

Teaming With Experts To Improve Peanuts

Sometimes a good idea seems to whisper in the minds of innovators, waiting to be discovered. As a college student working summers on his father's farm, Marshall Lamb could see that the family peanut crop records could work harder for them—perhaps even enhance profits. In his agricultural economics studies, Lamb saw how computers could organize farm data to reveal the patterns of seemingly random numbers.

Eventually, Lamb met the Agricultural Research Service scientist who pioneered this new kind of farming tool, and together with other researchers they have expanded on this computer-based technology, taking it to new heights.

The technology has a name: expert systems—which are decision-support systems. They are a class of software used by Fortune 500 companies and others to pool large amounts of information from human experts and organize it into “if-then” formulas for decisionmaking. New programs on peanut production make it like having a team of plant physiologists and agronomic experts assembled on your farm for a consultation.

The challenge of creating a decision-support system for peanut farmers is turning records and information into a step-by-step system that the computer can understand. It's a job that mechanical engineer James I. Davidson, who is with ARS' National Peanut Research Laboratory in Dawson, Georgia, knows how to do. He developed EXNUT, a program that relies on data from the field to improve irrigation. Growers make measurements of soil temperature, rainfall, and pesticide use and feed this data into the program.

Two years ago, EXNUT shocked veteran farmers who tested it, by sometimes beating them on watering predictions. When half of test fields were watered according to EXNUT—

sometimes sooner than farmers thought necessary—those plants thrived while the remainder wilted.

“It costs about \$4 an acre to use EXNUT, and growers have seen it consistently raise yields by 200 to 300 pounds per acre,” says Davidson. “We've also seen an average crop value increase of \$5 to \$10 per ton, based on grade improvements.”

Crop consultant Danny Bennett, of Bennett AgriConsulting in Cochran,

with ARS and Auburn University in Alabama, his alma mater. His contribution to this line of peanut software is MNUT. It helps farmers make sound marketing decisions, also based on records they usually keep.

EXNUT and MNUT require records on pests, minimum and maximum soil temperature, and rainfall. After feeding the data into the computer, the user tells it to run an analysis. All a grower has to do then is

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Left to right: Systems program analyst Jim Powell; farmer J. W. Law, Sr.; Terrell County (Georgia) extension agent Forrest Connelly; and mechanical engineer James Davidson discuss soil temperature, rainfall, pesticide use, and other data being gathered from Law's peanut field.

Georgia, has 14 years of experience and knows computers. He tested EXNUT with several Georgia peanut growers.

“I liked EXNUT because each time a new producer got involved, his knowledge and conditions, along with industry treatments, and results were added to the database,” says Bennett. “The potential for this program is just phenomenal.”

EXNUT was just the beginning. Now Lamb is working cooperatively

read the recommendations that appear on screen. And to see how those conclusions were made, the program can be made to go back a few steps.

Mac Harrington has been raising peanuts for 28 years, since he was 14. He and his brother Willton grow 625 acres of cotton and 95 acres of peanuts in Eastman, Georgia. They decided to test MNUT as part of a trial held by the Georgia Peanut Commission.

“The way I look at it, MNUT helps by giving us more market knowledge,” says Mac Harrington. “It projects how our crops will do.”

“Mac was one of many farmers across the state helping validate MNUT,” says Marcus Evans, who is with the commission. “The good thing about these two programs is they’re self-improving. We were able to factor in new treatments such as new pesticides and fertilizers that have a direct impact on yields. The program grows with the industry.”

MNUT gives farmers an indication of their crop’s market value, based on environmental conditions. It then compares the farmer’s output with others in his immediate area, or the state; if desired, it could give a national perspective. MNUT can help growers and shellers predict the market, possibly months before harvest.

“MNUT can tell the mill if a particular area’s crop has been hit hard by weather damage,” says Chuck Hancock, who is with Birdsong Peanuts in Blakely, Georgia. “That way, we can set quality control instruments on high to get more poor-quality peanuts out of the system.”

That kind of prediction is why MNUT is also good news for consumers. It can help protect them from aflatoxin, a potentially serious contaminant of peanuts that is produced by the fungus *Aspergillus flavus*. Federal law prohibits selling peanuts for



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Mechanical engineer James Davidson examines a peanut plant near Dawson, Georgia. Data gathered from field measurements are used in developing peanut management programs.

food unless they have less than 20 parts per billion aflatoxin. One part per billion is equal to a drop of water in 22,000 gallons.

For many peanut farmers, some parts of their farm are irrigated, some not. Rainwater is always best for the crop, and irrigation is costly. But the fungus loves hot, dry weather. If a reading from MNUT predicts a high chance of aflatoxin contamination, growers won’t mix their dryland and irrigated peanuts, since irrigation reduces the chance of contamination.

“It’s like if you had an apple orchard and got blight on one quarter of your trees,” says Harrington. “You wouldn’t mix those apples in a barrel with the good ones from the rest of your high-quality crop.”

Better irrigation and marketing are only part of the story. ARS agricul-

tural engineer Jay Williams, who also has a farm background, and Jim Powell, a University of Georgia systems programmer analyst who works cooperatively with ARS, are developing a new member of this peanut software family called HARVPRO. This program will help extension agents and farmers make better harvesting decisions.

It works like this: Growers take peanut samples from their fields to an extension agent who blasts off the outer layers of the peanuts’ hulls to check the ripeness of the middle hull. The darker the middle hull, the greater the peanut’s maturity. The extension agent would put this maturity profile and other data into the program and get recommendations on an optimal harvest time.

“One advantage of HARVPRO is, if a grower has several fields to harvest, he can use the program to pinpoint fields that are ready now and the ones that need more time,” says Williams. “It will be a good scheduling tool.”

All the peanut-production programs will run on computers with MS Windows. The largest, PNTPLAN, is currently implemented as a spreadsheet, but is being converted into a stand-alone program. PNTPLAN is a comprehensive package able to help with farm planning, crop rotation, and a host of other management decisions.—By **Jill Lee**, ARS.

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Peanut Management Programs

EXNUT, MNUT, DRYNUT, HARVPRO, and PNTPLAN will soon be available commercially. Five other related decision-support systems are under development. The goal is to integrate all of them into a peanut management program.

PROGRAM	USE	USER
TILNUT	tillage, land preparation	farmer
PECMAN	curing	mill
STORNUT	storage	mill
SHELNUT	shelling, plant management	mill
VNUT	variety evaluation	farmer, mill