Complete

III. Related Issues/Current Problems and Favorable or Unusual Developments

- Most project tasks remain uninitiated due to the QAPP not yet being approved. Work on these tasks will begin once approved.

IV. Projected Work for Next Quarter

- Address EPA concerns with QAPP
- Begin sampling and monitoring soils and irrigation waters upon QAPP approval.