



Using JMP® Genomics, USDA researchers are learning how to protect corn and other crops from harmful pathogens.



CHALLENGE

USDA researchers need an efficient way for molecular biologists and statisticians to work together on research projects ranging from crop yields to environmental concerns to human nutrition.

SOLUTION

JMP Genomics from SAS offers both powerful data analysis on huge data sets as well as point-and-click data visualization capabilities to show results in a format that is easy for non-statisticians to use and understand.

RESULTS

USDA is using JMP Genomics, new life sciences software from SAS, in research stations over a 25-state area.

MORE INFORMATION

Learn more about the USDA's Agricultural Research Service:
www.ars.usda.gov

Discover more about JMP Genomics:
www.jmp.com/genomics

Learn more about SAS: www.sas.com

Microarrays help USDA keep crops safe

JMP® Genomics links researchers in 25 states

Debbie Boykin works in a world of numbers. As area statistician for the Agricultural Research Service of the US Department of Agriculture (USDA), she helps USDA researchers design experiments, analyze the results and translate those results into a statistically relevant format.

Based in Stoneville, MS, two hours northwest of Jackson, Boykin works with more than 250 scientists in five southern states who study everything from crop yields to honeybee behavior to stream sedimentation and the nutritional values of specific foods. At one time, three statisticians served her region, which comprises Kentucky, Tennessee, Alabama, Mississippi and Louisiana. Now, she is the team's sole statistician. The molecular biologists in her group "have got to be able to do a lot of the work on their own," she explains.

JMP® Genomics software from SAS is designed to make it easy for researchers and statisticians to work together efficiently, says JMP Genomics Product Manager Shannon Conners. "By providing a menu-driven JMP interface to SAS, JMP Genomics can offer advanced

analytics, interactive graphics and design of experiment tools that appeal both to biostatisticians and the molecular biologists they support," Conners says.

USDA has long relied on SAS® software for its powerful data analysis capabilities. SAS released JMP Genomics, its desktop visualization software for genomics, early in 2006. In September, USDA purchased 30 licenses for the new genomics software, which its researchers are using in a 25-state area from Maine to Minnesota to Mississippi.

JMP Genomics incorporates industry-leading SAS analytics tailored for heavy-duty processing of large microarray, proteomics and genetics data sets. Its menu-driven system makes it easy for scientists without SAS programming experience to access powerful SAS processes. In addition, the flexible framework of the JMP Genomics platform allows statisticians to run their own customized SAS programs from JMP menus to accomplish specialized tasks. Researchers can then take advantage of advanced JMP data visualization and tools specifically required for the microarray analysis that lies at the heart of their research.

**STATISTICAL
DISCOVERY.™
FROM SAS.**

For example, USDA scientists are studying the interactions of corn lines with the fungal pathogen *Aspergillus flavus*. Corn lines infected with *A. flavus* can produce grain that is contaminated with aflatoxin, a potent and poisonous compound that must be controlled to assure that the grain and its byproducts are safe for human and animal consumption. The researchers are studying this problem at two levels: to understand why certain corn lines are more resistant to *A. flavus* infection and to determine how *A. flavus* interacts with the plant. Using microarray analysis, biologists can identify genes related to these questions by comparing the expression of those genes in diseased and normal cells. The goal is better breeding strategies for incorporating resistance into more corn varieties and better strategies for controlling the pathogen.

“If they can find specific genes and they know their location on the DNA, then the plant breeders and molecular biologists can come in and take the resistant varieties and get those particular genes into the high-production varieties,” Boykin explains. “Instead

of trying to grow individual varieties to maturity, which takes years, you can check their DNA and see which plants have the good genes and only work with them—and screen out the ones that don’t have the good genes.”

In the past, Boykin tried to integrate four or five different types of software. However, the technology lacked adequate analysis of variance tools and proved unsuitable for the huge data sets common to USDA research projects, she explains. “Having to bridge from one to the other, it just didn’t flow smoothly and it required a lot of time.”

JMP Genomics is designed to simplify work flow, Conners notes. “It offers the processing power to deal with extremely large data sets common to genomics research as well as graphical tools that make it easy to see patterns in data,” she explains.

As the science of genomics advances, discoveries at USDA and in the broader research community will come with increasing speed. USDA scientists in Boykin’s area will be ready. After all, in science, seeing is believing.

“Instead of trying to grow individual varieties to maturity, which takes years, you can check their DNA and see which plants have the good genes and only work with them—and screen out the ones that don’t have the good genes.”

Debbie Boykin
USDA Agricultural Research Service



USDA, which has long relied on SAS® analytics, recently added JMP® Genomics.

