Value of Information in a Whole-Chain Traceability System for Beef Cattle: Application to Meat Tenderness

Candi Ge
candi.ge@okstate.edu
Brian D. Adam
brian.adam@okstate.edu
Dept. of Agricultural Economics
Oklahoma State University

Selected Poster prepared for presentation at the
2016 Agricultural & Applied Economics Association Annual Meeting, Boston, MA, July 31- Aug 2

VALUE OF INFORMATION IN A WHOLE-CHAIN TRACEABILITY SYSTEM FOR BEEF CATTLE –APPLICATION TO MEAT TENDERNESS

CANDI GE
BRIAN D. ADAM
DEPT. OF AGRICULTURAL ECONOMICS, OKLAHOMA STATE U.

PROBLEM

- In the beef marketing system – a fragmented supply chain – credence attributes such as beef tenderness are difficult to identify and reward
- Beef tenderness can be increased with:
  - Genetic improvement (from cow-calf producer)
  - Optimal feeding (by feedlot)
- ***How can each agent be rewarded to provide tenderness attributes, overcoming information asymmetry?***

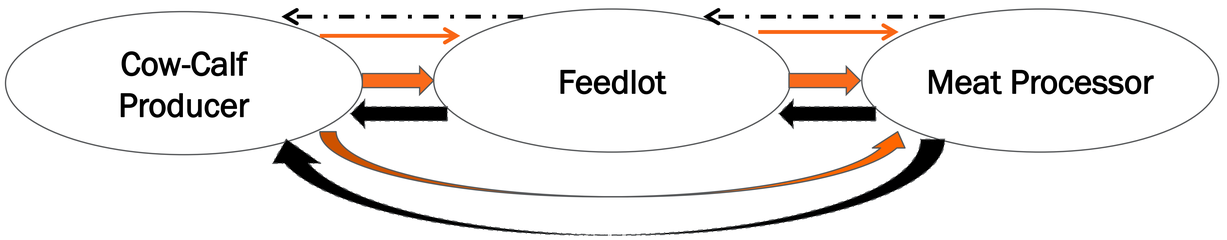
OBJECTIVES – In a Whole-Chain Traceability System (WCTS), determine:

- Optimal payment from meat processor to feedlots for feeding to optimize tenderness
- Optimal payment from meat processor to cow-calf producers for tenderness genetics
- Benefits and costs of value-added opportunities for an individual beef producer in a WCTS

METHODS

principal-agent model from Resende-Filho & Buhr is expanded to 2 agents in 3-stage supply chain:

Principal (meat-processor) minimizes cost subject to agents (cow-calf producer and feedlot) maximizing utility



$$\min_{I_{0,1,*},I_{1,1,(0)},\dots,I_{1,1,j},\dots,I_{0,2,*},I_{1,2,(0)},\dots,I_{1,2,j},\dots} E_C(I_{0,1,*}, I_{1,1,(0)}, \dots, I_{1,1,j}, \dots, I_{0,2,*}, I_{1,2,(0)}, \dots, I_{1,2,j}, \dots)$$

Subject to:

$$U_i(a_{i,k}|I_{0,i,*}, I_{1,i,(0)}, \dots, I_{1,i,j}, \dots) \geq \overline{U_i}\ \forall\ i$$

$$U_i(a_{i,k}|I_{0,i,*}, I_{1,i,(0)}, \dots, I_{1,i,j}, \dots) \geq k(a_{i,-k}, t)[P'_{0,i,*}u(I_{0,i,*}) + \sum_j P'_{1,i,j}u(I_{1,i,j})] - d(a_{i,-k}, t)$$

$$\forall\ i,\ a_{i,-k} \in A_i,\ and\ a_{i,-k} \neq a_{i,k}$$

PRELIMINARY RESULTS

- In a WCTS, information and payments can skip over one or more stages to achieve desired goals (e.g., processor can directly pay cow-calf producer for info about genetics).
- Optimal payment depends on the costs of actions agents take.
- With WCTS, there is $71.80/head extra profit for improved tenderness. Of this, $16 should go to the cow-calf producer, and $37.83 should go to the feeder

FUTURE RESEARCH

Research in progress is simultaneously estimating optimal payments for multiple attributes,

REFERENCE

- Resende-Filho., M.A., and B.L. Buhr. 2008. "A Principal-Agent Model for Evaluating the Economic Value of a Traceability System: A Case Study with Injection-Site Lesion Control in Fed Cattle." *AJAE,* **90**:1091-1102.