



Cost-Benefit Analysis of the U.S. National Animal Identification System (NAIS) in California

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Presentation to the Animal ID Expo, National Institute of Animal
Agriculture, Kansas City, MO. August 25-27, 2009

Project Goals and Objectives

- Analysis of costs and benefits of the NAIS for the beef, dairy, and sheep industries in California
 - Today's presentation will focus on segments of the beef and dairy industries
- Analysis of costs and benefits at the state level

Project Teams

- CSU Chico and Cal Poly San Luis Obispo
 - Data collection, survey development, producer interviews
- Univ. of California Davis
 - Survey development, economic modeling, industry interviews, and analysis
- California Dept of Food and Agriculture (CDFA)
 - Project management and assisted with collection of information

Project Methods

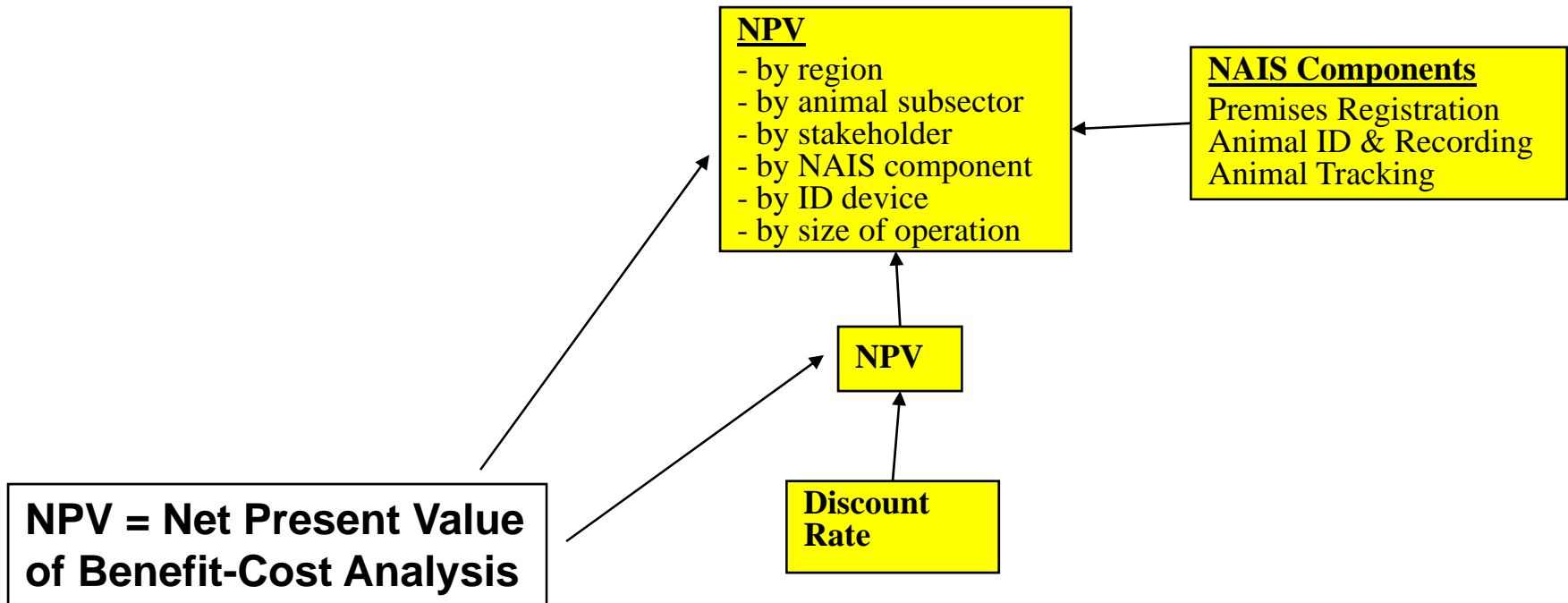
- Interviewed producers with different types and sizes of operations.
- Challenge to collect comprehensive information from any one producer
- Time and motion study--Data collected while producers worked with their livestock performing tasks for animal ID, data collection, and routine management practices

Project Methods

- We used expert opinion or the scientific literature to fill the areas with no field data
- Managed challenges of a changing national system
- Most producers cooperated, but many were just getting started and records were not always available

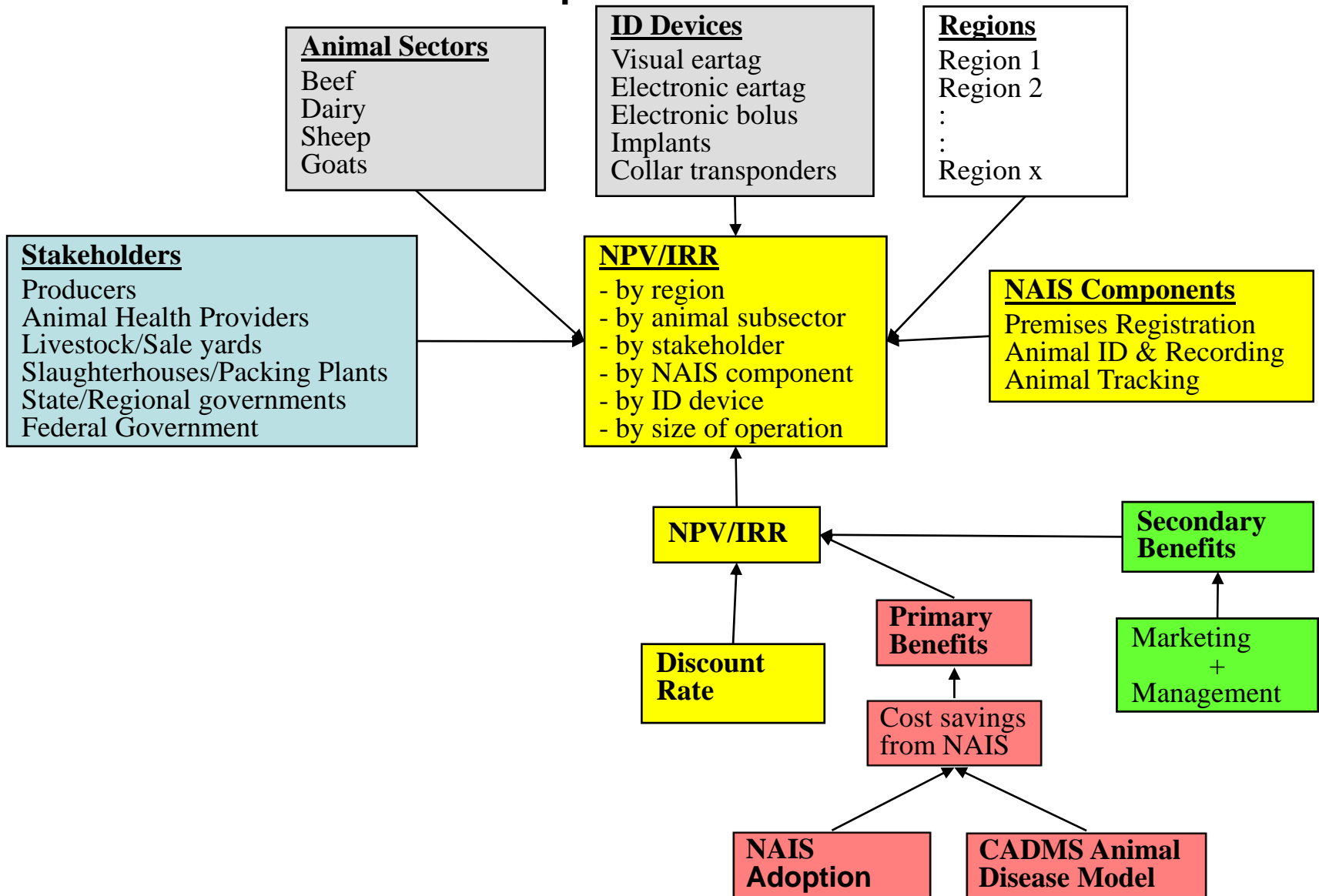
NAIS California Model

- Components: 1/5 -



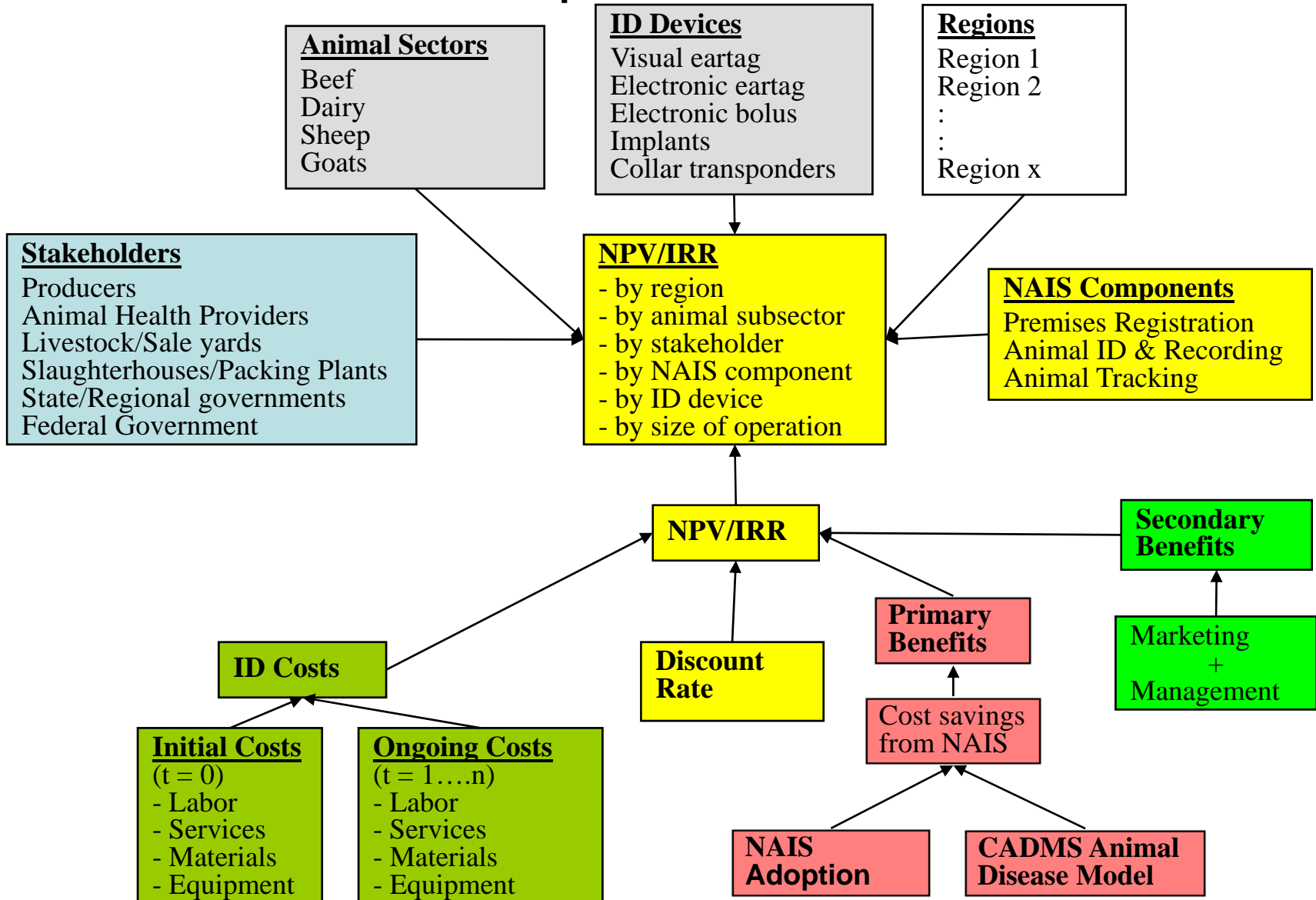
NAIS California Model

- Components: 3/5 -



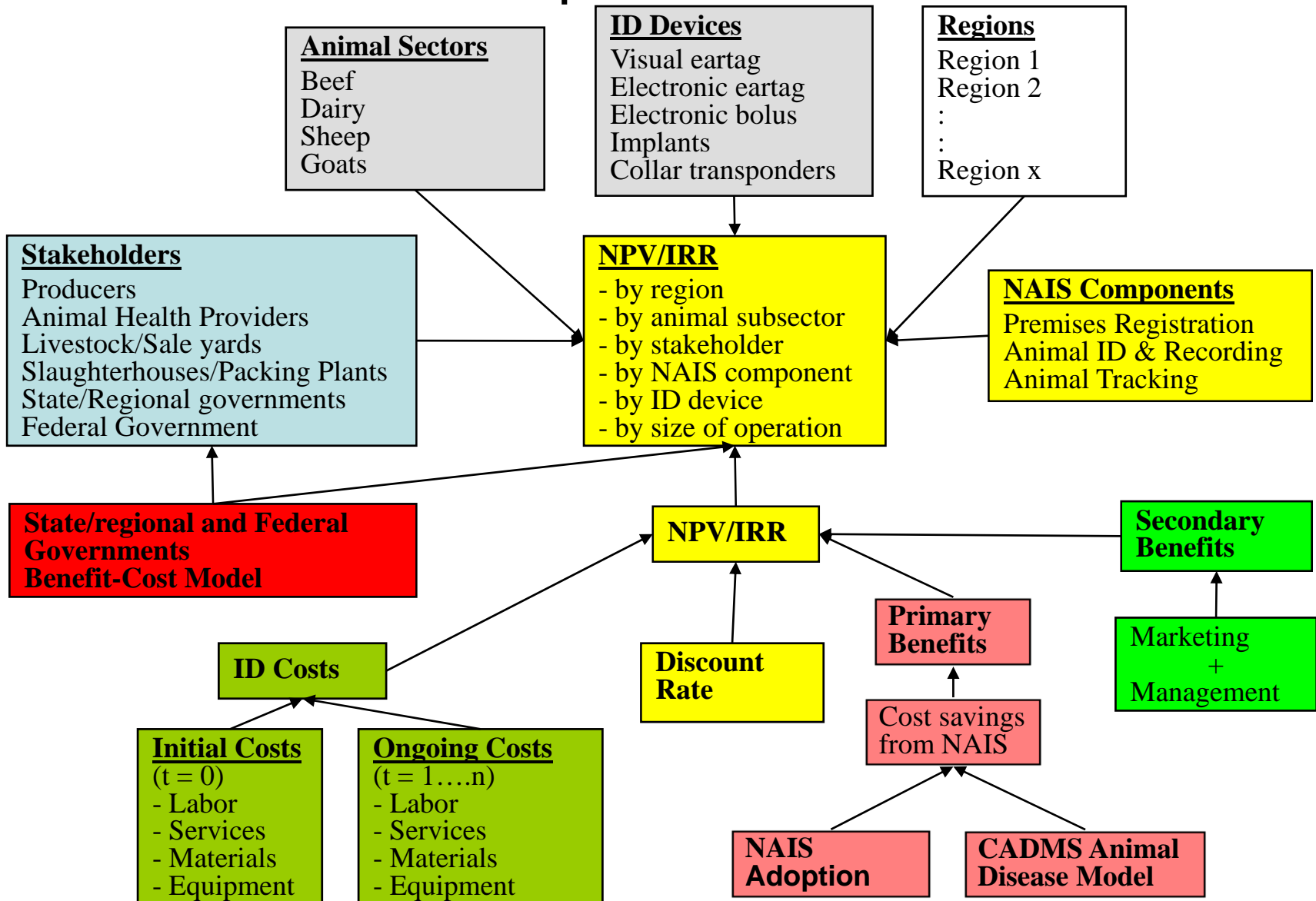
NAIS California Model

- Components: 4/5 -



NAIS California Model

- Components: 5/5 -

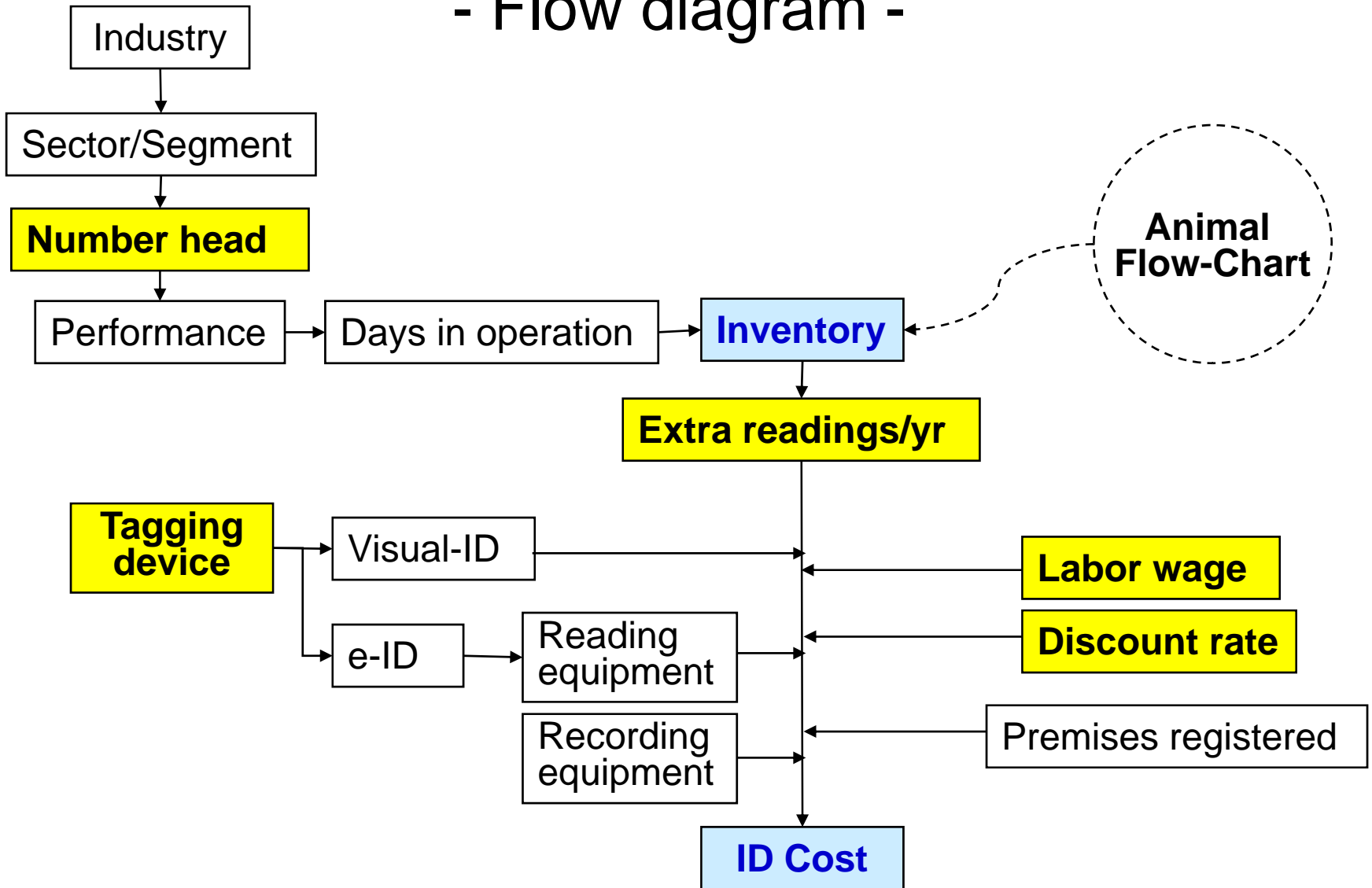


Costs of Animal ID

- We begin with the costs of animal ID systems because they are relatively easy to estimate.
- However, the model itself is large and complex and too unwieldy to demonstrate in a short time.
- Very briefly then.....

UCD-CDFA Cost-Benefit Model (v3.2)

- Flow diagram -



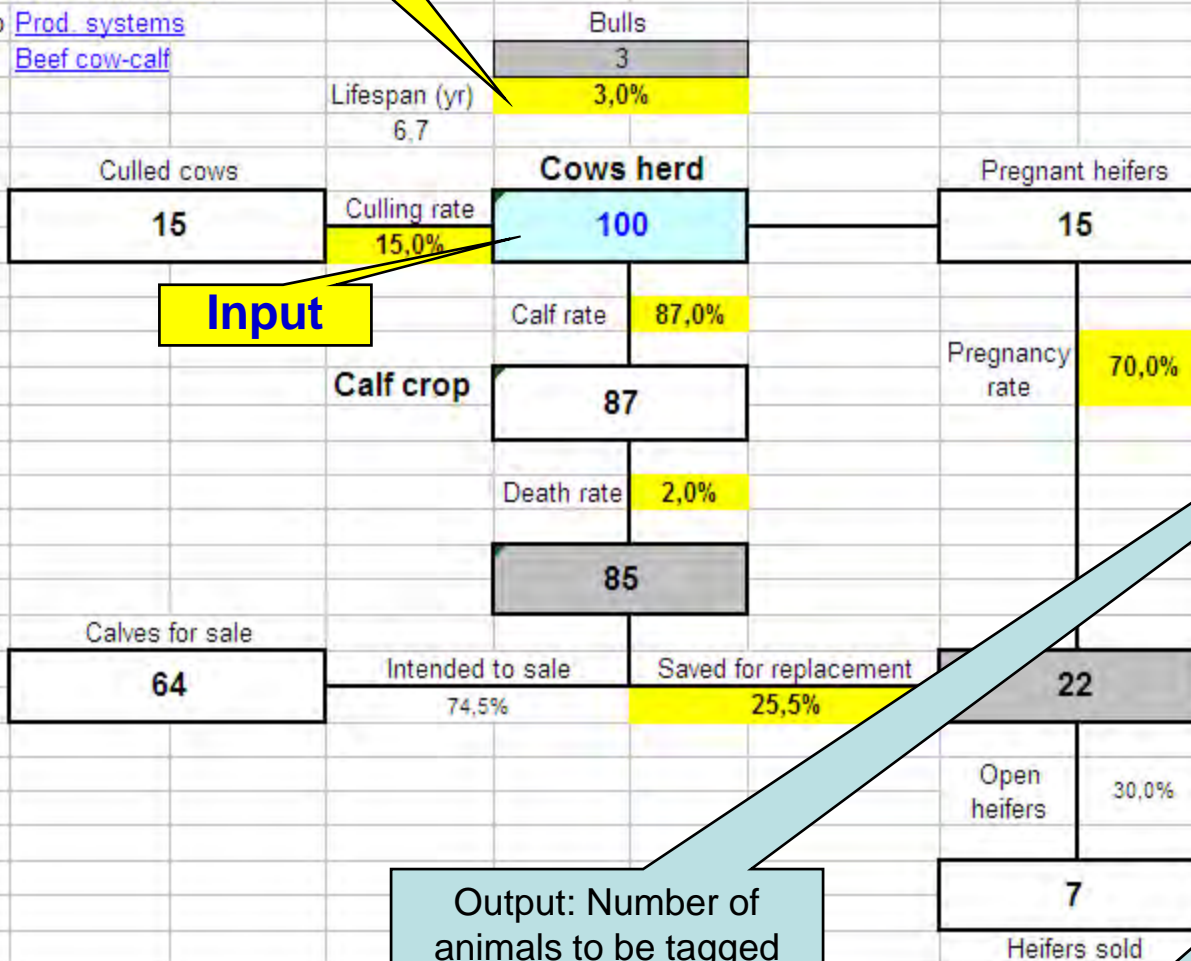
UCD-CDFA Cost-Benefit Model (v3.2)

- Cow-Calf Flow-Chart -

Input

Beef cow-calf flow:

Go to [Prod. systems](#)
[Beef cow-calf](#)



Input

Input

Output: Number of animals to be tagged

Output: Labor cost for readings

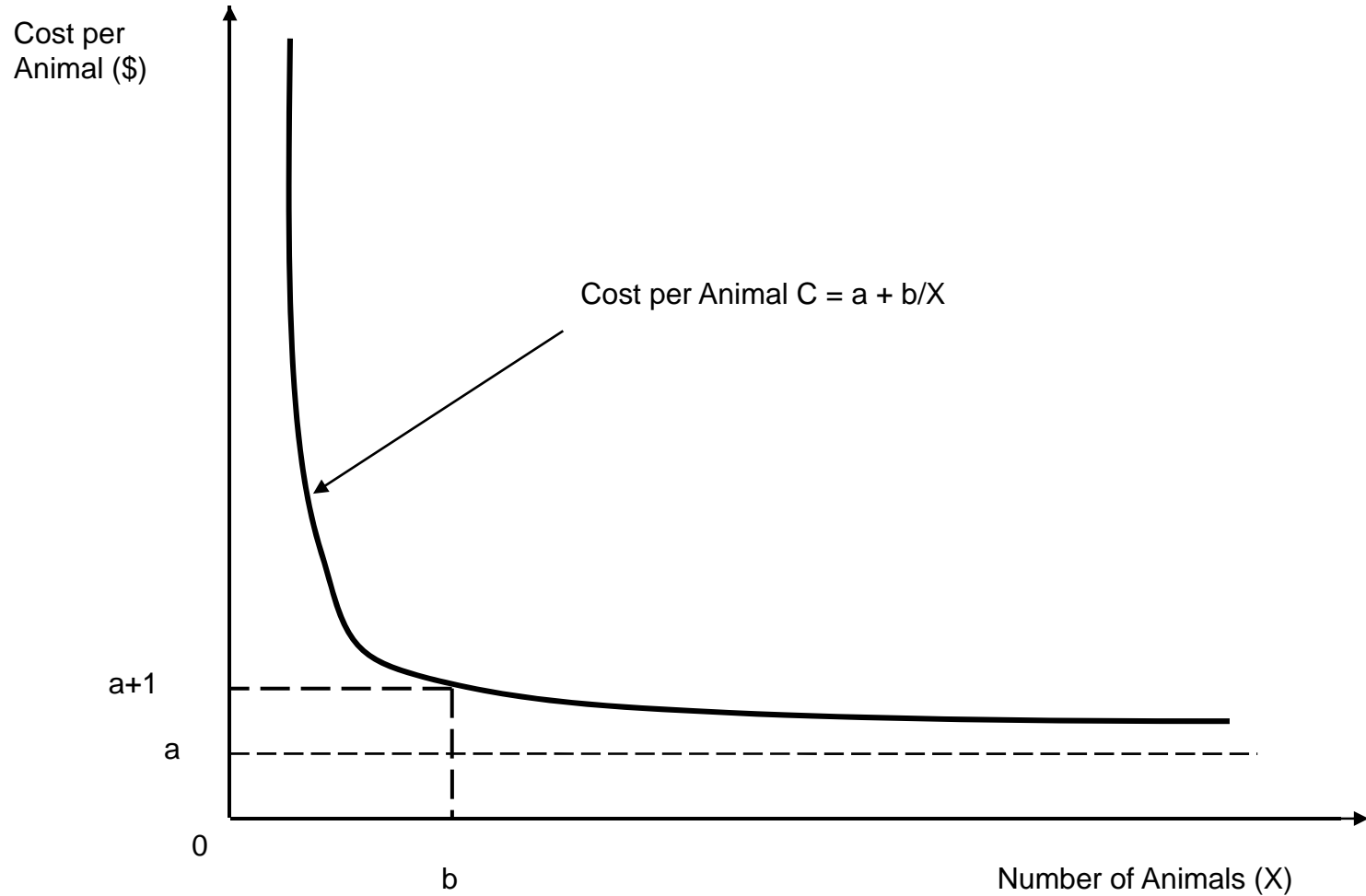
Animals inventoried per yr:	
Bulls	3
Cows	100
Live calf crop	85
Saved heifers	22
Total inventory	210
Extra readings per yr:	
Bulls	3
Cows	200
Live calf crop	85
Saved heifers	22
Total readings	5
Readings/farm	310
Ave readings (/animal/yr)	
Animals/reading/yr	1.5
	42



Cost Model Results 1

- Costs are directly and inversely proportional to size of an operation
- A complete RFID system is more expensive for small producers due to expense of readers, software and computers
- Costs of recording and reporting are minor
- Visual ID is cheaper, but burdensome due to lack of electronic ease of data collection and reporting

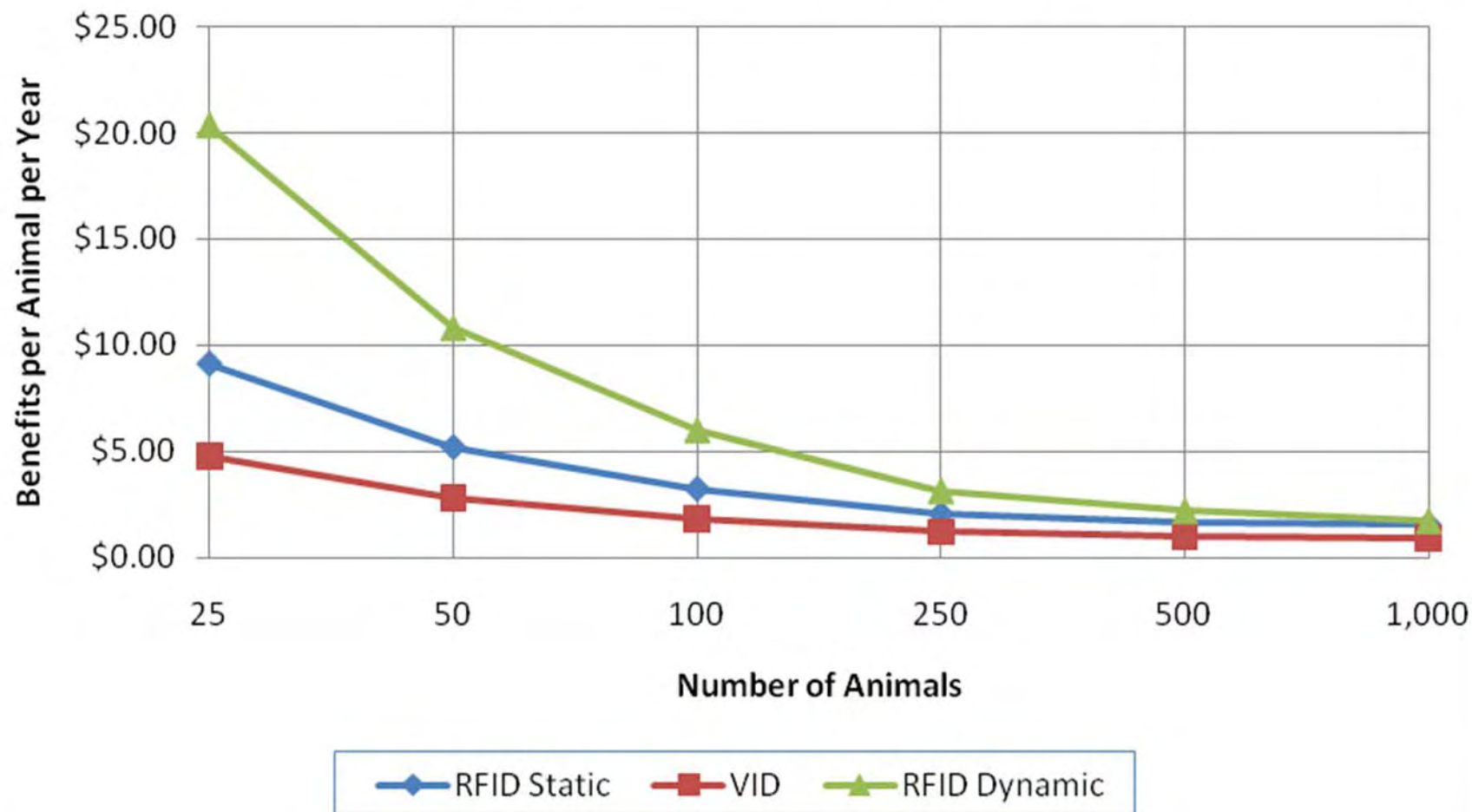
Costs of Animal ID – Cost Function



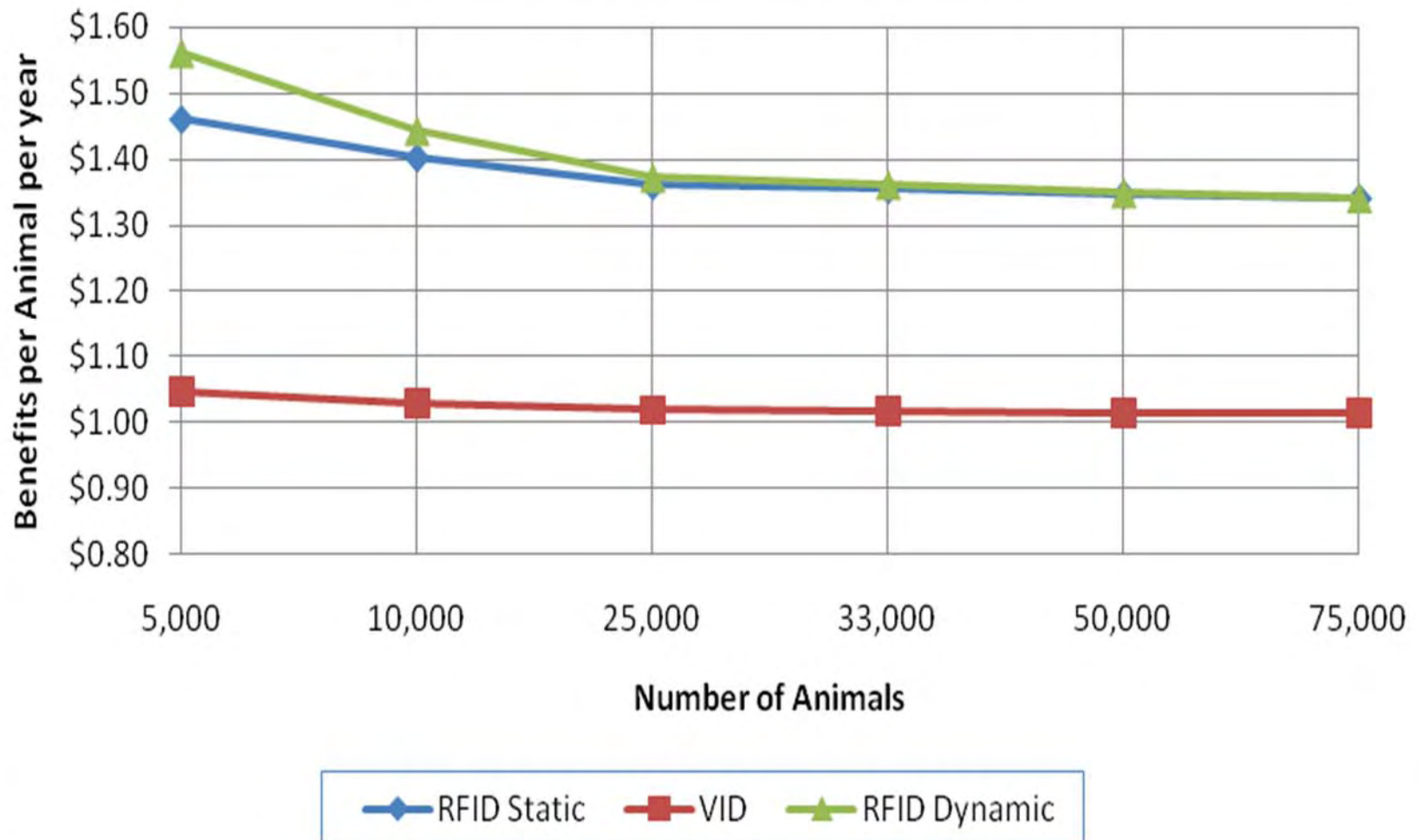
Cost Model Results 2

- Labor costs are much lower than past concerns expressed by producers
- Sensitivity analysis shows that material and capital equipment costs are main reason for variance in costs
- Cost reduction strategies examined show that costs for small and medium sized operations can be significantly reduced
 - 60 to 70% for initial costs
 - 40 to 50% for annual costs

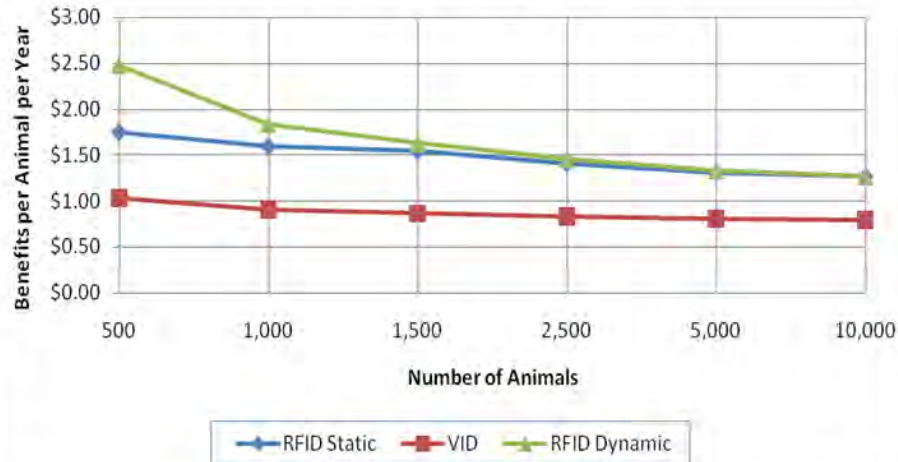
Minimum (Breakeven) Benefits Required to Offset Costs - Beef Cow-calf



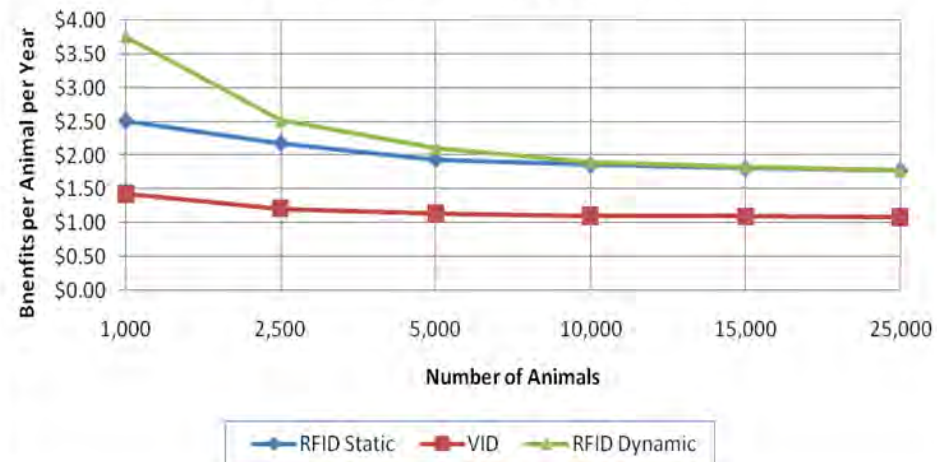
Minimum (Breakeven) Benefits Required to Offset Costs - Beef Feedlot



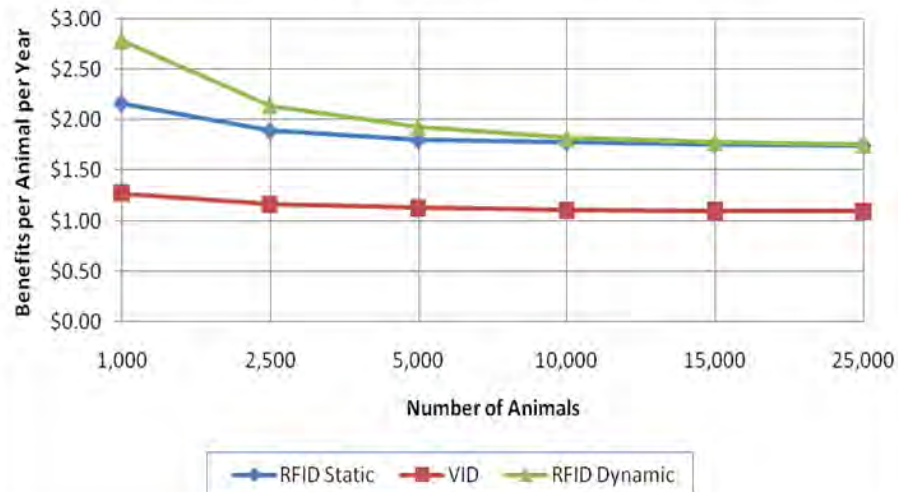
Minimum (Breakeven) Benefits Required to Offset Costs - Dairy cows-only



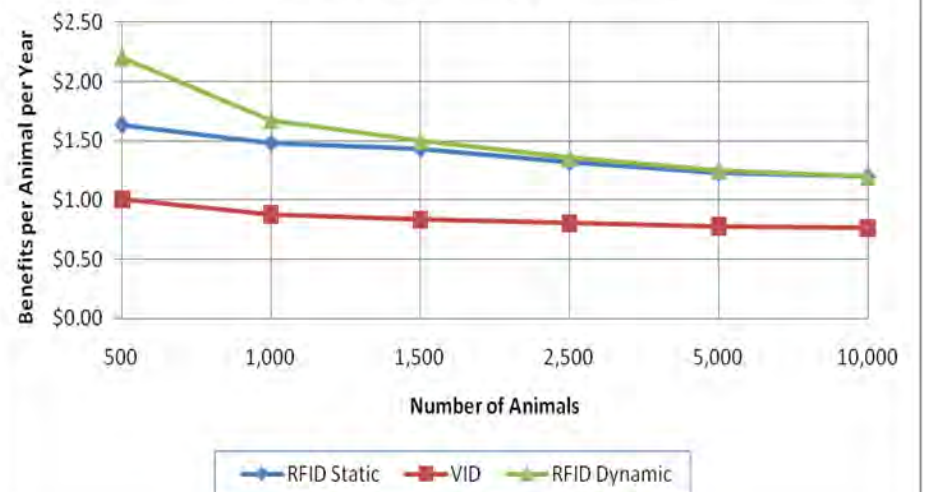
Minimum (Breakeven) Benefits Required to Offset Costs - Dairy heifers



Minimum (Breakeven) Benefits Required to Offset Costs - Beef Stocker



Minimum (Breakeven) Benefits Required to Offset Costs - Dairy Cow-heifer



Benefits of an Animal ID System

- Maintain distinction between primary and secondary benefits
- Primary benefits are main aim of NAIS – establish system of animal ID and traceability to improve abilities to identify and isolate exposure to outbreaks of serious disease
- Secondary benefits (management and marketing functions) also important, but should not be confused with primary benefits

Primary Benefits

- Lack of information – especially easily quantifiable information in \$ terms
- Used hypothetical example of FMD outbreak to demonstrate:
 - High costs of animal disease
 - Potential benefits of animal ID system
- State analysis explored benefits to CDFA and the livestock industry using past disease events
- Results showed difficulties due to:
 - Specific to particular disease in a particular location
 - Probability of disease is small but unpredictable
 - **Dependent on level of NAIS participation**

Benefits - Major Findings

- Benefits of an animal ID system accruing to benefactors depend **IMPORTANTLY** on level of participation in the system.
- Thus, impossible to evaluate benefits of NAIS without making **STRONG** assumptions about levels of participation.

Characterization of Animal ID System

- We use concepts of network effects (externalities) and critical mass to demonstrate:
 - Growth in NAIS adoption and participation
 - Critical mass points
 - Benefactors of NAIS
 - Participants
 - Non-participants
 - State
 - Society

Primary Benefits – Major Findings

- Primary Benefits increase as participation increases
- BUT, primary benefits accrue to ALL producers as system grows, regardless of whether they participate or not
- Thus, a major problem is FREE-RIDERS
- This means that all incentives to adopt an animal ID system rest almost entirely on the Secondary Benefits.

Secondary Benefits

- Secondary Benefits are incredibly difficult to estimate because they vary depending on:
 - The type of animal operation
 - The size of the operation
 - The needs of the operation
- Early adopters found it hard to estimate because it was too new—we did our best to collect data, but immaturity of system made it hard.

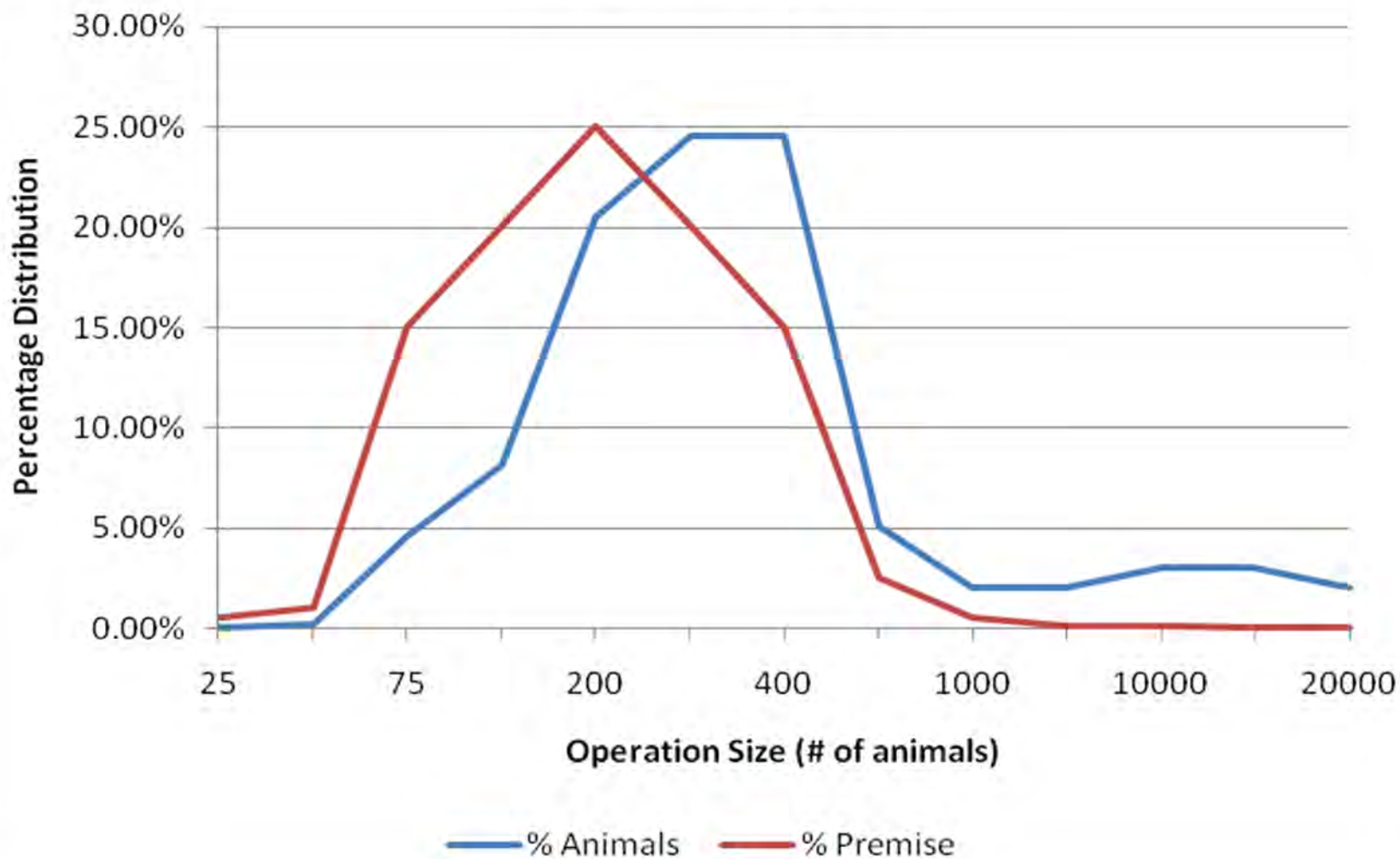
Estimating the Benefits of an Animal ID System

- For the first adopters of an animal ID system:
 - There are no primary benefits
 - Therefore adoption is based on secondary benefits only
 - Since there are substantial economies of size associated with animal ID systems then the first to adopt will be the largest operations for whom costs are lowest.

Estimating the Benefits of an Animal ID System

- Therefore we must look at a rank ordered distribution of an animal industry
- For example, we normally look at industry distributions going from small to large.....

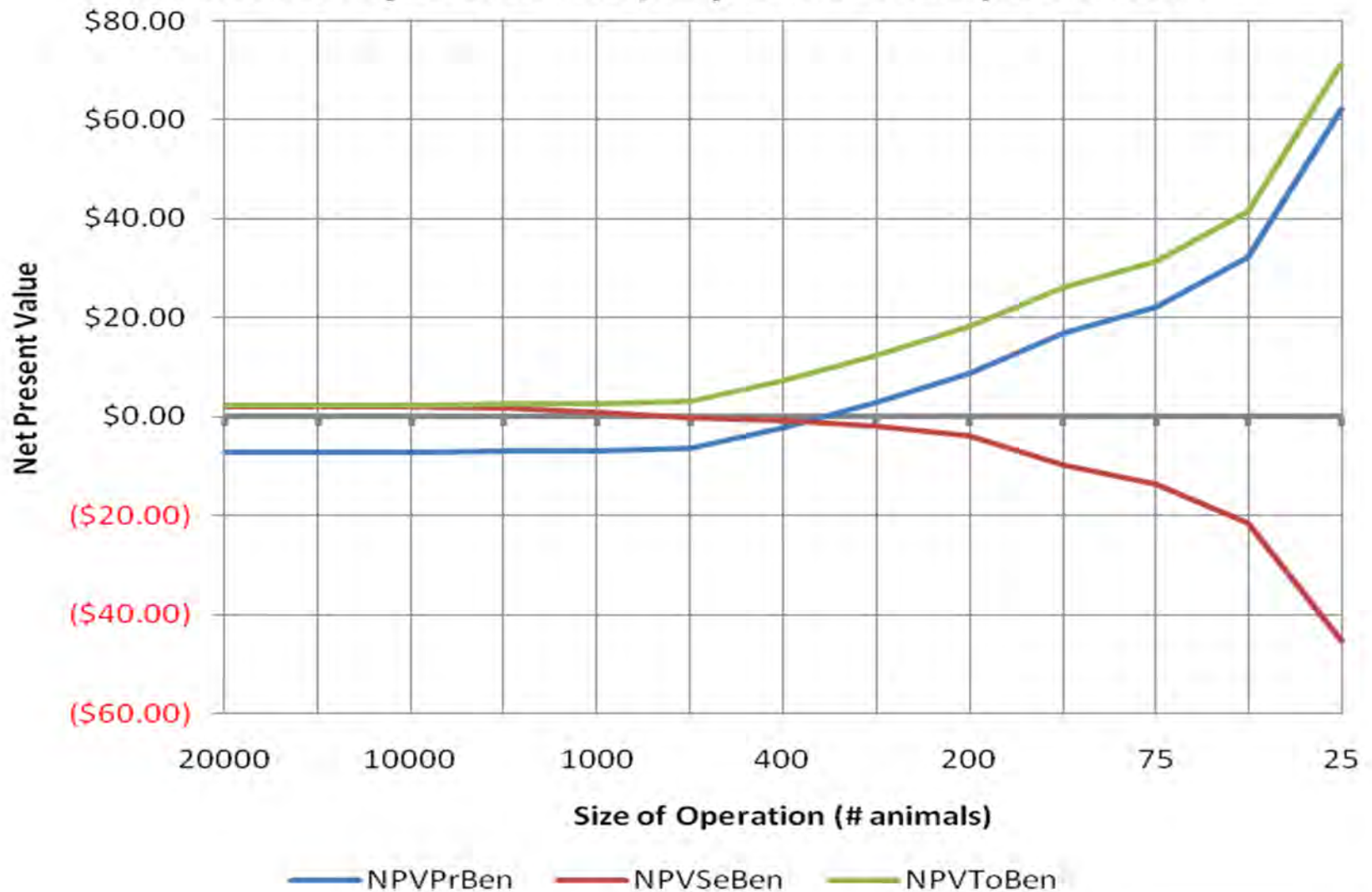
Stylized Distribution of the California Beef Industry



Estimating the Benefits of an Animal ID System

- After we determine primary and secondary benefits, total value and initial and ongoing (average annual) costs associated with an animal ID system for each size group of the industry.
- These values allow us to calculate:
 - Net Present Values for primary and secondary benefits
 - NPV of the system for each size group

Net Present Value of Primary, Secondary and Total Benefits (with constant Secondary Benefits) by Size of Operation



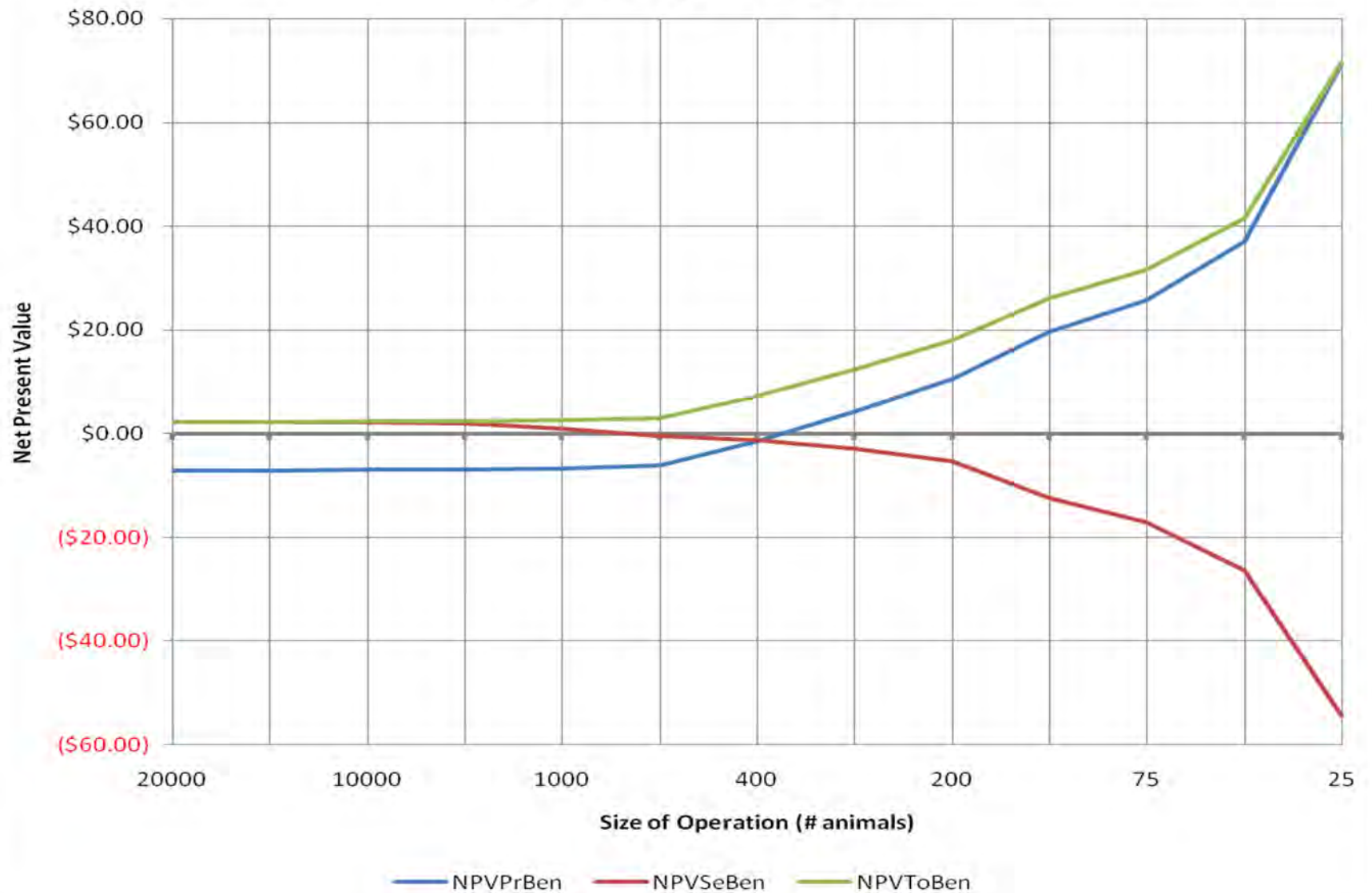
Estimating the Benefits of an Animal ID System

- In this case, the NPV of the **secondary** benefits are positive for all operations above about 400 animals, after which they become negative
- But, **primary** benefits are negative for all operations above about 400 animals, after which they become positive.
- Thus, the only incentives to adopt an animal ID system for operations below 400 animals are incentives associated with primary benefits.
- This of course assumes that ALL operations above the critical mass point adopt animal ID.

Estimating the Benefits of an Animal ID System

- It is unlikely, however, that secondary benefits will increase as the system grows.
- In fact, it is most likely that secondary benefits will actually decrease as the system grows.
- Why? Because all the secondary benefits that initial adopters gain from early adoption become so commonplace that they turn into costs of not adopting, as with almost all technologies.

Net Present Value by Operation Size with Declining Secondary benefits



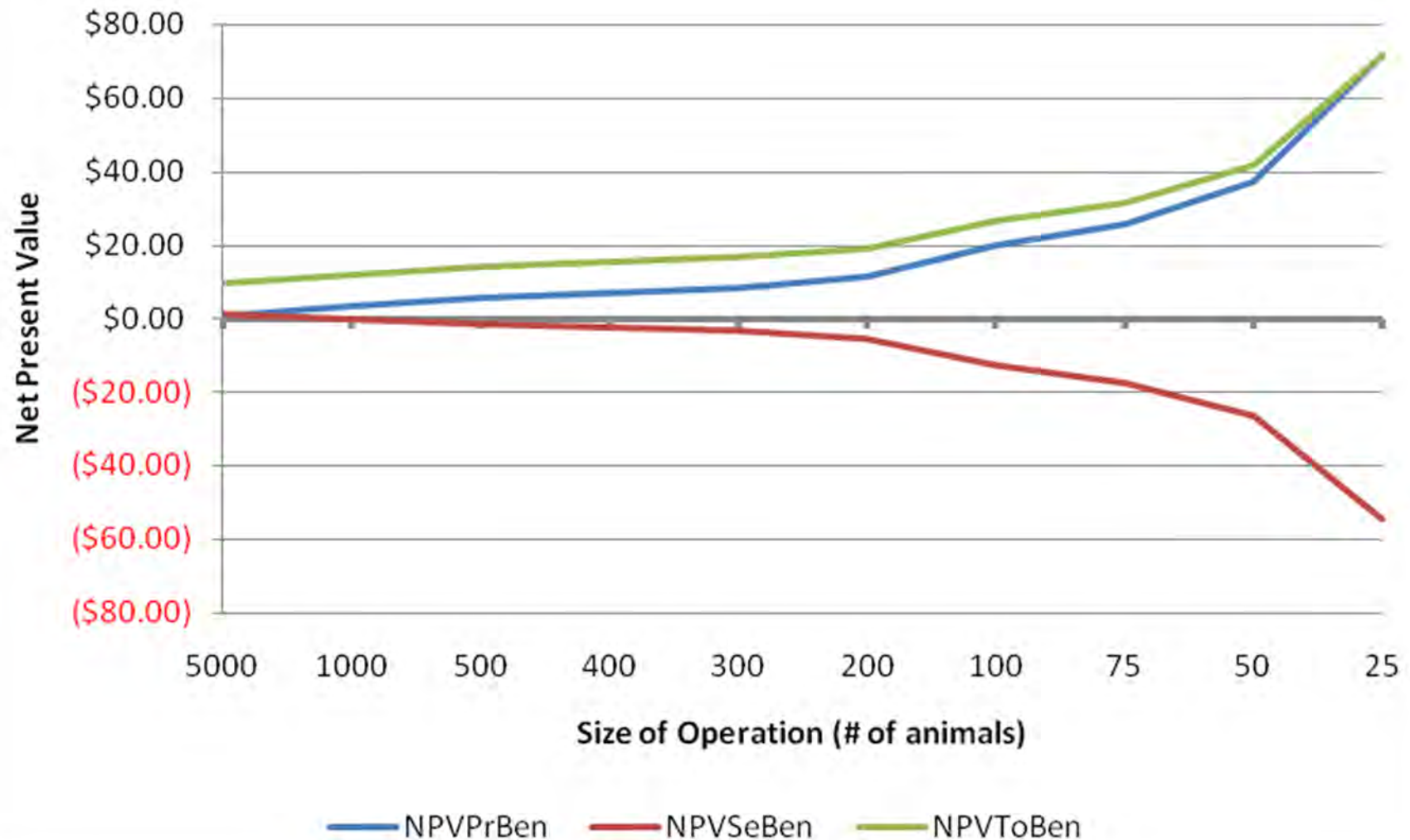
Estimating the Benefits of an Animal ID System

- That gap represents somewhere between 18% - 50% of the cumulative animal distribution, and about 4% - 30% of the cumulative premises distribution.
- More importantly, it represents an area in which the feasibility of adopting an animal ID system breaks down for this industry.

Estimating the Benefits of an Animal ID System

- These results for the California beef industry are due solely to the distribution of animals and premises.
- The California dairy industry, for example, has a much more “normal” distribution of animals and premises.
- Thus, these “gaps” in feasibility do not occur for all industries.
- Easier for producers to see a return on investment in the dairy industry

California Dairy Industry: Net Present Value by Operation Size with Declining Secondary Benefits



Other Considerations

- There is lots more to do with this type of analysis.
- As mentioned previously, there are a number of cost reduction strategies that smaller producers can adopt that would reduce the costs of adoption.
- BUT, these cost reduction strategies also limit producers ability to utilize secondary benefits.
- Will dramatically reduced costs result in feasible adoption or not?
- How important is the difference between “feasibility” and “incentive” to adopt?

Conclusions

- Voluntary systems only work up to a point
 - after which it will be necessary to make it mandatory.
- There are good arguments for NOT making it mandatory from the very start
 - Industry buy-in
 - Political buy-in
 - Mandatory programs have a nasty habit of not being a socially optimal outcome.
- Industry driven solutions

Conclusions

- There are a number of ways of overcoming the free-rider problems without making the system mandatory:
 - Industry Induced Market Standards
 - Subsidies
 - Taxes
 - Changing Property Rights
 - Indirect Legislative actions

Conclusions

- Industry groups need to be more aggressive and proactive than before about solutions for national traceability
 - Focus on common ground first and work through the problem areas.
 - In these situations, many groups may agree on 80+% of the issues, but last 10 to 20% prevents implementation
 - Our trading partners and foreign competition are already accelerating away from the US.

