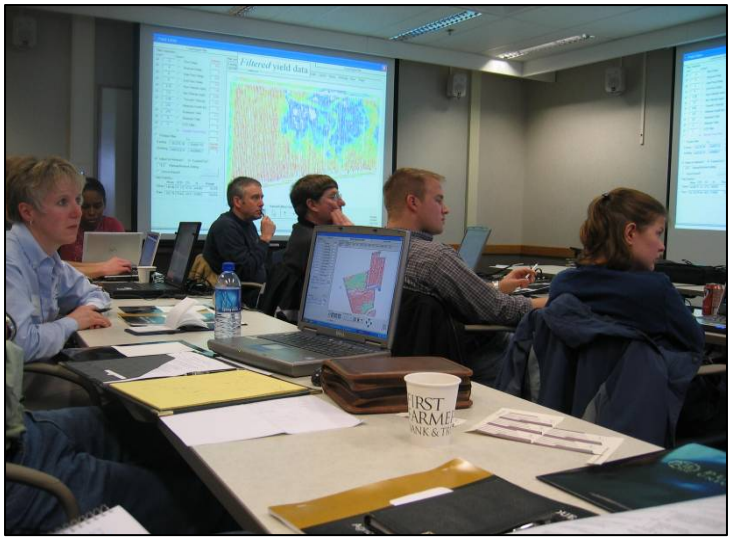
Farmers and Consultants Receive Training in Spatial Analysis of Yield Monitor Data

Adela Nistor and Raymond J.G.M. Florax

In response to suggestions from farmers and agribusiness, Purdue University offered a one-day workshop on spatial analysis of yield monitor data on March 1, 2007. There were 19 participants that included farmers from Indiana, Illinois, and Ontario, and representatives from agricultural input suppliers, farm cooperatives, and private consultants. The workshop was led by Terry Griffin, former Purdue University graduate student and currently Assistant Professor of Agricultural Economics and Agribusiness with the University of Arkansas Cooperative Extension Service. The discussions focused on strategies to design and implement on-farm experiments, collect data and harvest experiments, yield monitor calibration, precision agriculture, and spatial statistical analysis software.

"Spatial analysis techniques recently adapted from other disciplines allow farmers and consultants to make better decisions based on their field-scale on-farm trial data collected with yield monitors than previously possible," Griffin said. "This workshop serves in part as a pilot program to pass the techniques developed from recent research over to the end users along with some basic statistical training." The agenda was largely set by the farmer-collaborators from Griffin's (2006) Ph.D. research funded by a USDA-SARE Graduate Student Research Grant, and was in part a follow-up to the November 14, 2005 Yield Monitor Data Analysis Workshop (Erickson, 2005) affiliated with the Top Farmer Crop Workshop.

Several participating farmers stated they needed additional information on removing erroneously measured yield monitor data observations, hands-on experience in performing and interpreting (spatial) statistical analysis, and information about how to tie in spatial statistical results with economic analysis of alternative farm management scenarios. Yield data filtering is a first necessary step to ensure yield maps and spatial statistical analyses are not distorted by erroneously measured data points (e.g., at the edge of the field). Yield Editor Software from USDA-ARS (Drummond, 2006) was used to filter raw yield monitor data, and GeoDa (Anselin, 2003) was used to visualize and statistically analyze the data. Both of these programs are available for free downloading from the Internet.

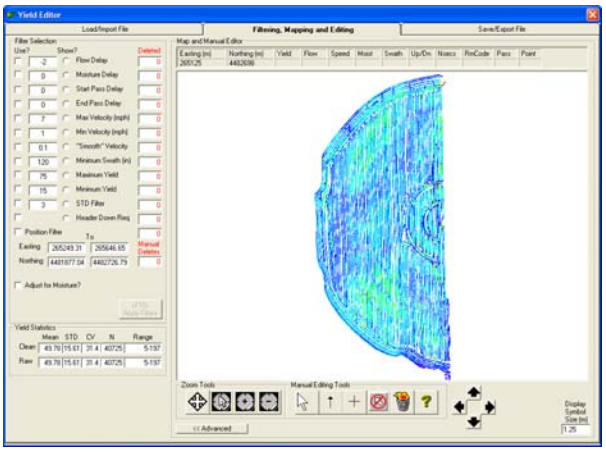


Participants brought their own notebook computers and performed data analyses during the workshop.

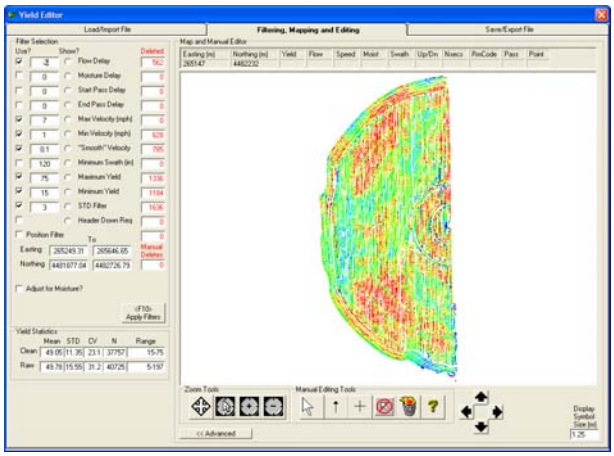
"We use yield monitor data to make better management decisions, but especially to help us make them more quickly," said Dan Duval, a workshop participant who farms near Manito, Illinois. Duval firmly

believes in the initial data filtering. "It makes good common sense—we know in some areas the data is not accurate for a host of reasons." On the Duval farm, yield monitor data has been used to test seeding rates, fertilizer rates, and fungicides, and he has adjusted his management accordingly.

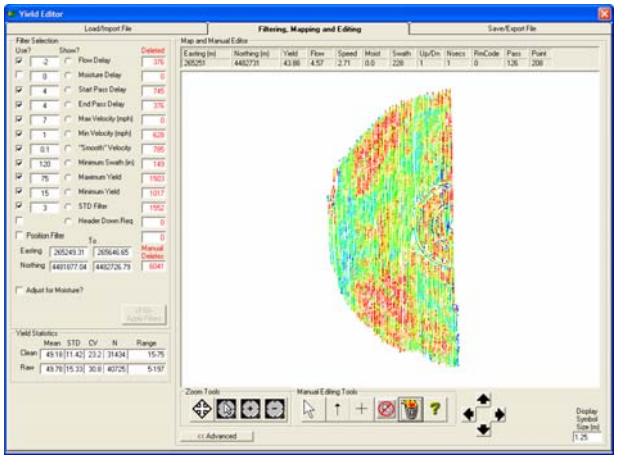
Universal access to software should make it feasible for the farmer to follow up on the collection of yield monitor data with easy-to-do spatial statistical analysis in order to make informed decisions on future management scenarios. However, this brings up a series of pertinent issues. Some of those issues are practical: How does one prepare raw yield data for effective use in spatial statistical software? What is needed to turn spatial statistical results into effective profitability forecasts of different management scenarios? Other issues are more general and have to do with the organizational setup needed to create a management information system based on effective use of yield monitor data. Are farmers expected to do their own spatial statistical analyses? If so, how is basic training in using spatial statistical software provided for? If instead, outsourcing is the preferred strategy, who will then provide the spatial statistical analysis service?



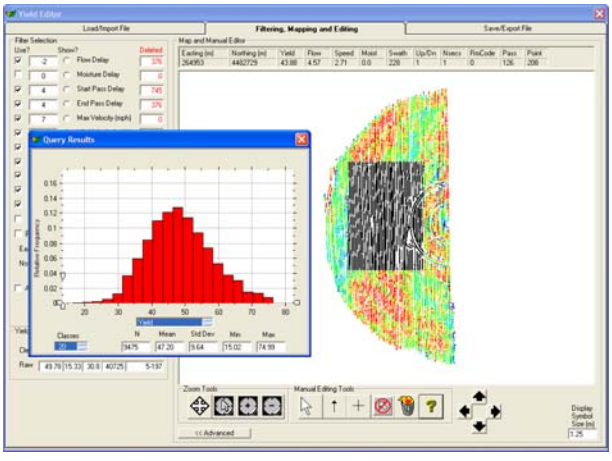
No parameter settings; raw yield monitor data



Some parameters have been set



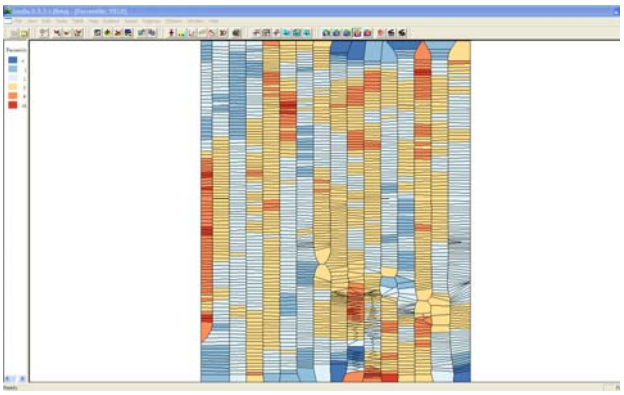
Final yield monitor data after filtering



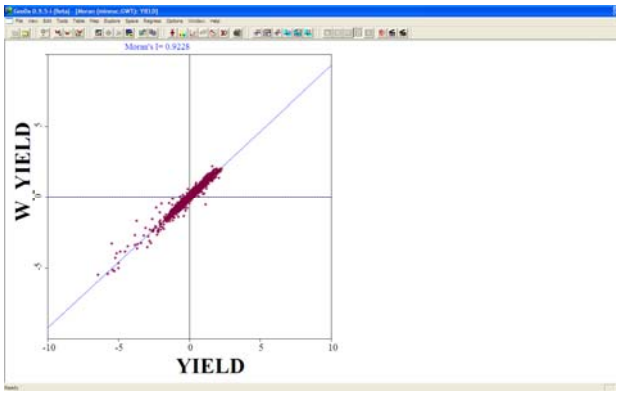
Yield histogram and query area

USDA-ARS Yield Editor Software Screen Captures

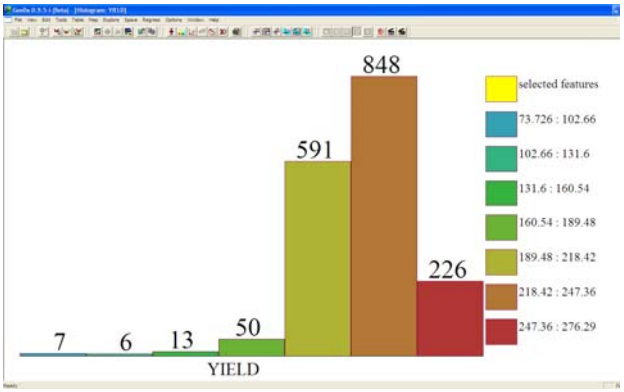
Participants brought to light practical considerations of yield data filtering. One agricultural consultant voiced the fear that yield data filtering may reduce the measured area from which the data were collected, thus reducing the perceived field size, which may cause concern with their clientele. One farmer-participant suggested maintaining multiple versions of yield data for printing maps, measuring total production, and spatial analysis of on-farm trial data. Griffin showed how the use of GeoDa aids in producing yield maps and identifying parts of a field where high or low yields are clustered. The software was also used to provide examples of how spatial statistical analysis of field-scale on-farm trials can identify whether or not a specific trial generates higher yields, and eventually in what parts of the field.



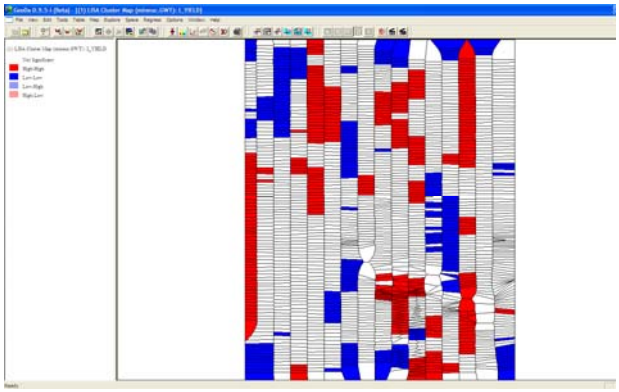
Choropleth map of yield data



Moran's I scatterplot for yield



Histogram of yield data



Map of local spatial correlation

GeoDa Software Screen Captures

There was a strong consensus that yield monitor spatial analysis is essential for the farm business, and that the future priority should be on the analysis and interpretation of statistical results to obtain answers that can be used in making better farm management decisions. The anticipated increase in the usage of yield monitor data will mean that at some point, farmers will have access to entire 'histories' of yield data on their fields. In the near future we will arrive at a junction where spatial tools will have to be able to come up with farm management recommendations that use the entire history of yield data available to the farmer—spatial tools will effectively have to have a memory. Future cooperation between spatial data analysis experts

at Purdue and specialists of Purdue's Site-Specific Management Center will be important to further develop space-time tools.

A discussion about the future of spatial yield monitor data analysis.

Many farmers and consultants have already made use of yield maps, while some farmers have challenged themselves to make the most of the potential benefit from quantitative and statistical uses. Advanced uses of yield monitor data led to the discussion on the future of spatial analysis services intended to assist farmers with making better management decisions. Future development and usage of space-time tools obviously makes the question of who provides for spatial analysis services even more pressing. In his research, Griffin (2006) discussed who would offer spatial analysis if and when the service was commonly demanded. He reported that farmer-collaborators suggested that some innovative farmers could perform their own spatial analysis and potentially do the same for other farmers. However, it is expected that private consultants or the university extension system would provide the majority of services. Workshop participants unanimously agreed that spatial analysis of yield monitor data is necessary for high quality analysis, with most farmers suggesting that private consultants or university extension programs should offer spatial analysis services.

References

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