Managing Risks in Adopting Agricultural Methods & Practices

Citrus Field Day

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AGRICULTURE AND NATURAL RESOURCE ECONOMICS PROGRAM

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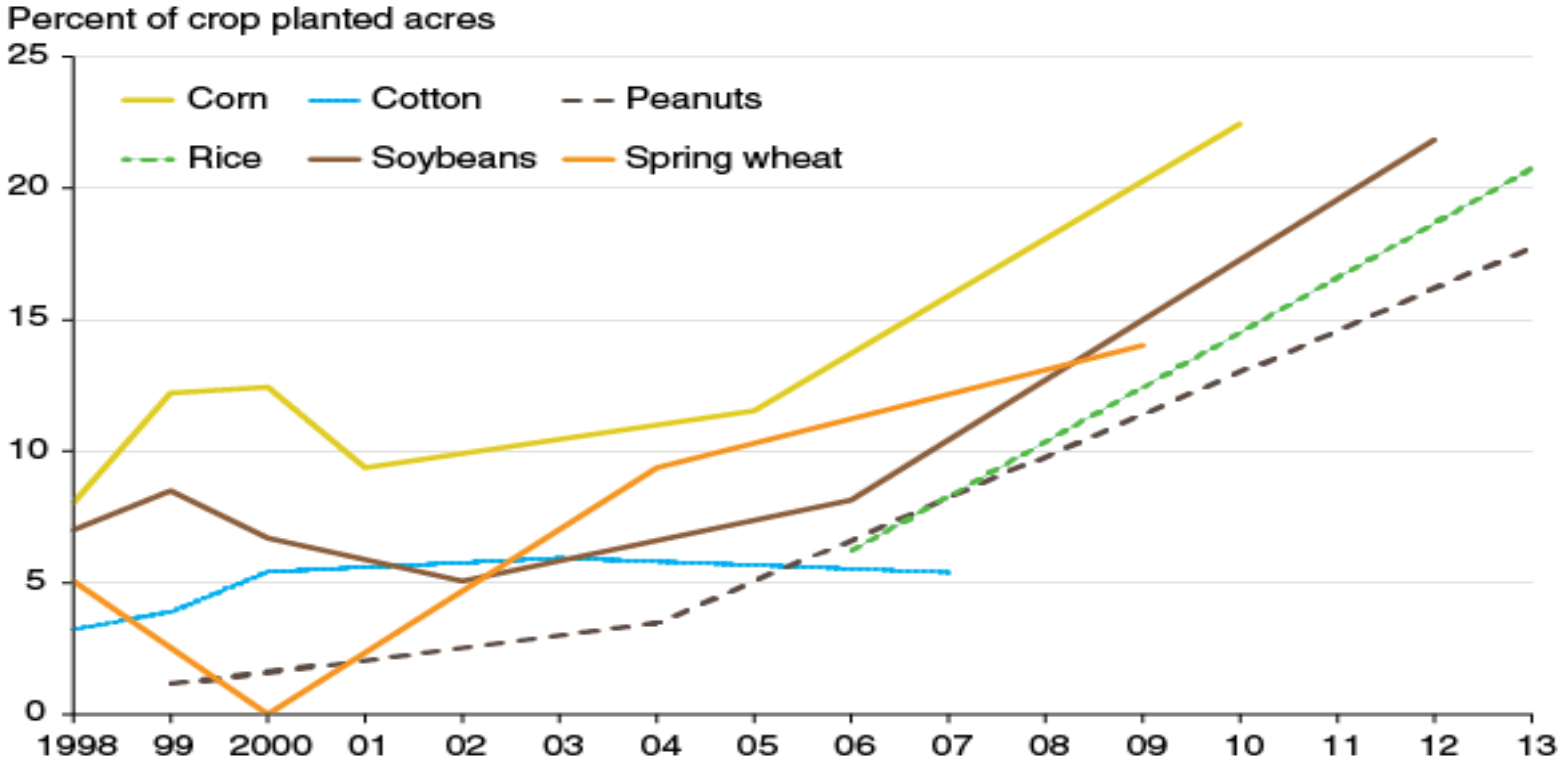
Little Is Known About Technology Adoption in Citrus

Study: Sevier and Lee (2004), *EDIS CIR 1461*
Study Area: 10 citrus producing counties
Year: 2003
Observations: 211
Minimum Acres: 100 ac

Technology	Adoption Rate
Sensor-based variable rate applicators	17.5%
Soil variability mapping	16.1%
GPS boundary mapping	16.1
Remote sensing	4.7%
Prescription map variable rate controllers	3.3%

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

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:

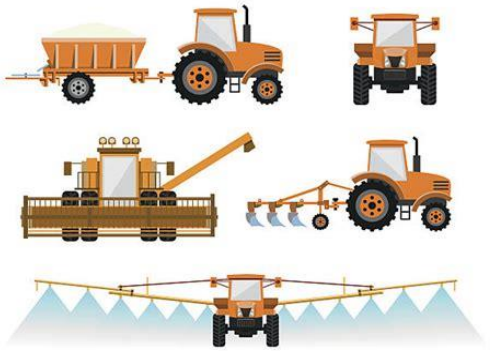
1. Fixed Cost—Machinery and Equipment
The initial cost of purchasing new equipment or upgrading current equipment.

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

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)

Depreciation is about 7% of operating expenses in Florida (NASS)

Interest:

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

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

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Opportunity Cost of Equipment

Fixed Costs/Ownership Costs/Cost of Modifications

Working Capital = Available Cash – Cash in Other Purchases

Older more successful farms usually have more working capital

Opportunity cost of owning:

- Cost of capital
- Loan Rate

Opportunity cost of leasing:

- Implied leasing rate (or profit the owner gets)

Labor Tradeoffs

- After the initial fixed cost of a piece of precision equipment like a variable rate application technology (VRT), citrus 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	All soybean fields using practice
Percent increases in practice adoption rates between farms with precision agriculture, 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 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.

Farm Size and Precision Adoption

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

- 63% of Florida citrus producers that use PA are over 500 acres (preliminary results)

- 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.

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.

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USDA

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