Using R to Reduce Pesticide Usage in the Horticultural Industry

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Most growers of high value horticultural produce scout their fields regularly for pests and diseases, but have very limited capacity to make good use of the data. Scarab provides growers' scouts with PocketPCs and GPSs. Each pest and disease observation is geo-referenced and given a timestamp. Data is submitted to a server via GSM. Using R and Latex, we analyse the data to produce reports with maps of every pest and disease in each greenhouse, enabling timely and accurate intervention. Growers can limit their spraying to the affected spots only, or release just the right number of natural enemies in the right place. This enables a shift from interventions based on economic thresholds to immediate intervention whenever a problem is detected, keeping problems small and costs low.

R has a broad range of useful features that have made this possible. While the interactive interface is useful for development, all routine analyses are run as batch files. GPS is not accurate enough on its own, so we use robust linear models to adjust coordinates and remove outliers. Interpolation provides estimates of pest and disease levels between observation points. R's graphics capabilities encourage the use of highly informative graphics. R's database connectivity provides good options for fetching data directly from databases and storing results. Sweave provides fairly flexible automated reporting with Latex.

We are moving the system to the new R spatial foundation classes to make it easier to take advantage of R's spatial capabilities, particularly the geostatistics and graphical capabilities. Other plans include improved analysis of scout performance; analysis of the results of pest and disease control interventions; and use of the new sudoku package to plan scout rotations.