Title of the Presentation

Agent-based Model of Bt corn Adoption and Insect Resistance Management

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Social Factors

• Most studies focus on biological factors of resistance development. They are important, but not in themselves; rather, dependent on other factors, especially social factors.
• For example, survival rate of each genotype against Bt toxin is crucial, but quite distinct rates can lead to similar resistance evolution once we take into account social components.
• Pests respond to how farmers manage them: what types of management, how much, how often, and how concentrated in a given landscape. These human activities also respond to neighbors’ and their own practices in the past. Not to mention regulations and input & output prices.

Complex Systems

• Recognizing the intricate interdependency among farmers, insects, and policy makers, we model insect resistance management as a complex system.
• Complex phenomena, however, need not consist of complex components. They can and do often emerge from simple processes, which interact with each other over time.
• Key components:
  • Explicit physical space
  • Insect reproduction & dispersal
  • Three genotypes with respect to inherent resistance
  • Peer effects on initial adoption of Bt corn
  • Probabilistic profit maximization
  • Heterogeneity in farm size
• To put the pieces together, we use computer simulation — agent-based modeling.

Agent-based Modeling

Adoption status of farmers (• adopt, □ non-adopt) and insect population (■ the darker, the greater) evolve over time.

Policy Analysis

Over the next 20 years, the total surplus of farmers and seed company essentially remains the same (+2% down). If accounting for other indirect benefits, e.g. environmental protection and postponed R&D expenditure, the social surplus would likely be positive.

(Agent-based modeling provides a realistic view of this process)

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