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THE ROLE OF EPIDEMIOLOGIC AND ECONOMIC MODELS IN EMERGENCY PREPAREDNESS AND RESPONSE

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Strategic Response

Emergency response planning continues to evolve to more **strategically stop and prevent disease spread** while maintaining business continuity and allowing as many animals as possible to reach their intended purpose



Photo by Amy Delgado

Increased need for scientific and analytical approaches to support emergency preparedness planning



What Drives Investments in Modeling?

Invest

- Better understand trade-offs in investments in human and material resources

Test

- Plan to quickly and accurately identify infected herds, differentiate between vaccinated and exposed/infected animals
- Plan to quickly and accurately evaluate animals and animal products for the presence of disease in order to make decisions about movement

Control

- Explore options for more targeted approaches to depopulation and disposal
- Evaluate alternative control strategies including vaccination



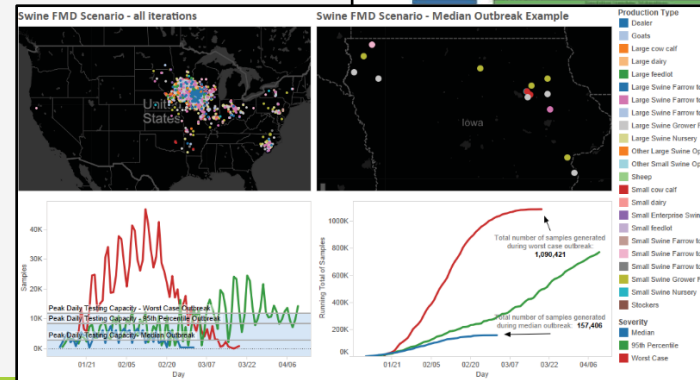
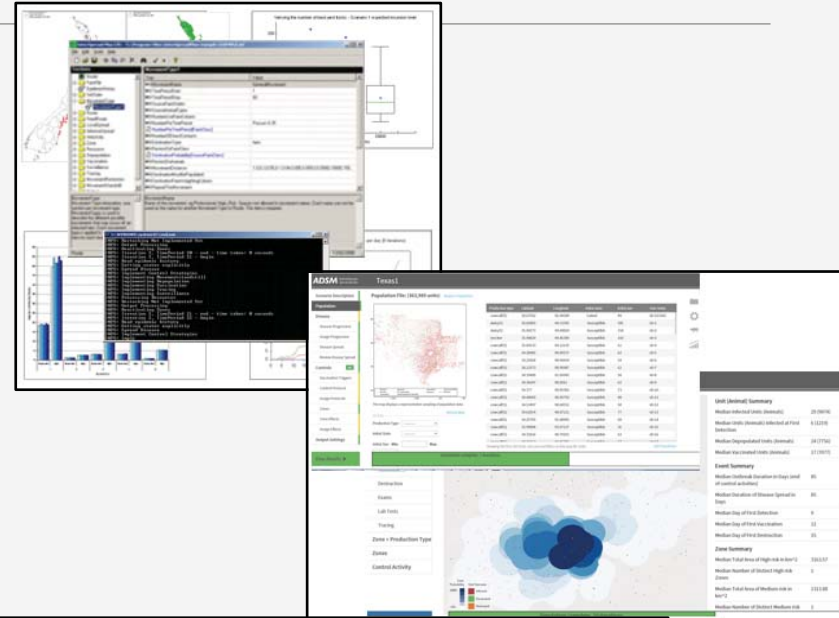
Current Tools

National and regional models for herd-to-herd or flock-to-flock disease spread

Within-herd or within-flock disease spread models

Statistical models such as spatial or habitat suitability models, surveillance evaluation, etc.

Network models of animal movements

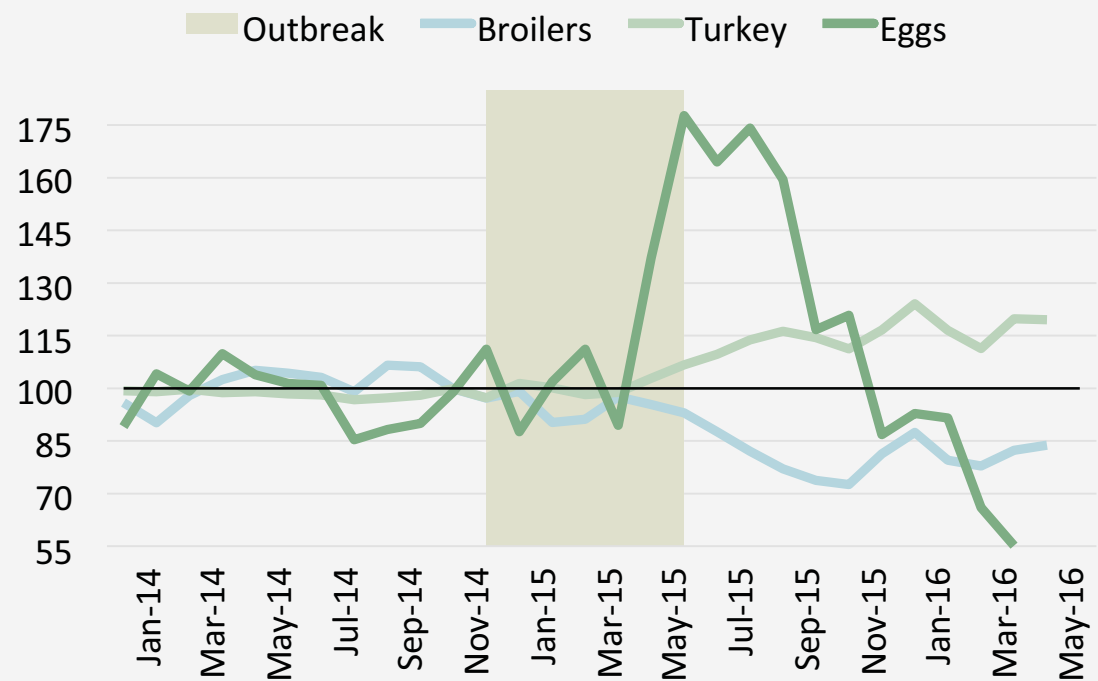




Economic Modeling

Economic modeling approaches

- Estimate fair market value of animals or animal products when data are limited or unavailable
- Evaluate economic impacts, including trade losses associated with response options
- Examine costs associated with response and potential trade-offs

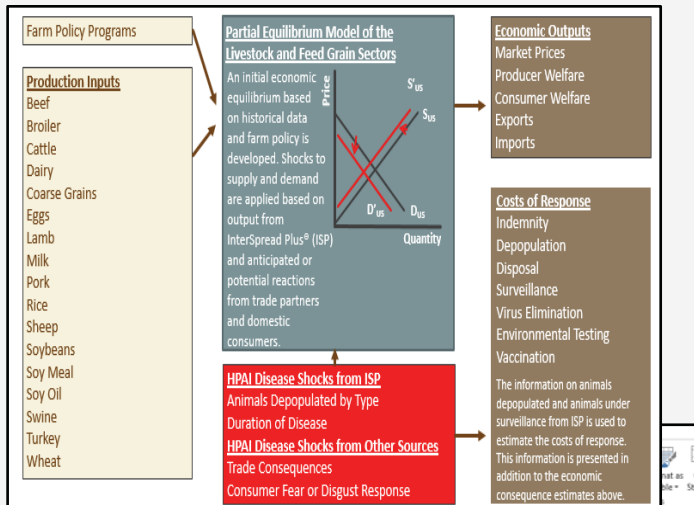


Monthly price indexes normalized to November 2014 by commodity, 2014 – 2016 (AMS, 2016)

Source: USDA-ERS



Current Tools



| Column | Year | Quarter |
|--------|------|---------|
| 1 | 2009 | 1 |
| 2 | 2009 | 2 |
| 3 | 2009 | 3 |
| 4 | 2009 | 4 |
| 5 | 2009 | 1 |
| 6 | 2009 | 2 |
| 7 | 2009 | 3 |
| 8 | 2009 | 4 |
| 9 | 2009 | 1 |
| 10 | 2009 | 2 |
| 11 | 2009 | 3 |
| 12 | 2009 | 4 |
| 13 | 2009 | 1 |
| 14 | 2009 | 2 |
| 15 | 2009 | 3 |
| 16 | 2009 | 4 |
| 17 | 2009 | 1 |
| 18 | 2009 | 2 |
| 19 | 2009 | 3 |
| 20 | 2009 | 4 |

Maximum 20 iterations

Naming Conventions
 Naming Conventions for named ranges
 Changes are typically named
 #Process#Commodity#Specific

CSB Cost Share Originate on commodity workbooks
 FFB Feed Base Originate on commodity FFB from the r
 FFL Feed Loss Originate in model, or Startp Resource
 FSD Supply C Originate on commodity workbooks
 INV Inventory Originate on commodity workbooks
 K Capital Originate in model, worksheet Solver
 LAG Lag Originate in model in Solver, pass to r

- Animal appraisal value calculators
- Herd budget models
- Paarlberg Partial Equilibrium Model
- Quarterly livestock sector models
- Spreadsheets models for cost estimation
- Statistical models



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Recent Applications

Past investments in modeling paid off during the 2014-2015 HPAI outbreak

- Estimating budgetary and material resource needs
- Examining alternative control strategies
- Evaluating vaccination strategies
- Informing surveillance, movement requirements, and permitting guidance
- Export recovery work to understand how trading partners respond to outbreaks



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Moving forward

Increased partnerships for data collection and sharing, parameter development, and model application

Model enhancements to allow for more complex control options or other types of disease spread, such as wildlife or vector-borne diseases

Continued engagement with emergency response community to ensure the work being done is meeting key needs



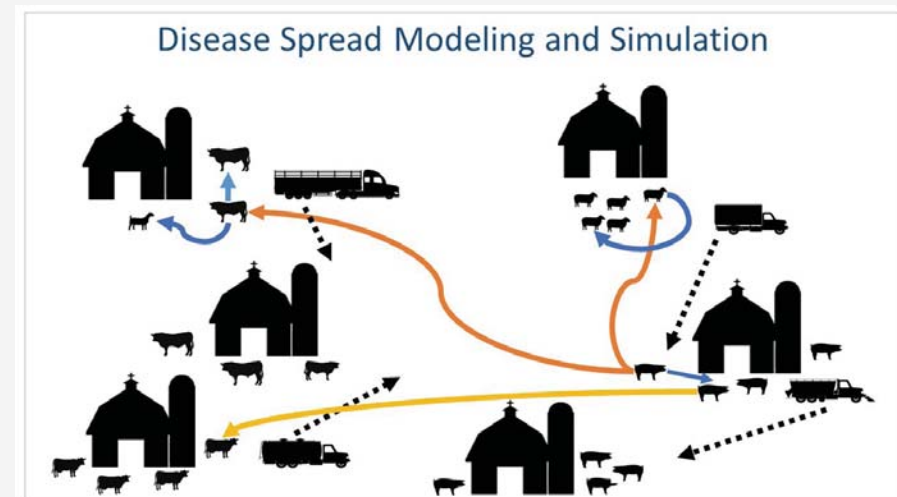
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Key Challenges

Staffing and support of modeling teams

Data and evaluating the level of complexity needed

Competing priorities – multiple diseases and multiple industries





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