

# SCIENCE & EDUCATION Impact

Benefits from USDA/Land-Grant Partnership

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## High-Tech Growing

Old MacDonald had a ... global positioning system.

*New technologies are bringing sweeping changes to U.S. agriculture, and the Land-Grant/USDA partnership is at the forefront of the growing revolution. Geographic information systems, digital decision-making tools and other high-tech breakthroughs are improving production efficiency and protecting the environment. For example, satellite remote sensing allows producers to reduce the use of fertilizer, pesticides and water without compromising crop health and yields. And the Internet has forever altered farming, providing growers with everything from precise local weather data to online auctions for used tractors.*

### Payoff

- **Weather wise.** Purdue's MELCAST system allows melon growers to tailor pesticide sprays to weather conditions. When dry weather lowers disease problems, the number of sprays can be reduced, saving growers about \$275,000 annually. Fewer sprays also reduce worker exposure to chemicals and protect the environment. A similar weather-based disease forecasting system developed by **Delaware** and **Maryland** allows watermelon growers to reduce fungicide applications, saving \$15 to \$30 per acre. A **Minnesota** weather network provides hourly data on conditions favorable to the development of late blight disease, helping potato growers apply fungicides with more accurate timing. The timely forecasts save growers in Minnesota and North Dakota more than \$3 million per year. **North Carolina State's** computerized disease advisory program warns peanut growers about leafspot, reducing fungicide costs by as much as \$2 million per year. **Ohio State's** TOMCAST and BLIGHTCAST disease forecasting systems for tomatoes and other crops also reduce production costs and protect the environment. **Iowa State's** severe weather warning system, which collects data from statewide monitoring stations, gives farmers information to determine climate and soil conditions for crop selection and management. **Arizona's** network of 23 automated weather stations provides information from agricultural and urban areas. Data from the Arizona Meteorological Network (AZMET) helps growers make important management decisions on planting dates, pest control, irrigation and harvesting. Information is available on the Web. AZMET also generates a daily lawn watering guide published in Phoenix newspapers.

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- **Going the distance.** Rapid diagnosis of insects, diseases, weeds and other pests can mean the difference between profit and loss, but sending plants to a central diagnostic facility may take days or weeks. To quickly diagnose pest and disease problems – often within hours – **Auburn, Clemson, Florida, Georgia, Hawaii, Illinois, Kansas State, Louisiana State, North Carolina State, Texas A&M** and other universities have developed distance diagnostic imaging systems that transmit high resolution photos over the Internet to university experts. In **Georgia**, for example, more than 1,200 samples were analyzed in 2002, saving farmers and city dwellers time and money.
- **Precision spraying.** A high-tech crop sprayer developed by **Oklahoma State** researchers senses what a plant needs and applies the proper amount of fertilizer or herbicide as the tractor moves through the field. Precise application allows growers to improve crop consistency, saves money, and protects people and the environment. Tests on wheat indicate nitrogen use efficiency improves 20 percent using the sprayer. It can be used on other grain crops, and is being adapted for golf courses and other uses. **Washington State** researchers developed precision “smart spraying” nozzles that apply herbicide only when an invasive weed is detected. This technology is being used to eradicate cordgrass in wildlife refuges and marine communities.
- **Information please.** Global positioning systems, geographic information systems and remote sensing are helping map and manage a vast array of crops and natural resources nationwide, giving decision-makers clear, detailed information. New low-cost field sensors developed at **Kentucky, Ohio State** and **Tennessee** help farmers maximize economic return and environmental sustainability. **Alaska, Colorado State, Minnesota, New Hampshire** and **Tennessee** use GIS to manage and protect thousands of acres of forest land from pests and fire. And **Connecticut’s** Nonpoint Education for Municipal Officials (NEMO) project, which advocates GIS mapping technology, educates local officials on the links between land use and water quality. NEMO is a national model being used in **Alabama, Arizona, California, Delaware, Georgia, Idaho, Indiana, Kansas, Louisiana, Maine, Maryland,**

**Massachusetts, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Washington** and the **Virgin Islands**.

- **Say cheese.** Separating the curd from the whey is critical for cheesemakers. If the timing isn’t right, quality and quantity suffer. A new technology developed in **Kentucky** electronically senses when the two should be separated, taking the guesswork out of the process. A light meter measures reflections from the surface of a cheese vat, indicating exactly when the curds and whey should be separated. The tool already has saved one manufacturer \$150,000 per year and could be widely used by industry.
- **Stronger seeds.** To help develop seed varieties with improved germination and yield, scientists at **Ohio State** developed a computerized image scanning system that analyzes all parts of the seed and measures seed vigor. The scanning system, which costs about \$100, will help farmers avoid purchasing seed with low germination rates. With modifications to the required software, all types of seedlings can be measured.



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