PRECISION AGRICULTURE INITIATIVE
FOR TEXAS HIGH PLAINS

2002 ANNUAL COMPREHENSIVE REPORT

Texas Agricultural Experiment Station and Texas Cooperative Extension

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Primary Research Location:

West Texas A&M University, Canyon
Texas A&M Agricultural Research and Extension Center, Amarillo
North Plains Research Field, Etter, Texas

Project Title:

Economic Feasibility Assessment of Variable Rate Applications (VRA) for the Northern Texas High Plains

Project Objectives:

The overall objective of this project is to integrate economics analyses into the current and future precision farming projects earmarked for the Northern High Plains of Texas and generalize potential impacts of VRA to Texas as a whole wherever data permit. The specific objectives are to:

1 Identify and analyze the costs of VRA technologies in Texas High Plains
2 Evaluate the breakeven field variability and estimate the breakeven yields to cover the technology cost by conducting expanded economic analysis of VRA

Reporting Period: January 1, 2002 - December 31, 2002

A. Summary of Progress:

Precision farming or site-specific farming uses site-specific information to apply inputs at spatially variable rates with the objective of maximizing profits. Precision technology helps in matching input application to crop and soil needs. Both over-application and under-application of inputs like seeds, water, fertilizers and pesticides are reduced. Voluntary adoption of VRA is likely to be dependent on profitability. Economic benefits of switching to VRA from uniform application methods depend on the feasibility assessment of the technology. Cost data of various VRA technologies and their components available in the market by different manufacturers have been collected. The costs are being analyzed for comparison purposes and will be put together in some form of informative bulletin **(specific objective 1)**. The information will be passed on to the area producers through extension network facilitating producer's decision-making process for adoption of precision farming technology.

A thorough site-specific assessment of the economic viability of precision agricultural technology must be conducted prior to producer adoption. In the semi-arid region of the Texas High Plains, research has shown that no production input is more important than water. The irrigation water is applied using center pivot in this region. Feasibility of using variable rate irrigation technology on these center pivots is assessed using actual yield maps from producers within the region. The impact of different prices of various commodities on the economic feasibility of VRI technology has also been assessed **(specific objective 2)**. Results of these analyses indicate that many producers have enough yield variability to justify the investment in VRI technology.

Economic analyses of crop production, regardless of the technology used, requires determining the responsiveness of crop yields to various inputs. The crop yield responses for corn, sorghum, soybeans, and wheat are being estimated for different topsoil depths in the field at North Plains Research Field (NPRF), Etter, Texas with variable rate applications of seed, fertilizer, and water. The information provided by the individual response functions will be used to

optimize the use of input in crop production. The profit maximization for any input will occur at the point where the additional returns equal the additional costs. The producer will break even if the additional returns above the input costs are equal to the cost of VRA depending upon the spatial variability in the field **(specific objective 2)**.

B. Education/technology transfer:

Attended and participated in sessions on precision farming and its economics and held discussion with professionals during Southern Agricultural Economics Association Annual Meetings at Orlando, Florida on February 3-6, 2002 and Western Agricultural Economics Association annual meetings at Long Beach, California on July 28-August 1, 2002. In depth discussion on the various economic aspects of precision agriculture indicated that the precision farming might be economically a viable option for producers if the adoption costs are low. Precision farming may not only enhance net profitability but also these site-specific management approaches could contribute significantly in improving environment.

C. **Milestones achieved:**

Yield as well as input data for crops grown in the area for years 1997 to 2002 from producers in Sherman and Moore counties were collected and processed by the graduate student. The data is being converted into a suitable form required for analyses. Yield maps and average distribution analyses will be used to assess the yield variability and factors responsible for this variation will be identified. Knowledge of yield increase from the potential areas in the field and expected returns to offset investment in the VRI can help the producers in making appropriate economic decisions about the adoption of VRI.

D. **Publications:** (Provide complete references)

- **Almas, Lal**, S. Amosson, T. Marek, and W. Arden Colette "Economic Feasibility of Precision Irrigation in the Northern Texas High Plains." Selected Paper submitted to Southern Agricultural Economics Association Annual meetings to be held in Mobile, AL on February 1-5, 2003. (paper accepted for presentation)

- Amosson, S., L. New, **L. Almas**, F. Bretz, and T. Marek. 2002. "Economics of alternative irrigation systems." B-6113, Texas Cooperative Extension, Texas A &M University System Extension Publication, College Station, Texas (peer reviewed)

- Colette, W. Arden, **Lal K. Almas**, and Brett Baker. 2002. "Evaluation of Irrigation and Other Production Technologies for Increasing Returns and Reducing Risk for Winter Wheat Producers on Pullman Clay Loam Soils in the Texas Panhandle." Submitted as Technical Paper to the Great Plains Foundation Symposium 2002, Amarillo, Texas (peer reviewed)

- Colette, W. Arden, C. Robinson, and **L. Almas**. 2002. "A statistical model using PET and weather data to predict the economic optimal irrigation level for corn production in the Texas Panhandle." Proceedings of KSU Conference on Applied Statistics in Agriculture, Manhattan, Kansas (peer reviewed).

E. **Precision Agriculture Proposals:** (List all proposals related to PA and indicate amount of request and if they were funded)

- A proposal related to precision agriculture was submitted with the request for research funds of $20,000 per annum for two years. The title of the project is "Economic Feasibility Assessment of Variable Rate Applications for the Northern Texas High Plains." The research project was funded for $15,000 for 2nd year

F. **Precision Agriculture meetings attended/papers (posters) presented:**

- Attended and participated in Selected Paper Sessions on Precision Farming of Southern Agricultural Economics Association Annual Meetings at Orlando, FL on February 3-6, 2002.
- Attended and participated in Precision Agriculture Selected paper Sessions of American Agricultural Economics Association/Western Agricultural Economics Association annual meetings at Long beach, CA on July 28 to August 1, 2002

G. Other developments:

The ongoing research project under precision agriculture supported partially a graduate student in the Division of Agriculture, West Texas A&M University. The student will continue to work on this project through 2003. Principal investigator and graduate student will closely work together and continue to conduct economic analyses and estimate potential economic and environmental benefits of variable rate applications of input uses associated with precision farming in Northern Texas High Plains.