I. Abstract

Work this quarter has focused on the continued analysis of soil samples collected during the past quarters. This is a lengthy and multi-faceted portion of the project that will continue for several more quarters. Delivery of preliminary project findings was also a key accomplishment of the past quarter; information on the potential of nitrogen crediting was presented at one national conference and three regional meetings. Additionally, a draft N crediting factsheet was initiated.

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 10th Quarter, report to TSSWCB on April 10th, 2012.

83% 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. Expenditures thus far have totaled $153,849 or roughly 34% of total project funding. Much of the delay in expending project funds can be tied to sample analysis billing. These bills are not completed and paid until analysis is complete, thus disproportionately causing project expenditures to lag behind actual project progress.

40% 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. Project quarterly meeting was held in Stephenville on March 30th. It was decided that a 9 month no-cost extension will be requested to allow for another growing season and data collection cycle to be completed.

83% 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. No activity to report at this time.

100% 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. The annual QAPP revision has been submitted to the EPA for their review and approval.

75% 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. Samples were sent from profiles for analyses.  

65% 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. USDA ARS completed analyses of soil samples from 16 boreholes (~ 100 samples) to maximum depth of 60 cm in each profile. Analyses included nitrate, ammonia, total nitrogen, and total carbon. Profiles were from rangeland, dryland, and irrigated sites. These data are being used to select sites for isotopic analyses.  

75% 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. Ionic composition analysis results from USDA ARS have been sent to TAMU for isotopic analysis.  

60% 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. NASS data are currently being collected to enable UT-BEG to quantify relative nitrogen inputs to the region.  

60% 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. Nitrate data from the USDA ARS profile analyses are being evaluated to illustrate nitrate movement.

65% 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. We are compiling records from farmers on historical agricultural practices at each of the sites drilled. We have calculated subsurface inventories for each of the profiles sampled in the Texas High Plains.

60% 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 as this will take place after completion of analyses.

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. Profiles recently drilled in Lynn County have been analyzed and the evaluation of SOM mineralization is underway.

62% 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. The cropping system implementation continues at Chillicothe along with the pre and post crop soil and plant tissue sampling.
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. Data collection for the first two growing seasons has been completed and season three is under way. Preliminary results indicate that N reductions of 42 to 70% will not adversely impact crop yields.

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. Data collection for the first two growing seasons has been completed and season three is under way. Information on effectiveness and potential cost savings through N crediting implementation have been presented at multiple public forums and have been well received.

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. A draft fact sheet describing N crediting is being developed and will be used to expand knowledge of this concept.

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. Preliminary findings on the project were presented to producers participating in the Beltwide Cotton Conference in Orlando on January 5th, a Peanut Growers Association Meeting in Quail on March 2nd, and at the Red River Basin Advisory Committee meetings in Amarillo and Wichita Falls on March 20th and 27th respectively.

B. Tentative plans have also been made for a demonstration field day at Chillicothe on July 17th.

50% 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. Efforts have begun to develop a written manuscript that describes findings to date.

10% Complete

III. Related Issues/Current Problems and Favorable or Unusual Developments
- The historic drought of the past year adversely effected normal cropping strategies resulting in excessive amounts of irrigation water being applied to crops only to have them fail as a result of extreme heat stress. This foray from the norm may result in legacy effects in crop yields from year to year. Continued sampling will illustrate these impacts in the months to come.

IV. Projected Work for Next Quarter
- Continue to analyze data collected over the last quarter
- Conduct isotope analysis on soil profile data
- Monitor irrigation water quality at Chillicothe
- Plan for the July 17th field day at Chillicothe
- Continue working on a N crediting factsheet
- Continue working on a draft manuscript describing findings to date