Trends in Dormant OP Use in CA Almonds

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Purpose

1) To develop a methodology for analytically determining the factors influencing levels of pesticide use

2) Apply the methodology to a specific example, dormant OP use in almonds

Adoption Literature

Determinants of adoption are factors that influence the costs and benefits of adopting a technology.

These include:

- Farmer and farm characteristics
- Characteristics of the technology itself
- Economic factors

Farmer and Farm Characteristics

- Farmer characteristics
  - Management ability, access to capital, attitude toward risk
  - Younger and better educated more likely to adopt IPM
- Farm characteristics
  - pest pressure, practices on adjacent fields, and crop
  - Farm size
  - Yield potential

Characteristics of the Technology

- IPM less likely to be adopted if it leads to increase in other pests
- Compatibility with other farm operations
- IPM may decrease or increase variability of yields and costs
- Efficacy
- Available alternatives

Economic factors

- Low market price may lead to cutting costs (reducing pesticide use)
- High prices may encourage maximizing production
- Relative costs of alternative methods
- Requirements of buyer (quality, delivery date)

Regulations

- Impact both the characteristics of the technology and the attitude of growers
- Grower anticipation of losing a pesticide
- Regulations signal environmental problem
- Voluntary suspension of use

Methodology

- Interviews and focus groups
- Hypothesis formation
- Identification and collection of available data
- Test hypotheses with econometric analysis

Reduction in Pesticide Use

- Number of growers using the pesticide decreases (yes/no)
- The number of acres treated decreases
- Decrease in the application rate

Background

- Dorman OP use in almonds control overwintering pests
- OPs came under scrutiny in the 80s when it showed up in groundwater
- Almonds accounted for 10 – 33 percent of dormant OP use from 1992 - 2000

Hypotheses

- Weather
- Economic
- Physical
- Education
- Risk

Weather

- Difficult to get in and spray in wet winters
- Dormant sprays following a wet year should increase
- Skipped dormant may mean cleanup PTB spray in spring
- Timing of BT and fungicide should be right before rain

Economics

- Reducing costs the number one reason given for skipping sprays
- Bonuses for reject levels – the lower the reject level required the more likely to spray
- Japanese market requires high quality
- Pyrethroids cheaper than OPs per acre

Physical

- Northern CA tends to have higher quality and lower yields
- Kern County has more in season pests
- Kern County larger growers
- Nonpareil, the main almond variety in CA is soft shelled and susceptible to pests
- Hard shells have lower value

Risk

- Bt perceived to be too risky by some, control is too short and not effective enough
- Managers of large farms may want to keep rejects down to keep their jobs
- Availability of OPs over time

Education

- BIOS program, public – private partnership to demonstrate alternatives to OP use and provide information to growers.

Weather Variables

- Two time periods:
  1/15-2/15 and 11/1 – 3/20
- Inches of rain
- Days of rain
- Average temperature
- Minimum temperature
- Cooling hours under 30 degrees
- El Nino year

Economic Variables

- Lagged price – almond price from the previous year
- Lagged rejects – rejects from the previous year
- OPprice – material cost per acre
- Pyrethroid price – material cost per acre
- Bt price – Bt price per acre
- Japan exports – pounds of exports to Japan
- Lagged rejects – rejects from the previous year
- Carry in – almond carry in from the previous yr.

Geographic Variables

- South – Fresno and Tulare
- Central – San Joaquin, Stanislaus, Yolo, Madera, and Merced
- North – Butte, Colusa, Glenn, Sutter, and Tehema
- Kern – Kern County

BIOS Variables

- BIOS -
  - Merced 1993 – 1997
  - Stanislaus 1994 – 1998
  - San Joaquin 1995 – 1999
  - Colusa 1995 – 1999
- BIOSbeg – for all years from the beginning of BIOS

Probability of Any OP Use - Probit

- OP use decreasing over time
- Kern and South region increased OP use
- Central region decreased use relative to North baseline
- Previous year price increased OP use
- Beginning inventory increased OP use
- Previous year's rejects increased OP use
- Japanese exports increased OP use

Probability of Any OP Use - Probit

- Price of OP and pyrethroids did not impact use
- Price of Bt impacted use slightly
- More inches of rain between Jan 15 and Feb 15 increased use
- Weather variables highly correlated
- BIOS and BIOSbeg decrease OP use

OP Use in Acres - Tobit

- Region was the most important determinant
- Central region applied OPs to fewer of their acres, Kern applied more compared to the North
- Lagged price not significant
- Pesticide prices not significant
- BIOS not significant
- Carryin had a positive affect on acres (not expected)

OP Application Rate - Tobit

- Average application rate was 1.82 pounds per acre, less than half the label rate of 4 pounds
- We excluded observations of .25 pounds and more than 30 pounds per acre, 172 of the 13,577 observations

OP Application Rate - Tobit

- Rate increased over time
- South and Kern regions used higher rate
- Central same as North
- Lagged price positive effect on rate
- Carry in had a positive effect (not expected)
- Lagged percent rejects positive effect
- Exports and Japanese exports positive effect
- Pyrethroid price positive, other pesticide prices insignificant

Lessons for Using Trend Analysis

- Price data through mill tax database provides a consistent time series
  - Price information with application rate recommendations used to obtain a per acre cost of treatment.
  - These variables did not perform well but might in other situations.
- Weather data is important but highly correlated
- Inventories and quality measures are important and may be more difficult to obtain for other crops
- Use trends should be evaluated several ways, the number of users, the percentage of their acreage treated, and application rates.