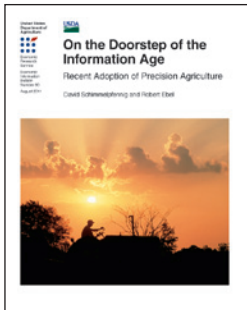


ERS *Report Summary*

Economic Research Service

August 2011

U.S. Department of Agriculture



On the Doorstep of the Information Age: Recent Adoption of Precision Agriculture

David Schimmelpfennig and Robert Ebel

This is a summary
of an ERS report.

Find the full report at
[www.ers.usda.gov/
publications/eib80](http://www.ers.usda.gov/publications/eib80)

What Is the Issue?

Efficient input use in agriculture is increasingly a priority of producers, the public, and policy-makers. One way to increase efficiency in agriculture is through the adoption of precision technologies, which use information gathered during field operations, from planting to harvest, to calibrate the application of inputs and economize on fuel use. While it holds promise for improving the efficiency of input use, adoption of precision agriculture—encompassing a suite of farm-level information technologies to better target the application of inputs and practices—has not been as rapid as previously envisioned. This report examines the prevalence and effectiveness of these technologies based on survey response data collected over the last 10 years.

What Did the Study Find?

Adoption of the main precision information technologies—yield monitors, variable-rate applicators, and GPS maps—has been mixed among U.S. farmers. Recent data from the Agricultural Resource Management Survey (ARMS) show that use of yield monitors, often a first step in using precision technology for grain crop producers, has grown most rapidly, and was used on 40-45 percent of corn and soybean acres in 2005-06. However, farmers have mostly chosen not to complement this yield information with the use of detailed GPS maps or variable-rate input applicators that capitalize on the detailed yield information. Some of the possible factors behind this adoption lag include farm operator education, technical sophistication, and farm management acumen. The report is not testing the impacts of precision agriculture on other farm practices like conservation tillage, but some associations between the various factors are noted. Among the report's findings:

- Corn and soybean yields were significantly higher for yield monitor adopters than for non-adopters nationally. This yield differential for corn grew from 2001 to 2005. Yield monitors are being adopted more quickly by farmers who practice conservation tillage.
- Corn and soybean farmers using yield monitors had lower per-acre fuel expenses. Average per-acre fertilizer expenses were slightly higher for corn farmers that adopted yield monitors, but were lower for soybean farmers.

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

www.ers.usda.gov

- In the Corn Belt, GPS maps and variable-rate technologies were used on 24 and 16 percent respectively of corn in 2005, and 17 and 12 percent of soybean acres in 2006, but nationally the adoption rates for variable-rate technologies were only 12 percent for corn and 8 percent for soybeans.
- Average fuel expenses were lower, per acre, for farmers using variable-rate technologies for corn and soybean fertilizer application, as were soybean fuel expenses for guidance systems adopters.
- Adopters of GPS mapping and variable-rate fertilizer equipment had higher yields for both corn and soybeans.
- Adoption of guidance systems, which notify farm equipment operators as to their exact field position, is showing a strong upward trend, with 35 percent of wheat producers using it by 2009.

How Was the Study Conducted?

The Agricultural Resource Management Survey (ARMS) provides data on technology choices, input costs, and yields for a nationally representative sample of U.S. farms growing selected commodities. Phase II of the ARMS is conducted on a rotating set of commodities, and this study relies primarily on the 2001 and 2005 surveys of corn, 2002 and 2006 surveys of soybeans, and 2004 and 2009 surveys of winter wheat, with secondary emphasis on other crops and years. Descriptive statistics are presented at the national level and by production region as defined by USDA's National Agricultural Statistics Service. Simple statistical difference-of-means tests are conducted to examine differences in input costs and yields between precision technology adopters and non-adopters.