

Introduction to Prescription Maps for Variable-rate Application

Variable-rate application (VRA) of fertilizer allows a prescribed rate of fertilizer or lime to be applied at each location within the field, based on soil test results. Generally, agribusinesses charge a higher fee for VRA of fertilizer or lime over traditional uniform application (to recoup the costs of their equipment). Research has suggested VRA of lime has been economically justified, but with recent increases in fertilizer costs, P and K may also be viable candidates for VRA. Depending on the variability within each field, a decision will need to be made as to whether variable rate or a uniform rate is the economically optimum choice.

This publication addresses the process of connecting the geographic information to the soil test results and the process of generating a prescription map. For more information on soil sampling, refer to *Precision Soil Sampling for Alabama Farms* (Timely Information Sheet, January 2007) and additional information on VRT, *Overview of Variable-Rate Technology* (Timely Information Sheet, January 2009).

Equipment

Variable-rate application of fertilizer and lime requires several steps. Often, the last step in the process is the step that should be addressed first: How is the fertilizer going to be applied? Once the application equipment has been identified, the process that takes you from soil sampling to the actual fertilizer application can be completed.

There are numerous ways to set up fertilizer equipment to vary the application rate of products. There are four basic components of variable-rate technology: computer and/or controller (can be integrated into one product); Differential GPS (DGPS—receiving a correction signal such as WAAS, StarFire 1 or 2, or OmniStar); hydraulic valve and motor; and metering device.

Many of these devices are multipurpose; for example, both the Ag Leader 3000Pro and the John Deere 2600 display may be used as part of a yield monitoring system in addition to serving as a computer for a variable-rate application. The following are examples of typical setups:

- John Deere Greenstar 2600 display with a Raven 440/660 controller and appropriate valve on a spreader buggy
- Raven Viper with appropriate valve/hydraulics on a spreader buggy
- iPAQ with FarmWorks Site Mate and Rawson Accu-Rate on a sidedress nitrogen applicator

Note that all setups would require a DGPS receiver.

Once the appropriate equipment to apply fertilizer or lime has been selected, you will know which format the prescription map should be written in and the type of data card needed.

Prescription Map

A prescription map tells the controller how much product to apply based on the location of the equipment in the field. One must know what computer and/or controller will be used to create a prescription map in the appropriate format. For example, a prescription map written for an Ag Leader PF3000 Pro requires the ***.tgt** format, and a Raven Viper can read the ***.shp** format. Most agricultural GIS packages can create prescription maps in multiple formats. Other factors to note are equipment limitations (minimum and maximum rates) and application width. Some controllers, such as John Deere controllers, require that a boundary file of the field be included in addition to the prescription map. The prescription is written to a compact flash (CF), PCMCIA card (depending on equipment selections), or other type of data card, which is then uploaded to the computer within the machine cab.

For prescriptions to be based on zones, the first step is to delineate the zones. This step can be completed using several methods. Visit www.aces.edu/waterquality/gis_data/index.php for free Alabama GIS data that can be used for zone delineation. Data available on this Web site include Digital Ortho Quarter Quads (DOQQ), a form of aerial imagery that can be used in the creation of boundaries and zones, and Soils Data, which includes county soil surveys in both spatial and tabular form. The spatial form can be imported into the GIS packages and clipped to field boundaries. Farmer knowledge and yield data are also excellent tools for creating management zones.

When zone maps are created, each zone within the field is automatically assigned a number (see figure 1). The soil sample is usually named in the following format:

Farm Name-Field Name-Zone Name

When soil analysis data is returned from the lab, the same naming convention is used, which allows the GIS to match the data to the appropriate zone (figure 1). Zones can be used for numerous applications, such as variable rate fertilizer (broadcast and sidedress), plant growth regulators, cotton defoliant, and seeding rates.

For grid sampling, the boundary is typically divided into 2 ½ acre grids, using a desktop GIS or a PDA (hand-held computer) loaded with an agricultural GIS software package. Grids are usually arbitrary and do not account for any past or current knowledge of the field. Each grid is assigned a number, sometimes referred to as Feature ID.

Feature ID is comparable to the “zone” column in figure 1; this is how the GIS package links the soil test results back to the geographical location.

Agricultural GIS Packages

Agricultural GIS (Geographic Information System) software packages are used to create prescription maps (table 1). They are also used to generate zones or grids for soil sampling. When considering the purchase of a GIS, keep in mind the equipment the GIS will need to be compatible with and the type of record keeping needs you have. Many of the programs provide in-depth analysis features that will allow you to analyze multiple years of data, average yields across crops, import and clip soil type data to field boundaries, along with other analysis functions. If you plan to import soil test results, find out what type of electronic formats your soil test lab will provide and how that information will be returned to you (e.g., e-mail, downloaded from the Web site).

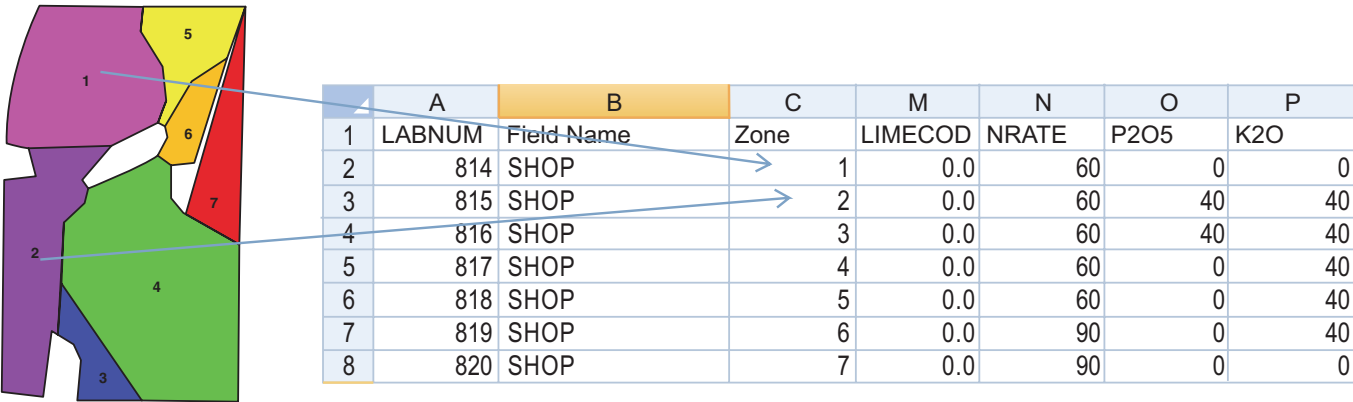
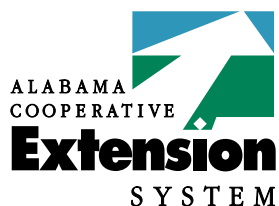


Figure 1. Example of a prescription map with seven defined zones. The spreadsheet on the right contains the soil test data with arrows indicating how zones are linked to the soil test results.

Table 1. Desktop GIS Packages Tailored for Agriculture

Company	Desktop Product	PDA Companion Program	Web site	Phone Number
EasiSuite	MapShots	Pocket Crops (record keeping only)	www.mapshots.com	(678) 513-6093
SST Development Group, Inc.	SSToolbox® SSToolbox Lite® SSToolkit®	SST Stratus	www.sstsoftware.com	(888) 377-5334
Ag Leader	SMS Basic SMS Advanced	SMS Mobile	sms.agleader.com	(515) 232-5363
Farm Works	Farm Site Site Pro	FarmSiteMate	www.farmworks.com	(800) 225-2848
John Deere	Apex	NA	stellarsupport.deere.com/en_US/	(888) GRN-STAR



ANR-1362

Shannon Huber Norwood, *County Extension Agent*, **Amy Winstead**, *Regional Extension Agent*, and **John Fulton**, *Assistant Professor and Extension Specialist*, all with Auburn University

Trade and brand names used in this publication are given for information purposes only. No guarantee, endorsement, or discrimination among comparable products is intended or implied by the Alabama Cooperative Extension System.

For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

Published by the Alabama Cooperative Extension System (Alabama A&M University and Auburn University), an equal opportunity educator and employer.

New Web Only Sept 2009, ANR-1362

© 2009 by the Alabama Cooperative Extension System.

www.aces.edu