2006 Beltwide Cotton Conferences, San Antonio, Texas - January 3 - 6, 2006

PRECISON COTTON FARMING IN THE SAN JOAQUIN VALLEY OF CALIFORNIA

Lowell Zelinski
Precision Ag Consulting
Paso Robles, CA
Brock Taylor
Brock Taylor Consulting
Fresno, CA

Abstract

Cotton production is declining in California due to competition for resources such as water and land, as well as higher economic returns for other commodities such as almonds and pistachios. In order for cotton to remain in the crop mix, practices that reduce the cost of producing a pound of cotton need to be adopted. One practice that may have the ability to help with this goal is precision farming.

Precision farming encompasses many different technologies and the goal of this paper is to document the current status of precision farming of cotton in California. The most established form of precision farming in California is precision guidance systems on tractors. Most of the larger farms (greater than 2,000 acres of cotton) have tractor(s) equipped with some type of precision guidance system. Many farmers with small to medium size acreage will either rent a tractor with precision guidance or will contract out the "listing" of beds to a company that uses precision guidance. The economics of this type of precision farming is well established, and though there is room for improvement in the implementation of guidance systems, farmers realize that this technology is beneficial.

The second area of precision farming that is gaining acceptance is the use of variable rate (VR) applications of farming inputs. It is estimated that approximately 20% of cotton farmers in California have tried VR applications of some type of input. VR application of mepiquat chloride is the most widely adopted use of this technology. VR applications of herbicides, soil amendments such as gypsum and sulfur, fertilizer, planting seed and defoliation materials are being made on a more limited basis. Some of the newest areas of VR technology involves applications of insecticides and irrigation water.

Steps in making VR applications include: 1) utilizing some technology for dividing a field into areas that are more-or-less uniform. These technologies include aerial imaging and analysis, satellite imaging and analysis and soil salinity mapping with an automated sampling and data collection system such as Veris. There areas of uniformity (zones) are geo-referenced utilizing the global positioning system (GPS) and either personal or web-based software. The most frequently used personal software packages include: Arcview, HGIS and Farmworks. InTime's services are the most commonly used web-based application. 2) Ground truthing the zones utilizing laboratory analysis or plant based measurements to determine specific rates of inputs for each zone. 3) Preparation of a "prescription" file and/or map to control the VR applicator. This step is either performed by the web-based software or by precision farming consultants. 4) Application of the input using a VR applicator. Both aerial and ground-based applicators utilized with the number of ground-based applicators being larger than the number of aerial applicators but the numbers of acres treated is probably greater with the aerial applications. 5) Analysis of as-applied maps to insure that material was applied as desired.

The final area where precision farming technology is developing in California is the use of cotton yield monitors. This technology is based on the attenuation of light by seedcotton as it travels through the shoots on the cotton harvesters. The absolute accuracy of the yield estimates relies on careful calibration of the software to field measurements. Seedcotton moisture, gin turnout and variety can all have influences on accuracy. It is also recognized that relative difference in yield are also valuable and this reduces the need for careful calibration. This technology has been the slowest to be adopted as it only tells in hindsight how the cotton yielded. It is being recognized as method of accurately determining patterns of variability within a field, and since most of these pattern are soil based, and the soil characteristics do not change significantly from year-to-year, the yield maps are excellent indicators of in-field variability.

Most precision farming expertise is currently in the hands of a limited number of independent and corporate consultants with a few farmers utilizing the technology completely on their own. Farmers are evaluating the benefits

of VR technology and some applications, such as PGR use, are well accepted. It is generally felt, even with some of the web-based software programs that have made VR technology easier to implement, that the learning curve is steep and the benefits are difficult to quantify. Farmers are aware that making product use recommendations are more time consuming and pest control advisors and consulting agronomists will need to be compensated for the additional time but the structure has yet to be worked out.

Most California cotton farmers have heard of precision farming technology and a majority have adopted precision guidance at some level. It is estimated that 20% use or have used VR technology. Less than 5% of farmers have yield monitors but this number will increase as the use of the monitors becomes easier and the integration of the results with VR information needs is more seamless.