Managing Risks in Adopting Agricultural Methods & Practices

Presenters

Dr. David Schimmelpfennig, ERS/USDA

&

Dr. Tara Wade, UF/SWFREC

University of Florida / IFAS Southwest Florida Research & Education Center (SWFREC)

UF|IFAS UNIVERSITY of FLORIDA

USDA Disclaimer

This work did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors have no financial interests in the application of this research. This research was supported by the intramural research program of the U.S. Department of Agriculture, Economic Research Service. The Findings and Conclusions in This Preliminary Article Have Not Been Formally Disseminated by the U. S. Department of Agriculture and Should Not Be Construed to Represent Any Agency Determination or Policy.

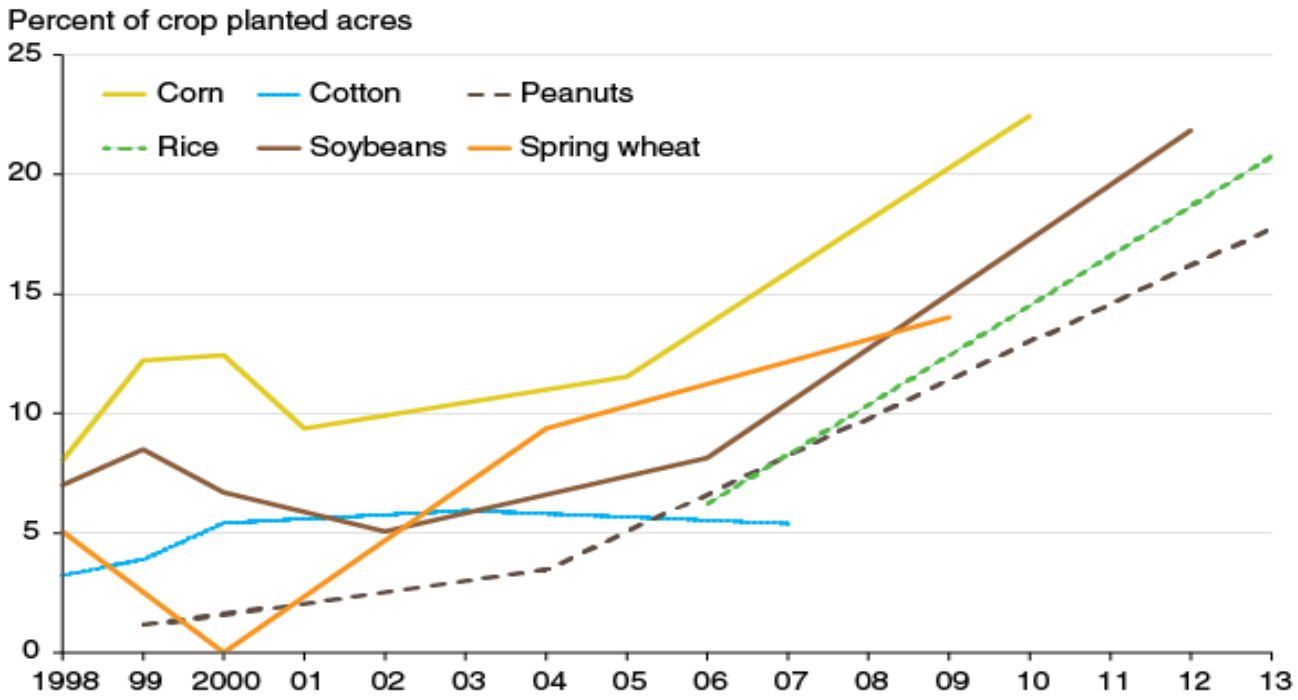
Introductions

- David Schimmelpfennig is a senior economist and program leader of precision agriculture research at USDA's Economic Research Service. His work uses USDA's premier crop production survey to monitor the development of new technologies; and the drivers and impacts of adoption.

- **Tara Wade** is an agricultural resource economist in the Food and Resource Economics Department and the Southwest Florida Research and Education Center. She specializes in determining the economic factors that affect choices to adopt environmentally benign agricultural practices. Dr. Wade's extension and research programs focus on helping farmers to reach their economic and conservation goals in efficient ways.

Adoption Trends in Program Crops

VRT use has risen to about a fifth of planted acres of corn, peanuts, soybeans, and rice



USDA, Economic Research Service using data from USDA's Agricultural Resource Management Survey (ARMS) Phase II.

Technology Adoption Changes the Financial Risk Characteristics of a Farm Operation

- Implementation of technology goes beyond the cost of a new piece of equipment. Higher costs can mean more profit risk.

- We can use these budgets to help make decisions regarding the adoption of new technologies.

- Budgets are one tool you can use to help determine if this change is right for your operation.

Technology Adoption Changes the Financial Risk Characteristics of a Farm Operation

This presentation highlights tradeoffs other farmers have seen between machines and labor, input cost savings, and potential environmental benefits.

Major changes in new technology adoption are seen in:

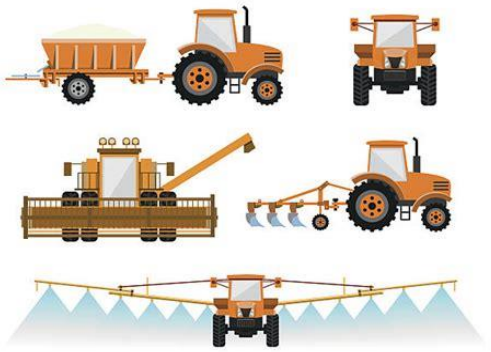
1. Fixed Cost—Machinery and Equipment
The initial cost of purchasing new equipment or upgrading current equipment.

2. Variable Costs—Labor
The cost of specialized labor or consultants that vary by time and acres.
Examples: Hired Specialty Labor
Hired Consultants & Pest Scouts
Unpaid Labor

UF|IFAS
UNIVERSITY of FLORIDA

Cost of Equipment

Fixed Costs/Ownership Costs/Cost of Modifications



- The introduction of new technologies may make equipment obsolete.
  - Newer models may do a better job of spraying, harvesting or planting, or operate more efficiently.

- It is important to distinguish new technology that can increase profits from changes that provide more convenience or comfort.
- Fixed costs for machinery and equipment include: depreciation, interest on investment, taxes, insurance, and housing

Cost of Equipment

Fixed Costs/Ownership Costs/Cost of Modifications

Economic Depreciation:

Annual depreciation of a machine and its decline in the value over time

Economic depreciation = (cost - salvage value) ÷ (expected years of life)

Interest:

Average value of investment = (cost + salvage value) ÷ 2

Interest on investment = (interest rate) x (average value of investment)

Labor Tradeoffs

- **After the initial fixed cost of a piece of precision equipment like a variable rate application technology (VRT), vegetable production technologies can be labor saving. This is often unskilled labor.**

- It is important to keep in mind that new technology may require additional spending on precision technology specialists. This type of hired labor may be needed to help fully exploit new technology.

Hired Labor

- Hired Specialty Labor: A second labor-related impact of new technology might be an increase in the use of specialists that may already be involved in the management of the operation.

- **Hired Consultants**: Consultants and scouts may need to have expanded roles to help more fully exploit farm data made available by new technologies.

- **Unpaid Labor**: Farm owners and operators may need to account for a reallocation of their own time to help implement technology – *the opportunity cost of their time with a new technology.*

TECHNICAL SERVICE USE MORE COMMON WITH PRECISION AGRICULTURE (SOYBEANS, 2012)

In-season practice adjustments	GPS Soil/Yield Mapping	Guidance System	VRT	Percent of all soybean fields using practice
Percent increases in practice adoption rates between farms with PrecAg, compared to those not having each technology				
Soil, nutrient, pest management technical services used	8%	10%	8%	11%
Cropping practices changed to reduce fertilizer use	9%	7%	17%	23%

- Covers farm visits by crop consultants, agronomists, and other technical experts.
- 2013 rice data shows similar significant percentages.

Source: USDA Economic Research Service estimates using data from the Agricultural Resource Management Survey (ARMS) Phase II.

Reduced Input Use and Profits

- With more information intensive application of inputs, farmers often see input cost savings.
- In some field crops, farmers see an average of about 5% savings in production inputs with precision technologies.
- Enhanced yields and fewer inputs often lead to higher profits. The average farm sees around 3% increases in some surveyed field crops.

NUTRIENT CONTROL MORE COMMON WITH PRECISION AGRICULTURE USE (SOYBEANS, 2012)

Nutrient control practices	GPS Soil/Yield Mapping	Guidance System	VRT	Percent of all soybean fields using practice
Percent increases in practice adoption rates between farms with PrecAg, compared to those not having each technology				
Detailed nutrient testing, or tissue tests	9%	6%	12%	18%
Cash-crops rotated	20%	11%	9%	48%

- These are tests for nutrients in addition to any that may be mapped—N, P, K, and soil organic matter.
- 2013 rice data shows similar significant percentages.

Source: USDA Economic Research Service estimates using data from the Agricultural Resource Management Survey (ARMS) Phase II.

Farm Size and Precision Adoption

- **Larger farms tend to benefit more just because they have more acres to apply the technology over.**

- This is reflected in adoption statistics, which show steadily increasing adoption rates on grain farms, particularly over 1000 acres.

- Large farms often have opportunities to diversify the risk of new technology adoption. Pilot applications of technologies on a few acres can be expanded or not.

PRECISION AGRICULTURE ADOPTION HIGHER ON LARGER CORN FARMS

Corn Cropland Acres	GPS Soil/Yield Mapping	Guidance System	VRT
	Percent of farms adopting each technology		
Less than 600 acres	12%	12%	12%
600 – 1,000 acres	34%	24%	20%
1,300 – 1,700 acres	50%	40%	23%
2,200 – 2,900 acres	49%	60%	32%
Over 3,800 acres	80%	84%	40%

- 2012 soybean data shows similar percentage increases.

Note: Cropland acres are all farm acres operated whether owned, rented, leased, or share-leased.

Source: USDA Economic Research Service estimates using data from the Agricultural Resource Management Survey (ARMS) Phase II.

New Technology and the Natural Environment

- **A final point is that closer management of farm inputs often has environmental benefits.**

- Fewer non-productive applications of pesticides and fertilizers usually means these chemicals stay out of waterways and the Gulf.

Thank you.

UF | IFAS
UNIVERSITY of FLORIDA