Experimental gaming research: the next step in data gathering and complex systems analysis

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Roadmap

- Introduction to the North East Water Resources Network (NEWRnet) and Social Ecological Gaming and Simulation team
- Understanding the data gathering process
- Current progress
- Looking ahead

SEGS Lab
Social
Ecological
Gaming &
Simulation

Who we are…

NEWRnet
Delaware • Rhode Island • Vermont
North East Water
Resources Network

Chris Koliba

Yushiou Tsai

Asim Zia

Scott Merrill

Steve Exler

Scott Turnbull

Linyuan Shang

Ahmed Hamed

Carol Adair

Serge Wiltshire

Courtney
Hammond
Wagner

VERMONT
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Gaming & Simulation
The University of Vermont
SEGS in the News
Seth Frey to give talk at SEGS lab on March 31
Apr 30th, 2015: SEGS Lab at Center of New $7.4 Million USDA Grant
Oct 28th, 2014: Experimental Economics: Gaming and Simulation Class Photos
July 23rd, 2014: Board Game Trials July 23rd & 24th 2014
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VERMONT EPSCoR
What are Social Ecological Systems?
Why Games and Simulations?
Applications:

Roadmap

- Introduction to the North East Water Resources Network (NEWRnet) SEGS team
- **Understanding the data gathering process**
- Current progress
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How do we attempt to understand the human component of social ecological systems?

http://www.extension.umn.edu/agriculture/nutrient-management/nitrogen/nitrogen-availability-from-liquid-swine-and-dairy-manure/img/08583a.jpg

http://www.farmwest.com/images/client/Minimizing%20Nutrient%20Movement%20Figure%20141.JPG

Example: Your house is on fire

In an interview your are asked

- "What two small things do you grab on the way out the door?"
  - "Heirloom necklace from your grandma valued at $15,000"
  - "Laptop computer with the only copy of all of your data from last summer"
  - "A picture book with the only copies of photos from your childhood"
  - "Your pet goldfish"
  - "A painting that your don't really love valued at $45,000"

Example: Your house is on fire

In a paper survey your are asked

- Circle the items that your would grab on the way out the door?
  - A. Heirloom necklace from your grandma valued at $15,000
  - B. Laptop computer with the only copy of all of your data from last summer
  - C. A picture book with the only copies of photos from your childhood
  - D. Your pet goldfish
  - E. A painting that your don't really love valued at $45,000

Example: Your house is on fire

- In an experimental game you are put into burning house…

- Heirloom necklace from your grandma valued at $15,000
- Laptop computer with the only copy of all of your data from last summer
- A picture book with the only copies of photos from your childhood
- Your pet goldfish
- A painting that your don't really love valued at $45,000

Example: Your house is on fire

What do you actually grab!!

A. My laptop
B. Nothing – I ran away!!!
C. Just the picture book
D. My empty coffee mug
E. The goldfish and a house plant that was next to the door

Lots of ways to collect data to attempt to understand these social ecological systems and approach “truth”.

Problems in data gathering

Education Game: healthy diets

Attempt to gather data in such a way to approach realistic responses

Given all of this noise, can we detect signals in human behavior?

Sherlock Holmes. The Sign of the Four

“Winwood Reade is good upon the subject," said XXXXX. "He remarks that, **while the individual man is an insoluble puzzle, in the aggregate he becomes a mathematical certainty.** You can, for example, never foretell what any one man will do, but you can say with precision what an average number will be up to. Individuals vary, but percentages remain constant. So says the statistician."

Using multi-model inference with well defined hypotheses, we can learn what people or organizations might do in different situations without having to put them in those situations.

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UVM's Experimental Games: Current

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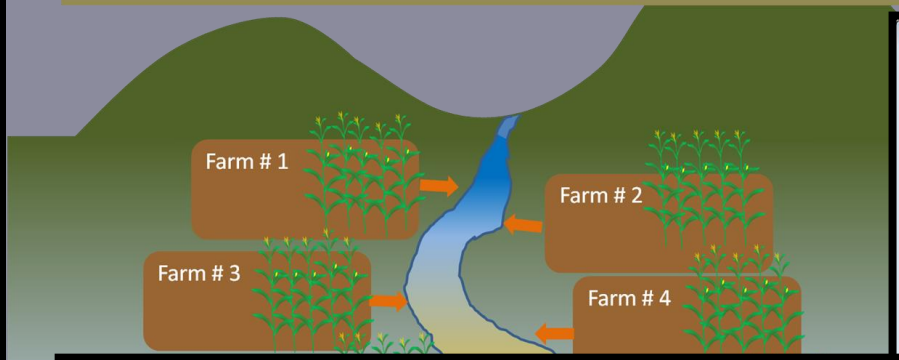
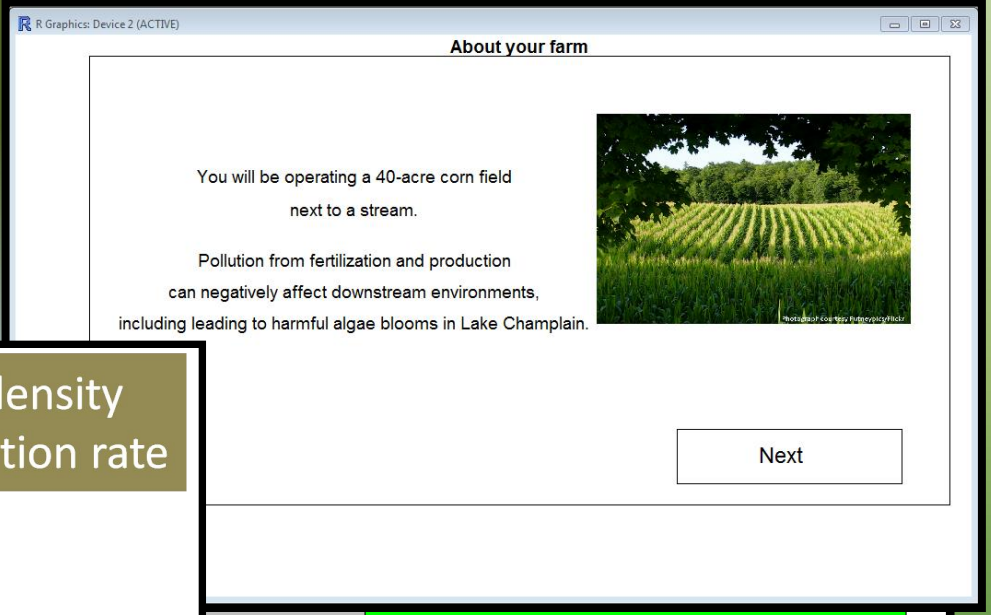
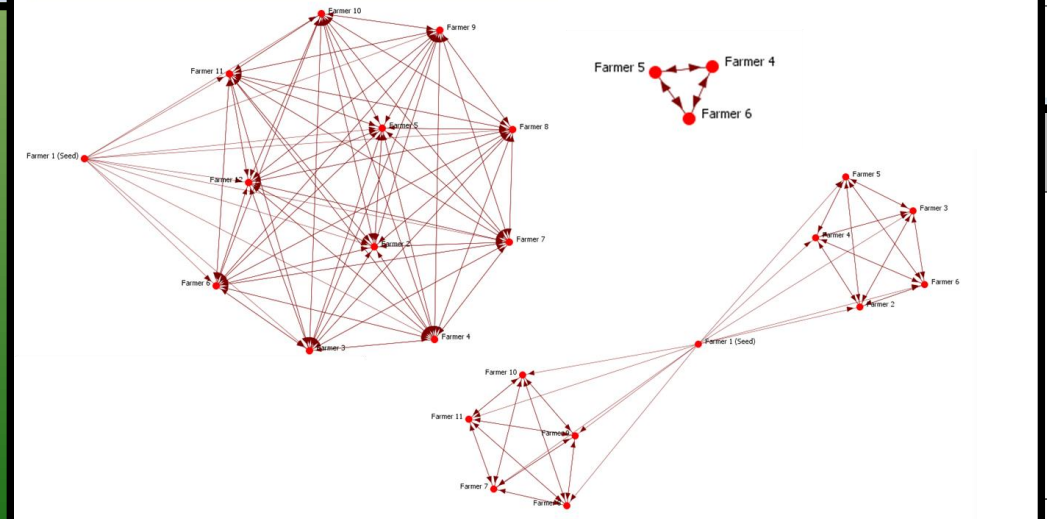
SEGS Lab
Social Ecological Gaming & Simulation

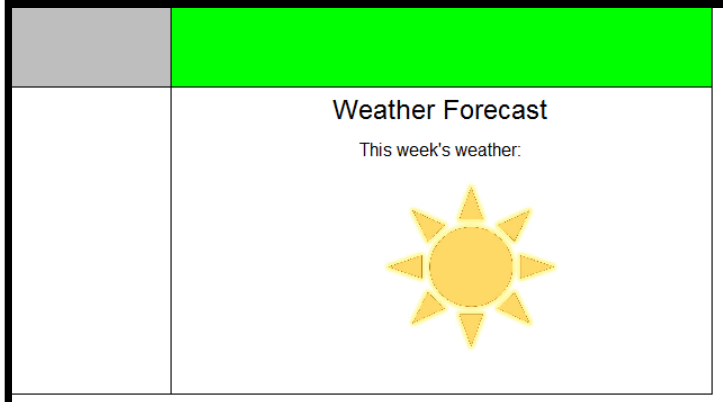
Experimental gaming: Examining the effects of taxation and incentives on farmer decision making processes



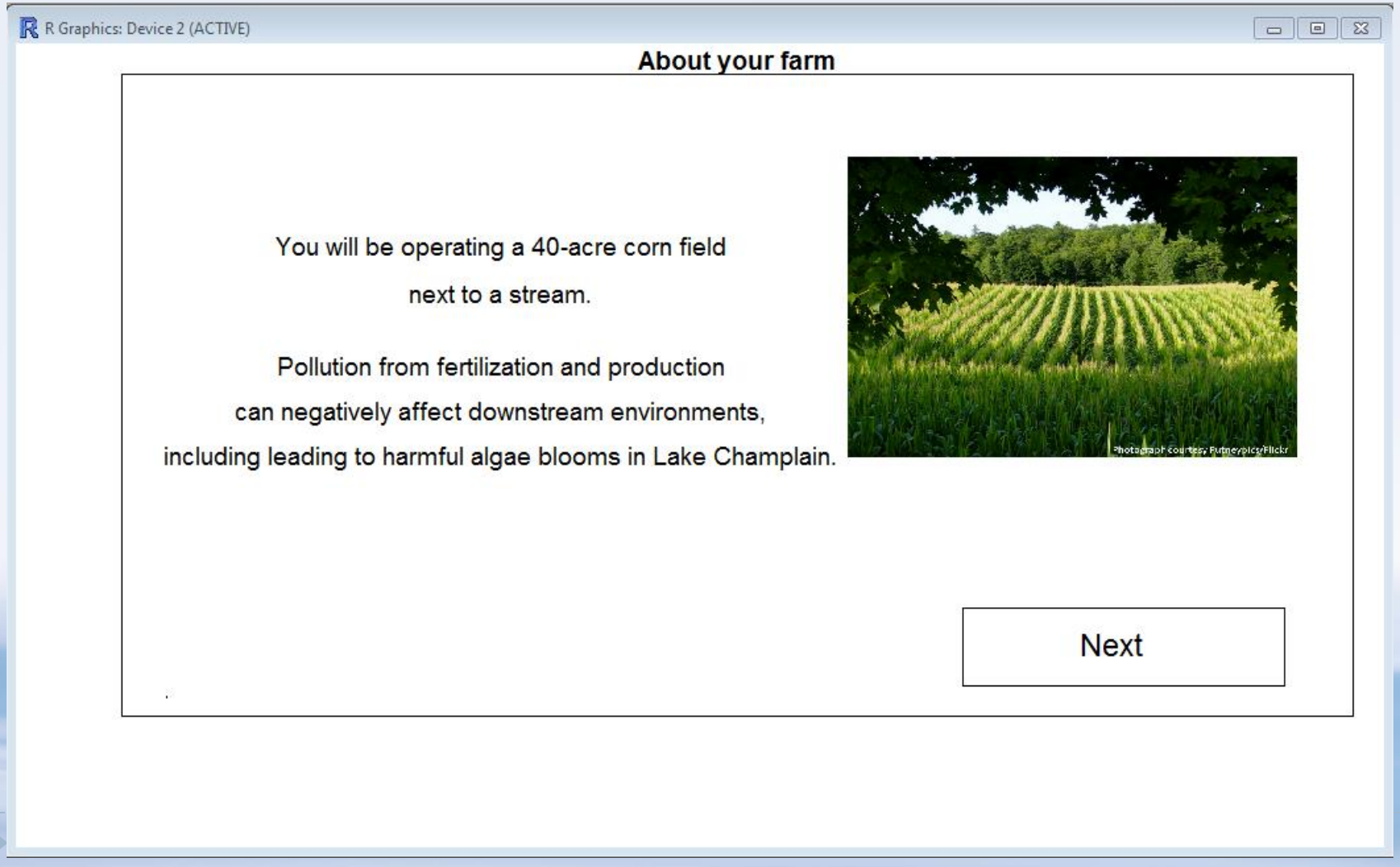


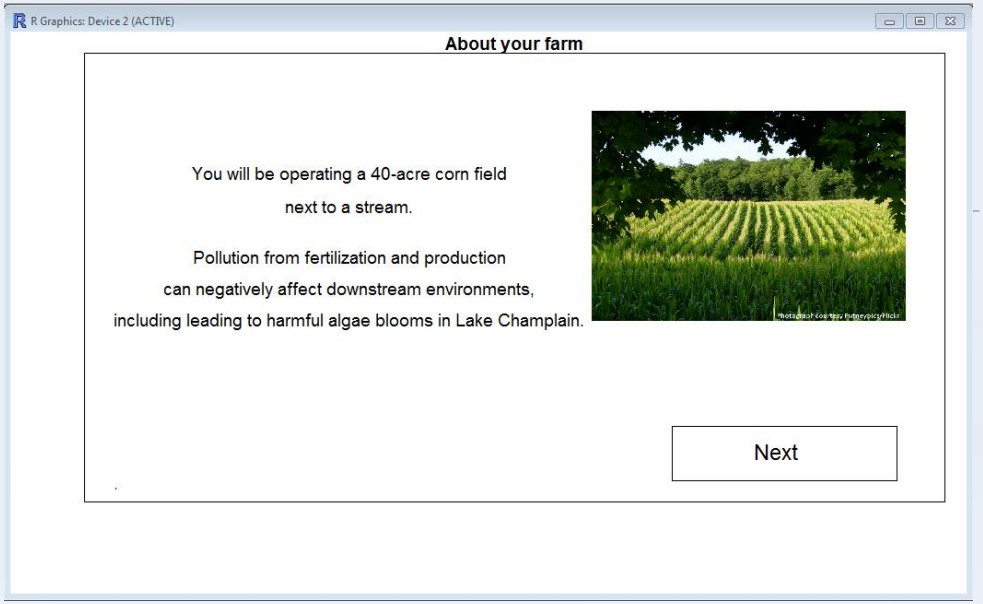
Experimental gaming: Peer network density affects Best Management Practice adoption rate





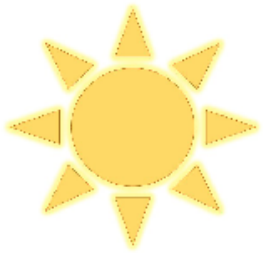
An examination of the effect of information: Awareness of buffer strip effects increases adoption rates





- Study (Ongoing) preliminary findings and implications:
  - Increase knowledge/awareness of buffer strip dynamics increased adoption of buffer strips even when adoption was a poor economic decision

Weather forecast uncertainty

Review Information	Fertilize Your Fields
No Action	Weather Forecast This week's weather: 

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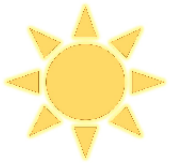
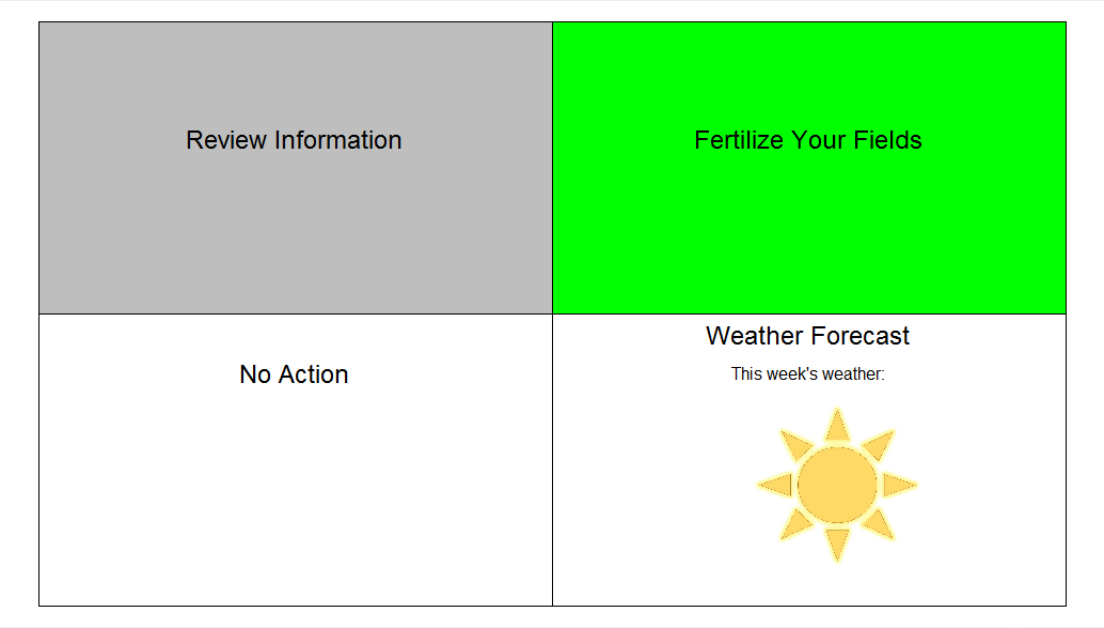
No Action	Weather Forecast This week's weather: 

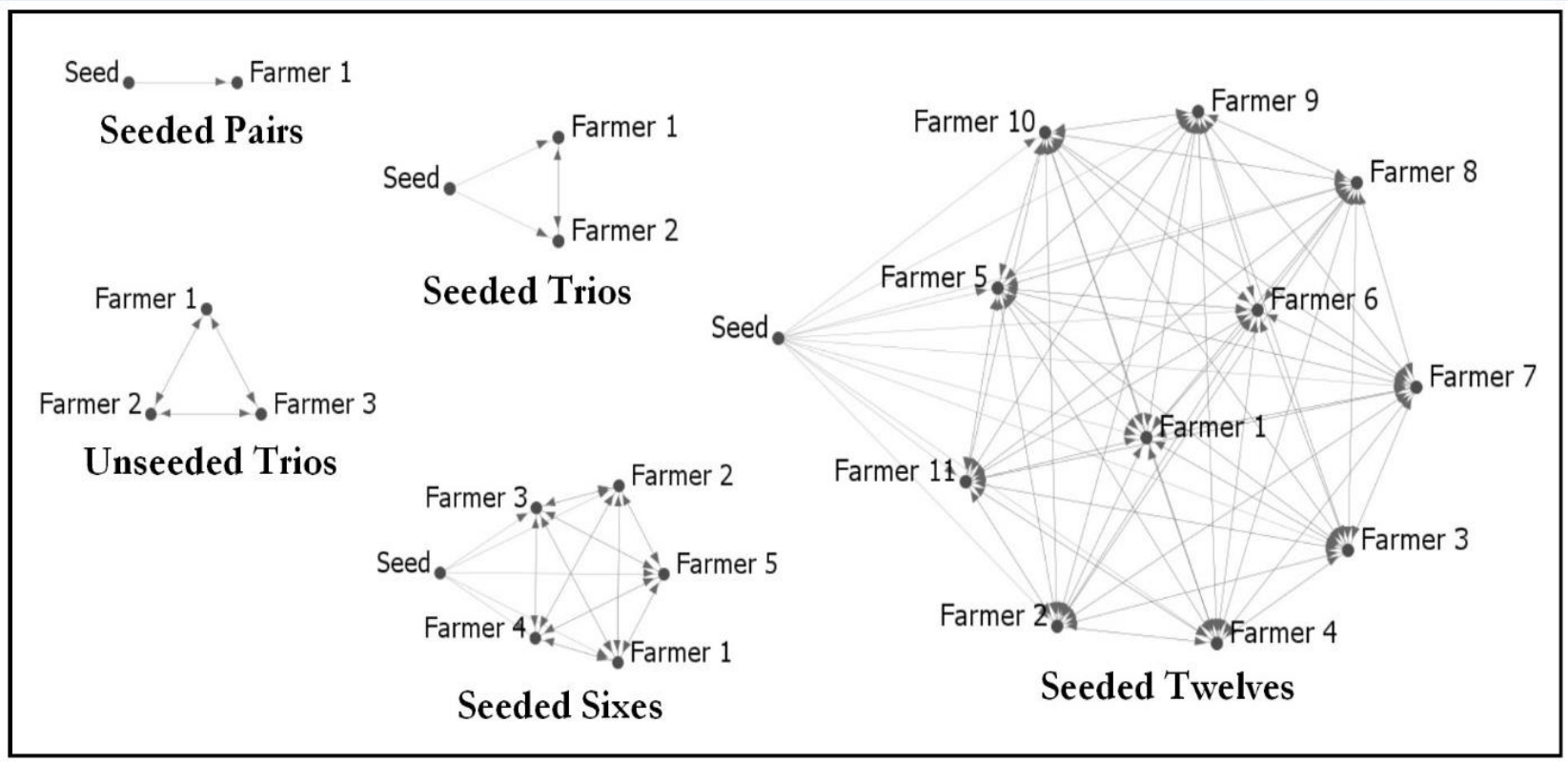
- Hypothesis
  - Using a risk acceptance framework, uncertainty in weather forecasts will affect manure management behavior



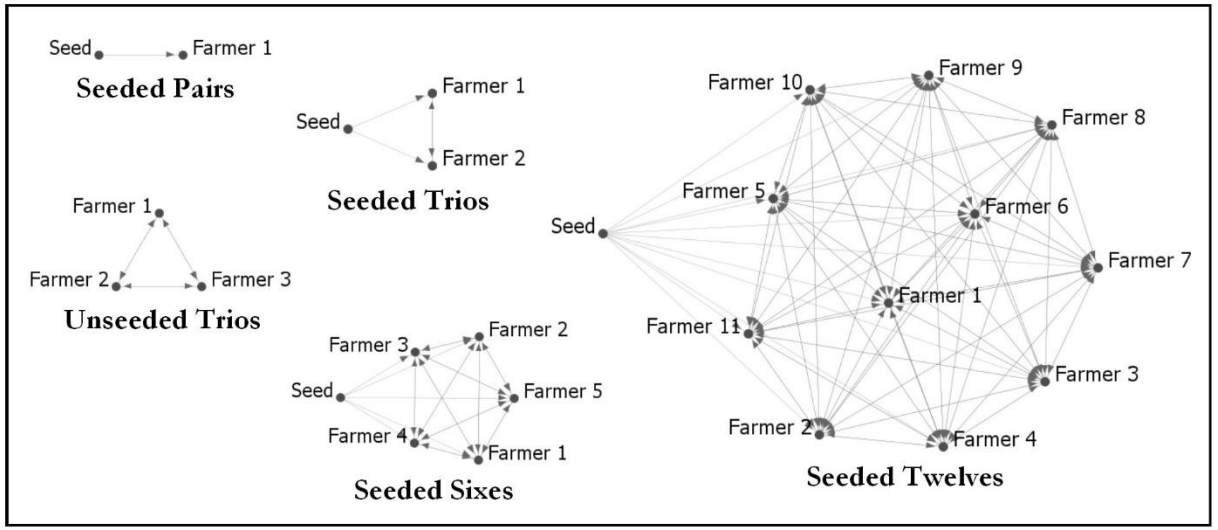
- Manure storage conflict
- Sell manure to a Digester Facility or put manure on your fields under weather conditions that may result in high nutrient loss from fields and high resulting degradation of water quality

Wynn, Merrill, Uchida, Guilfoos, Zia, Koliba, et al.

Influence of peer network configurations on adopting novel management tactics

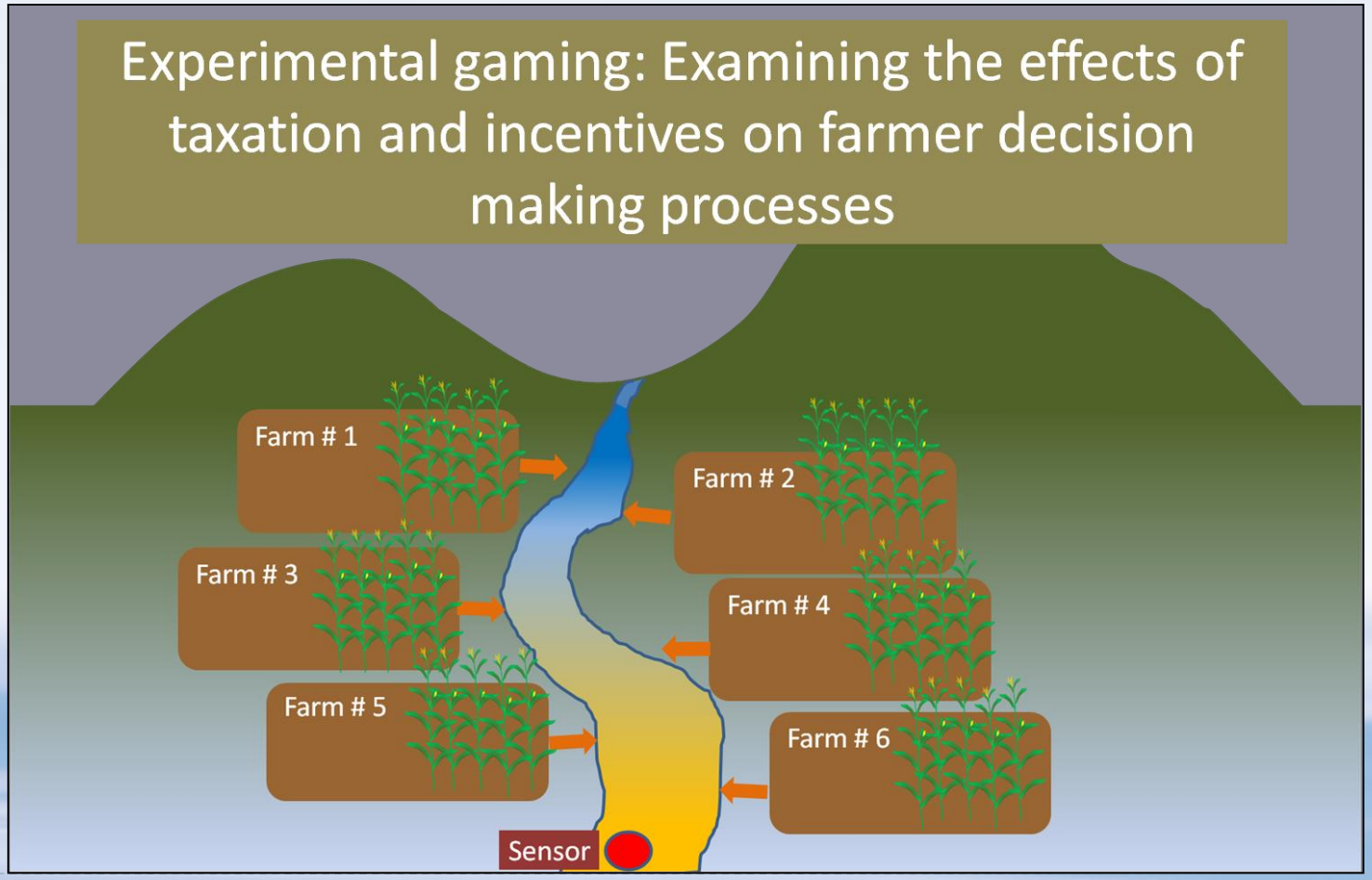


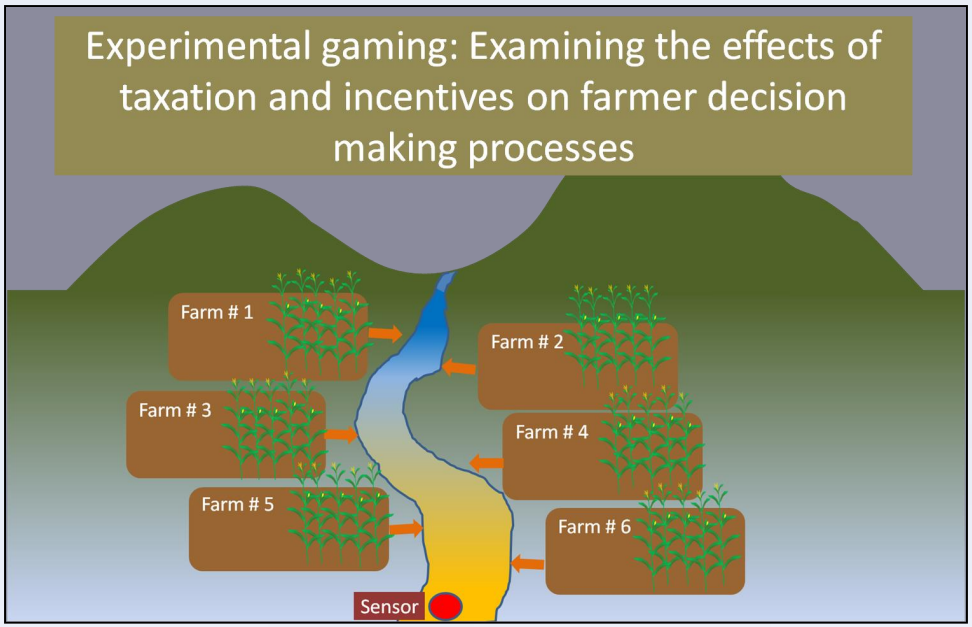
Wiltshire, Logan, Merrill, Fooks et al. Size Matters: Innovation diffusion in a clustered social network experiment



- Study findings and implications:
  - As the social network size increased participants made better decisions about adopting new manure management practices

Examining the effect of sensor placement and pollution detection frequency on production decisions

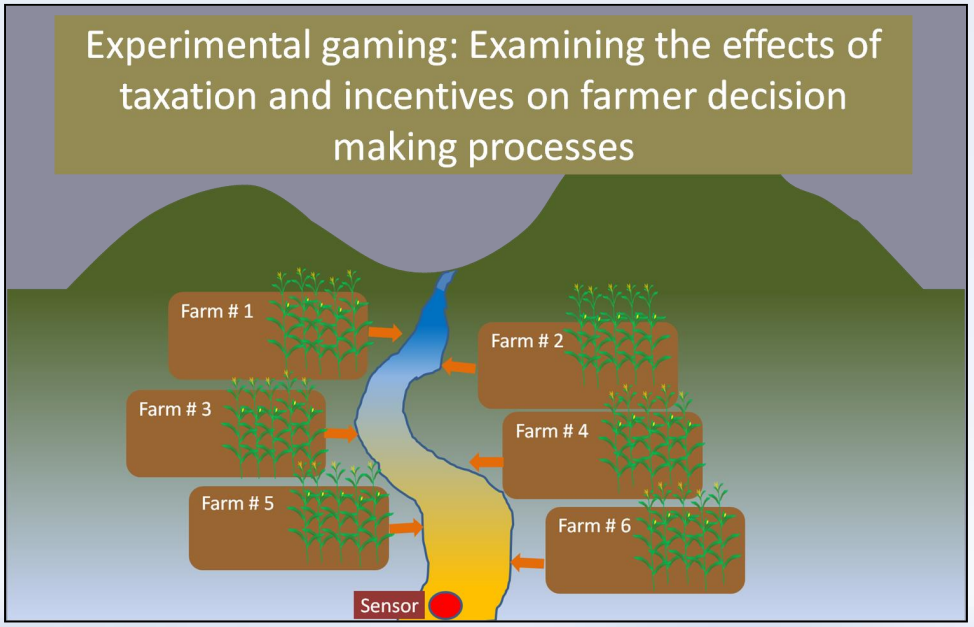




- Study findings and implications:
  - Individual behavior could be classified or clustered into groups on a spectrum from socially altruistic to economically rational

Taking the next steps: Complex Systems Analysis

- Use gathered data to develop rules for Agent-based models



Zia et al. Using sensor information to induce cooperative behaviors for managing non-point source pollution: Evidence from a decision game in an idealized watershed.

Iterative process: Complex Systems Analysis

- Use gathered data from Agent-based models to parameterize new experimental games

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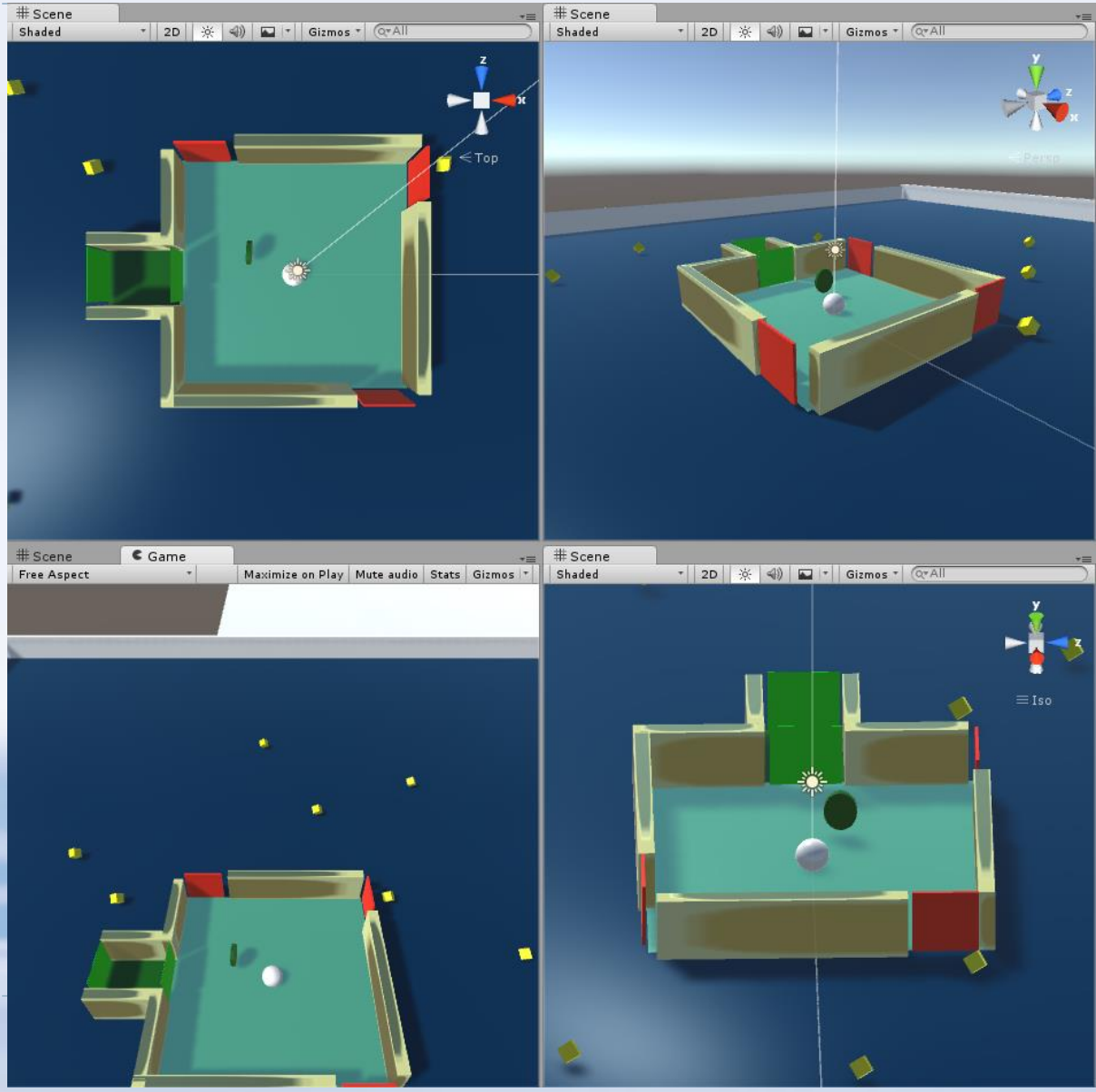
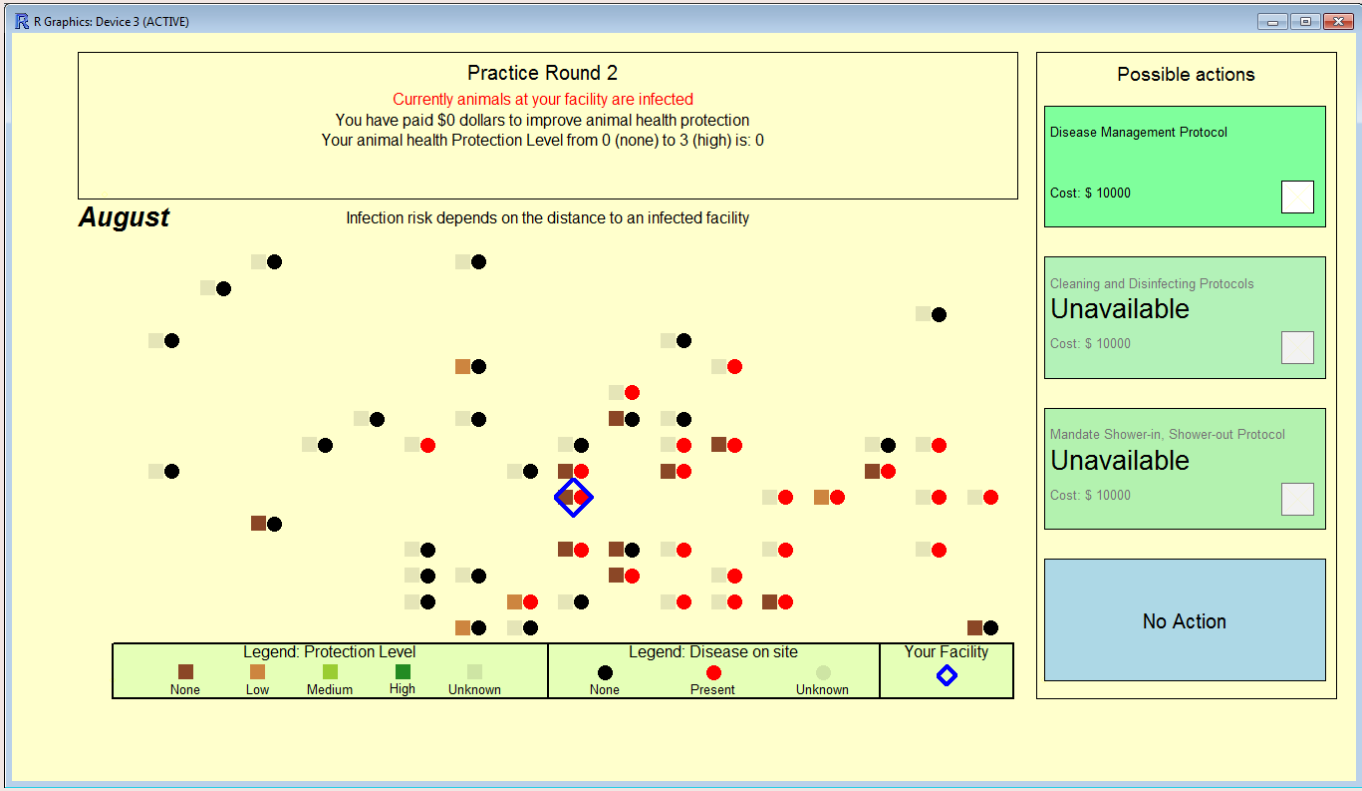
Looking ahead

- Moving from discrete to continuous data gathering modes



Building sustainability and capacity

The SEGS lab and the Dept. of Animal Sciences were granted the largest grant ever received by the College of Agriculture & Life Sciences.



Funds will go towards protecting animal health from disease in animal production using simulation and gaming.

RACC
Research on Adaptation to Climate Change

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Questions?

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