TITLE:

Peanut Precision Agriculture Studies at Western Peanut Growers Research Farm (Gaines County, Texas) 2001.

AUTHOR:

Mike Schubert (All collaborators were involved in some way in this part of the work)

INTRODUCTION:

The use of precision agriculture or site specific techniques is a very important part of much of the research conducted at the Western Peanut Growers Research Farm (WPGRF). Site specific approaches recognize that a field is not uniform. A field varies in soil chemical and physical properties and slopes, for example. With modern technologies of global positioning systems (GPS), aerial imagining, geographic information system (GIS) software, and relatively inexpensive, yet powerful, computers, we are now able to characterize field variability in an organized fashion that allows us to determine what factors influence plant performance and ultimately profitability. With sufficient information, this approach will assist in management decisions for the field or for zones within it. This report highlights progress in this area of study.

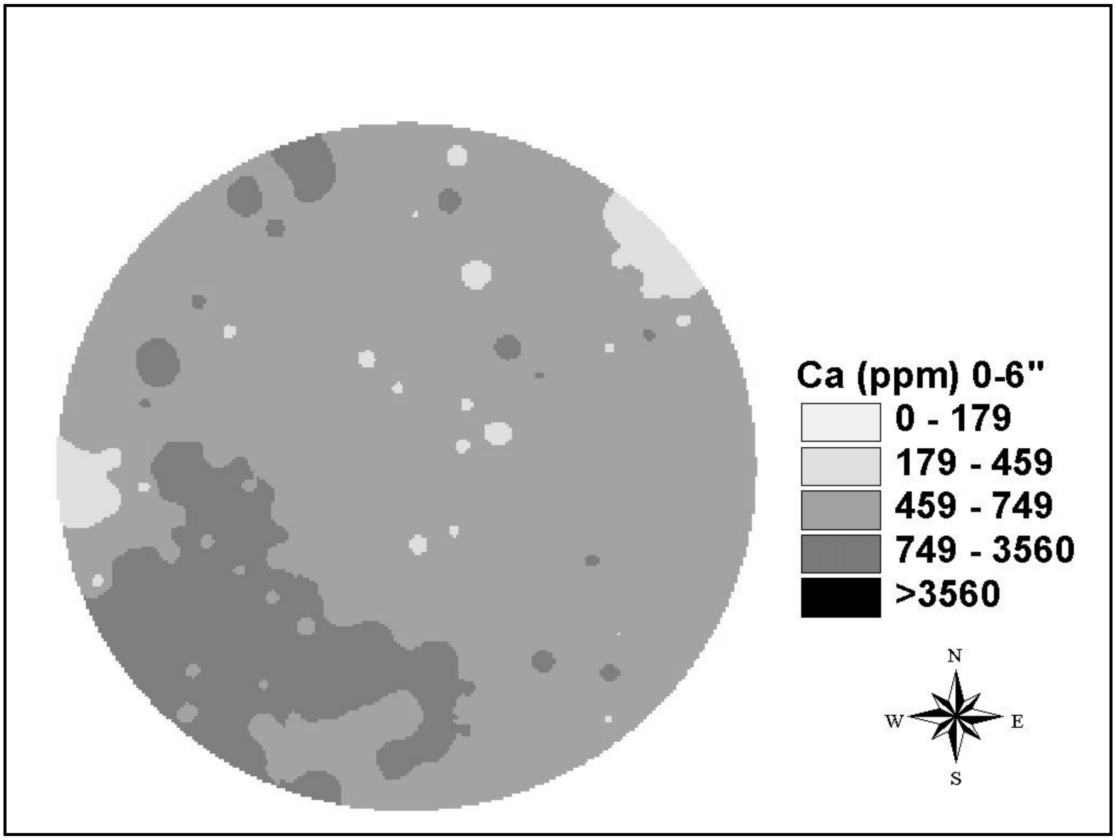
SOIL MAPPING:

Beginning in the spring of 2000, soil samples were collected in the east circle of the WPGRF on a ½ acre grid with sampling spots identified by differential GPS coordinates. The soil samples were collected using hydraulic, tractor-mounted soil probes with a clear plastic liner. Two cores were collected at each site, approximately 10 ft apart. The goal was to collect samples to the 4-foot depth, but dry soil conditions and shallow caliche layers limited the depth at many sites, resulting in samples to the 3-foot depth at most sites.

The depth from surface to major color change and depth to caliche was measured. Soil cores were sawed into 0-6", 6-12", 12-24", 24-36", and >36" sections. Soil from the two cores at each depth and sampling site were combined, pulverized through a screen, and mixed. A portion of each sample (excluding the >36" samples) was sent to Ward Laboratories at Kearney, Nebraska for chemical analysis. Technical staff and student assistants at the TAMU Agricultural Research & Extension Center at Lubbock performed mechanical analysis on all samples (excluding the >36" samples) to determine sand, silt, and clay percentages. The >36" samples were not analyzed, because there were so few of them and they added only a few inches to the initial core. Because of the expense and time required to analyze the approximately 450 samples, analysis of all samples was completed in the spring of 2001.

Data from all soil analyses were entered into the computer and verified. Geographic Information System (GIS) software was used to prepare graphic representations of the data throughout the field and to compare site-specific soil data with yield and other site-specific data. Figure 1 shows an example of the graphic representation of the 0-6" calcium map.

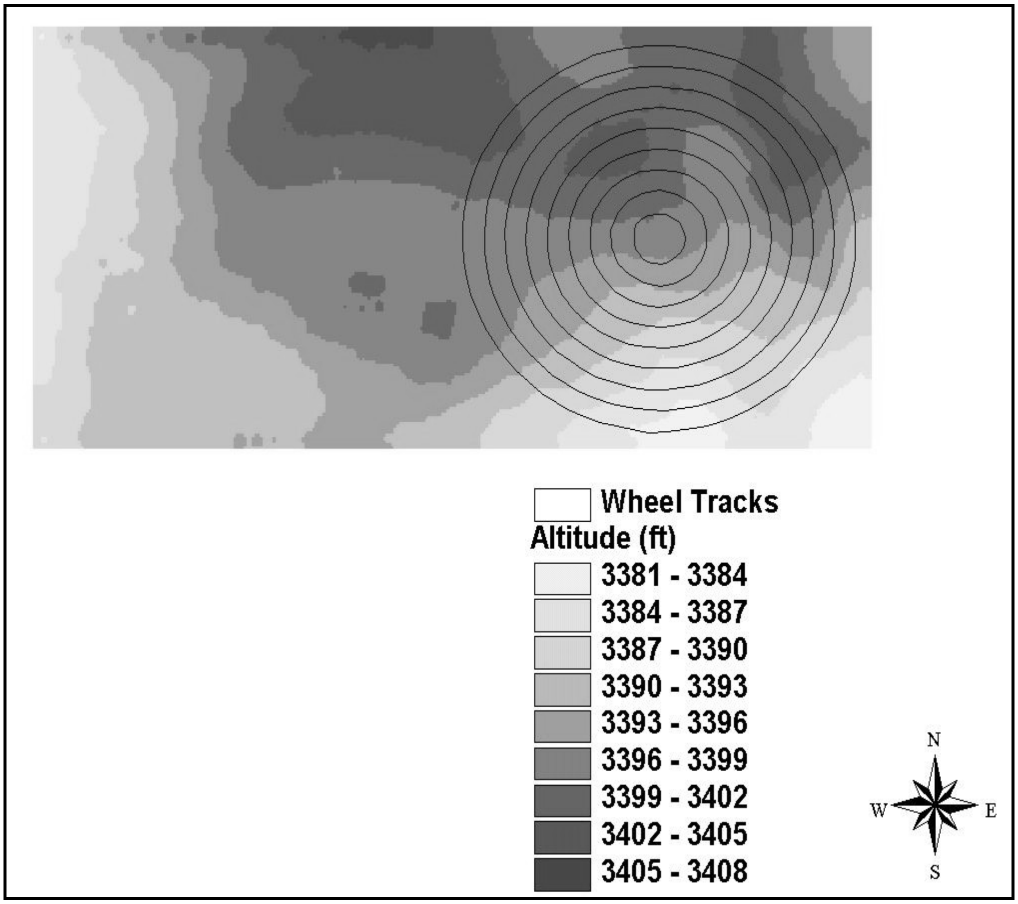
Figure 1.



ELEVATION MAPPING:

In December, 2000, Greg Sokora, Gordon Paden, and Ron Crumley (USDA, Natural Resources Conservation Service) performed a detailed GPS-referenced elevation analysis of the entire WPGRF. This data will allow us to characterize slopes throughout the research farm. The slope data will be especially useful in evaluating site-specific irrigation performance throughout the field. Initially we prepared graphic presentations of this data to illustrate overall elevations. We recently revisited this data, developing skills to begin to calculate site-specific slopes and to correlate slope down-the-row with crop performance at selected sites in the field. Much work remains to totally exploit this information. Figure 2 is a graphic representation of an elevation map constructed from the elevation data. In initial analyses of 2001 LEPA irrigation areas, there was no relationship between slope down-the-row and yield. These analyses will be continued for 2000 yield maps at WPGRF and 1998-2001 yield maps at AG-CARES.

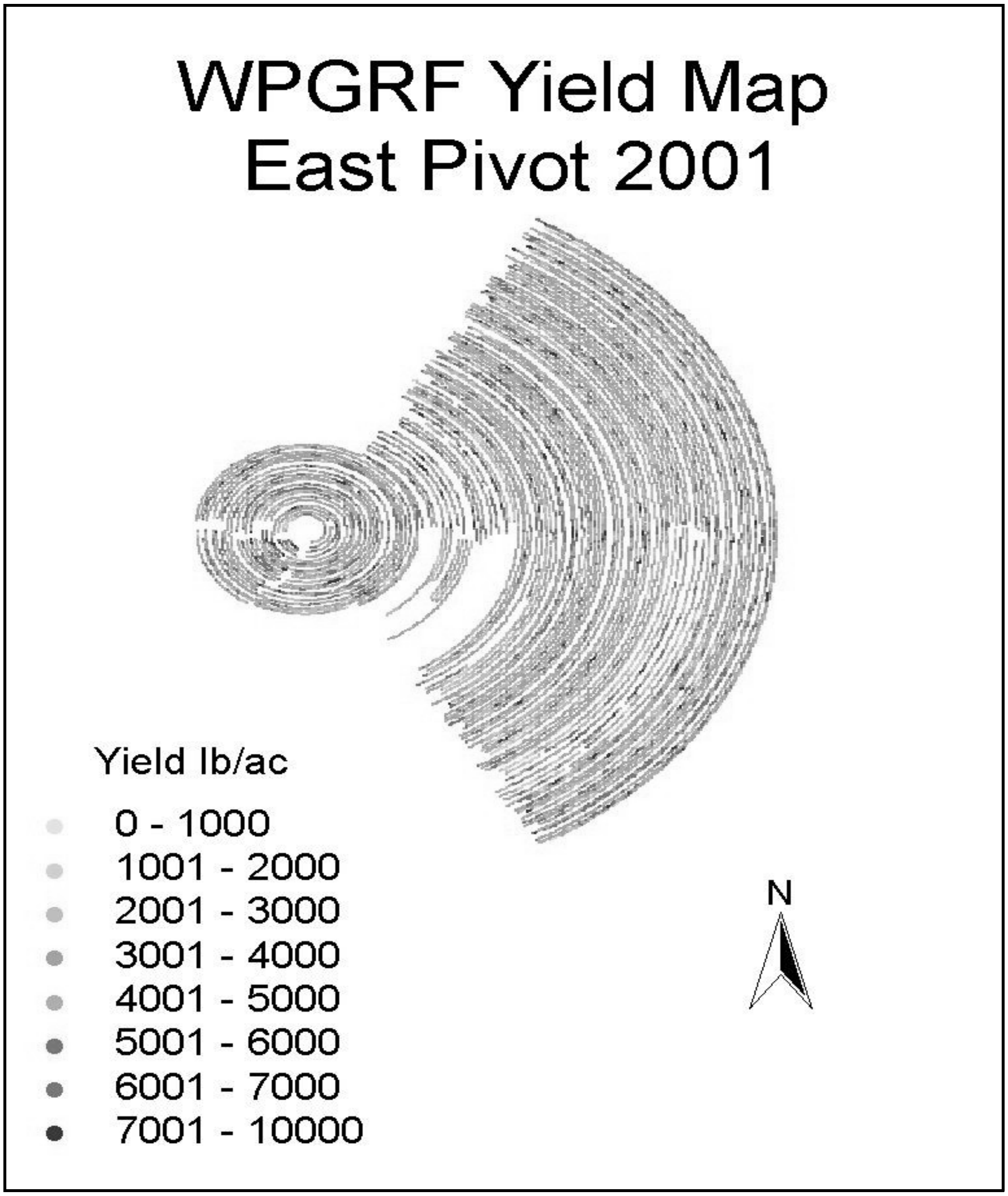
Figure 2.



YIELD MAPPING:

A very important tool in site-specific or precision agriculture approaches is the ability to produce a yield map of the field. Detailed yield maps can then be linked by GPS coordinates to other maps, such as those for soil chemical and physical properties, soil depth, surface slope, remote sensing data (such as, aerial photography), weeds, diseases, nematodes, insects, and varying cultural practices. In 1998, we were able to install and test a peanut yield mapping system (PYMS) developed by engineers and scientists at the University of Georgia (UGA) Coastal Plains Research Station at Tifton, GA. UGA cooperators included Dr. George Vellidis, Calvin Perry, and Jeffrey Durrence. With their cooperation, the Texas Agricultural Experiment Station acquired a four-row peanut combine. The UGA collaborators transported that combine to their shop where they modified it to accept the mapping instrumentation. The combine was then shipped to Lamesa where we installed load cells, wiring, and other instrumentation with the assistance of personnel from Nix Implement Company. We used the PYMS in 2000 and 2001 at WPGRF. Information from yield maps like the one in Figure 3 are used in several of this year's reports contained in this booklet.

Figure 3.



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