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

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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

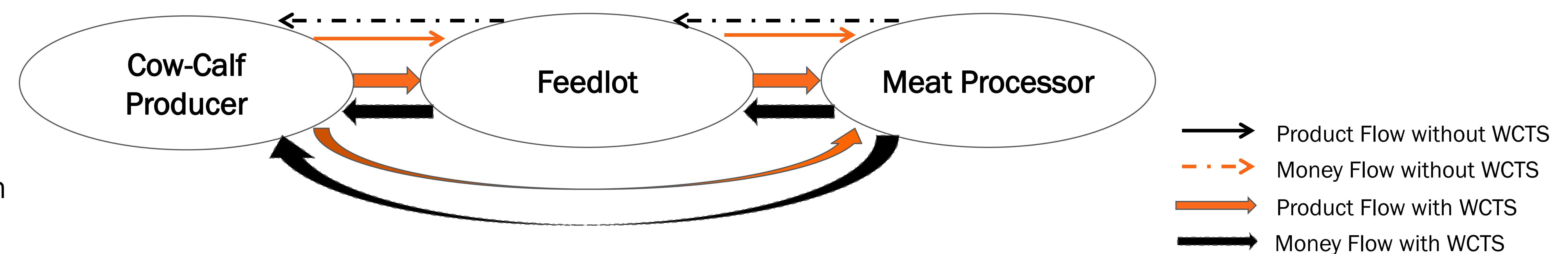


METHODS

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

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,

$$\begin{aligned}
 & \min_{I_{0,1,*}, I_{1,1,(0)}, \dots, I_{1,1,j}, \dots, I_{0,2,*}, I_{1,2,(0)}, \dots, I_{1,2,j}, \dots} E_C(I_{0,1,*}, I_{1,1,(0)}, \dots, I_{1,1,j}, \dots, I_{0,2,*}, \\
 & \text{Subject to:} \\
 & U_i(a_{i,k} | I_{0,i,*}, I_{1,i,(0)}, \dots, I_{1,i,j}, \dots) \geq \bar{U}_i \forall i \\
 & U_i(a_{i,k} | I_{0,i,*}, I_{1,i,(0)}, \dots, I_{1,i,j}, \dots) \\
 & \geq k(a_{i,-k}, t)[P'_{0,i,*}u(I_{0,i,*}) + \sum_j P'_{1,i,j}u(I_{1,i,j})] - d(a_{i,-k}, t) \\
 & \forall i, a_{i,-k} \in A_i, \text{ and } a_{i,-k} \neq a_{i,k}
 \end{aligned}$$

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.