Value of Sexed Semen

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Introduction

- Sexed semen: higher proportion of female calves
- Female calves: more valuable than male calves
- Sexed semen: economically attractive
- However: sexed semen also compromises fertility
- Bottom line: sexed semen brings more female calves but with lower conception rates

Introduction

- A series of other factors affect the economic decision of using sexed semen
- The decision of using sexed semen could be based on economics of using a new technology
- Sexed semen is recommended for virgin heifers
- Wisconsin dairy producers are using sexed semen with heifers in first and second services

Objectives

- Present a framework of how to calculate the economics of using sexed semen on heifers
- Define biological and economic parameters needed to evaluate the use of sexed semen
- Discuss results for baseline conditions
- Demonstrate the use of a user-friendly decision support system
- Hands on use of the decision support system

Framework

- Partial budgeting: new technology will impact a specific part of management
- Partial budgeting:
  - Additional revenues
  - Additional costs
  - Revenues foregone
  - Reduced costs

Framework

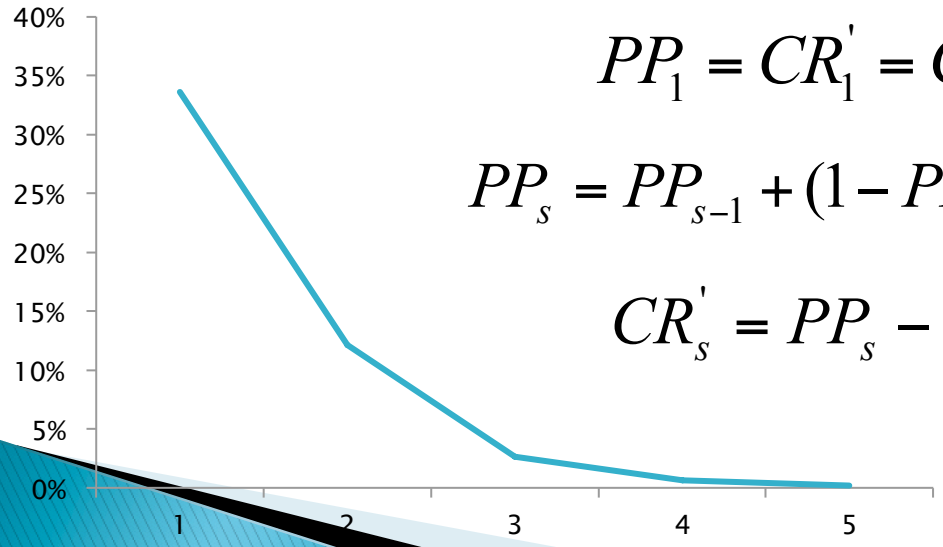
- Net Present Value (NPV): fair comparison between technologies
  - $\text{NPV} = \sum_{s=1}^{5} (\delta_s)(NPV_s) + (\delta_5)(HC - HR)(1 - PP_5)$
- Expected Value (EV): difference between sexed semen and conventional programs
  - EV = NPV(X) – NPV (NX)

Framework

- Overall EV
  - Overall EV= $\left(\sum_{t=1}^{5}\sum_{CR=1}^{3} EV_{t,CR}\right)/(5trt*3CR)$
- 5 treatments
- 3 levels of conception rate
- Average of 15 possible outcomes

Framework

- NPV for each service
  - $NPV_s = CR_s^{'} * (CV - DC) - (1 - PP_s) * MC - AIC$
- Survival curves using conditional probabilities



$$PP_1 = CR_1^{'} = CR_1$$

$$PP_s = PP_{s-1} + (1 - PP_{s-1}) * CR_s \quad \text{for s = 2 to 5}$$

$$CR_s^{'} = PP_s - PP_{s-1} \quad \text{for s = 2 to 5}$$

Framework

- Assumptions
  - Reproductive program starts on 14-mo old heifers (420 d age)
  - Producers will attempt up-to 5 consecutive reproductive services on heifers

Experiment

Treatment	Service 1	Service 2	Service 3	Service 4	Service 5
Trt 1	X	NX	NX	NX	NX
Trt 2	X	X	NX	NX	NX
Trt 3	X	X	X	NX	NX
Trt 4	X	X	X	X	NX
Trt 5	X	X	X	X	X
Control	NX	NX	NX	NX	NX

Reproductive Parameters

- Conventional CR:

Low	Average	High
34%	56%	83%

- Sexed semen CR: 80% of Conventional
- Decrease in CR: 2.5% for additional service
- Heifer calf rate:

Conventional	Sexed Semen
46.7%	89%

Economic Parameters

- Premium paid for sexed semen: $30

- Calf value:

Female	Male
$562	$48

- Dystocia cost:

Female	Male
$22.15	$34.91

Other Economic Parameters

Parameter	Conventional and Sexed Semen
Maintenance or day open (DO) cost	$2.4/d
Salvage value of 20-mo non-pregnant heifer	$904
Value of 20-mo pregnant heifer	$1,200
Interest rate	12%/yr

Results & Discussion

- Overall EV: $30.1/heifer

Treatment	Low CR 34%	Average CR 56%	High CR 83%	CR for positive EV
	($/heifer)			
Trt 1	6.5	49.3	100.0	31%
Trt 2	-3.4	57.8	111.6	36%
Trt 3	-23.1	46.4	96.1	41%
Trt 4	-48.9	24.7	71.7	48%
Trt 5	-78.5	-2.7	43.9	58%

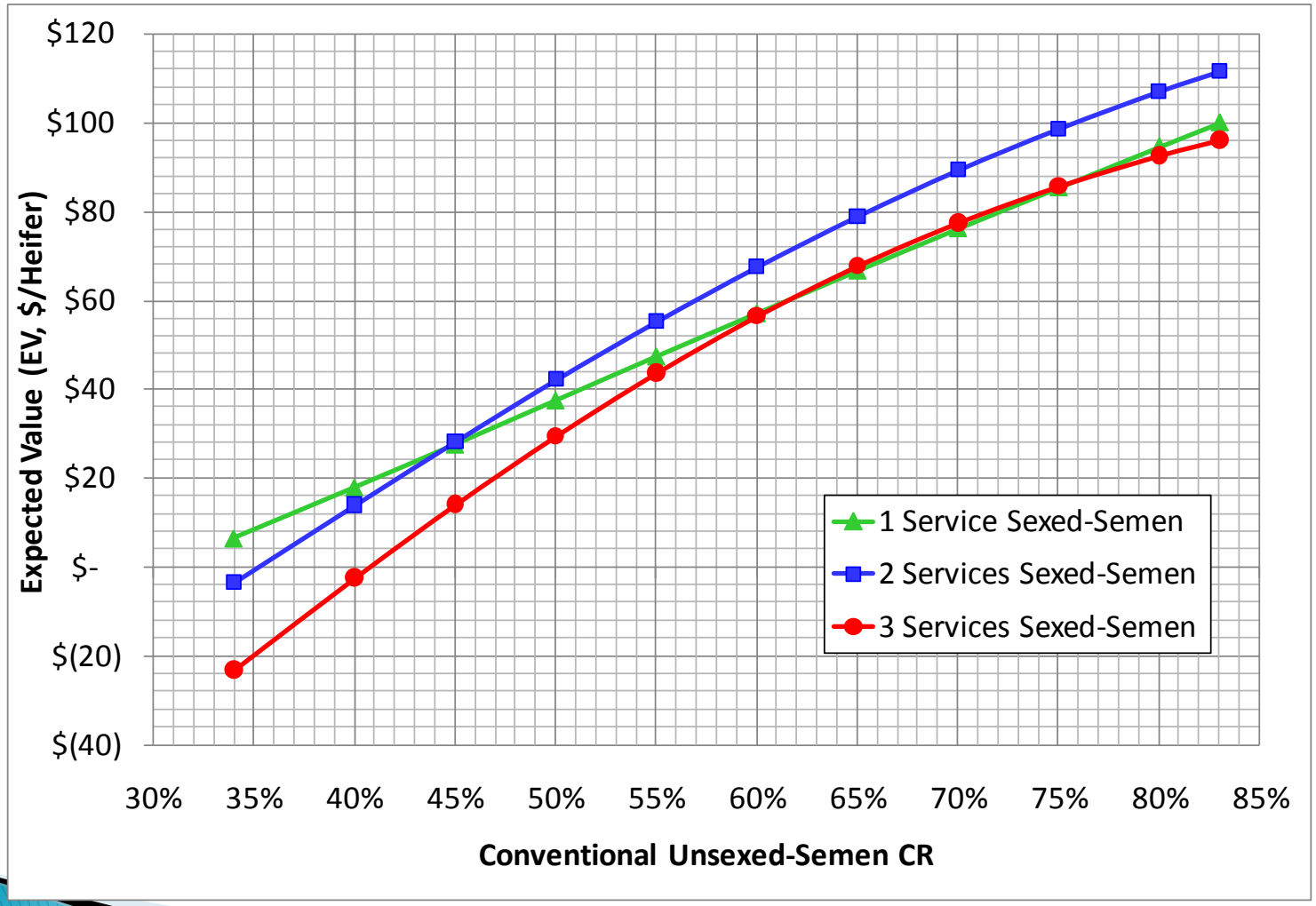
Results & Discussion

Scenario	Overall EV	CR for positive EV	Low CR 34%	Average CR 56%	High CR 83%
	($/heifer)	(%)	# Consecutive Services + EV		
X CR 85% of NX	46.10	31	1	4	5
X CR 75% of NX	12.50	36	0	4	5
X heifer ratio 95%	52.40	27	2	5	5
X heifer ratio 78%	-10.90	41	0	3	4
Female calf $700	69.30	25	3	5	5
Female calf $280	-50.10	59	0	0	2
X premium $40	1.10	37	0	3	4
X premium $20	59.1	26	3	5	5
Dystocia $42.8	32.40	30	1	5	5
Dystocia $14.27	27.70	31	1	4	5

Results & Discussion

Scenario	Low CR 34%	Average CR 56%	High CR 83%
	Number of Services with Maximum +EV		
Baseline	1	2	2
X CR 85% NX & X heifer ratio 95%	2	2	2
X heifer ratio 95% & female calf $700	2	2	2
X CR 85% NX & female calf $700	2	2	2
X CR 85% NX & X heifer ratio 95% & female calf $700	2	3	2
X CR 75% NX & X heifer ratio 78%	NONE	1	1
X heifer ratio 78% & female calf $280	NONE	NONE	1
X CR 75% NX & X heifer ratio 78% & female calf $280	NONE	NONE	NONE

Results and Discussion



Results & Discussion

	Baseline Value	Change Value	Change on Overall EV
Maintenance or DO cost	$2.4/d	+$0.1	-$1
Salvage value	$1.79/kg	+$0.1	-$1
20-mo old pregnant heifer value	$1,200	+$100	-$2.84
Dystocia cost	$28.53/heifer	+$10	+$1.44
Premium paid for X semen dose	$30	+$5	-$14.50
Discount rate	12%	10%	-$0.1

Conclusions

- In most of the cases sexed semen would have a higher economic value than conventional semen
- Single most important factor in the decisions is the conventional CR:
  - Between 34 and 44%: Optimal Trt 1
  - 45% or higher: Optimal Trt 2

Conclusions

- Other important parameters:
  - Female calf value (++)
  - X semen CR (+)
  - X expected proportion of females (+)
  - Premium for X semen (+)

- Other parameters will only have limited impact on the decisions

Other Considerations

- Implications for farm herd expansion
- Faster genetic improvement

- Greater incidence of stillbirths
- Longer gestation period

- Decreased bio-security risks

- Implications for US herd expansion

Decision Support Challenge

- Results are not applicable to all farm situations
  - Every farm is different
- Results are not applicable to all market conditions
  - Market conditions change permanently
- Challenge: provide the same analysis, but as a decision support system aid for practitioners

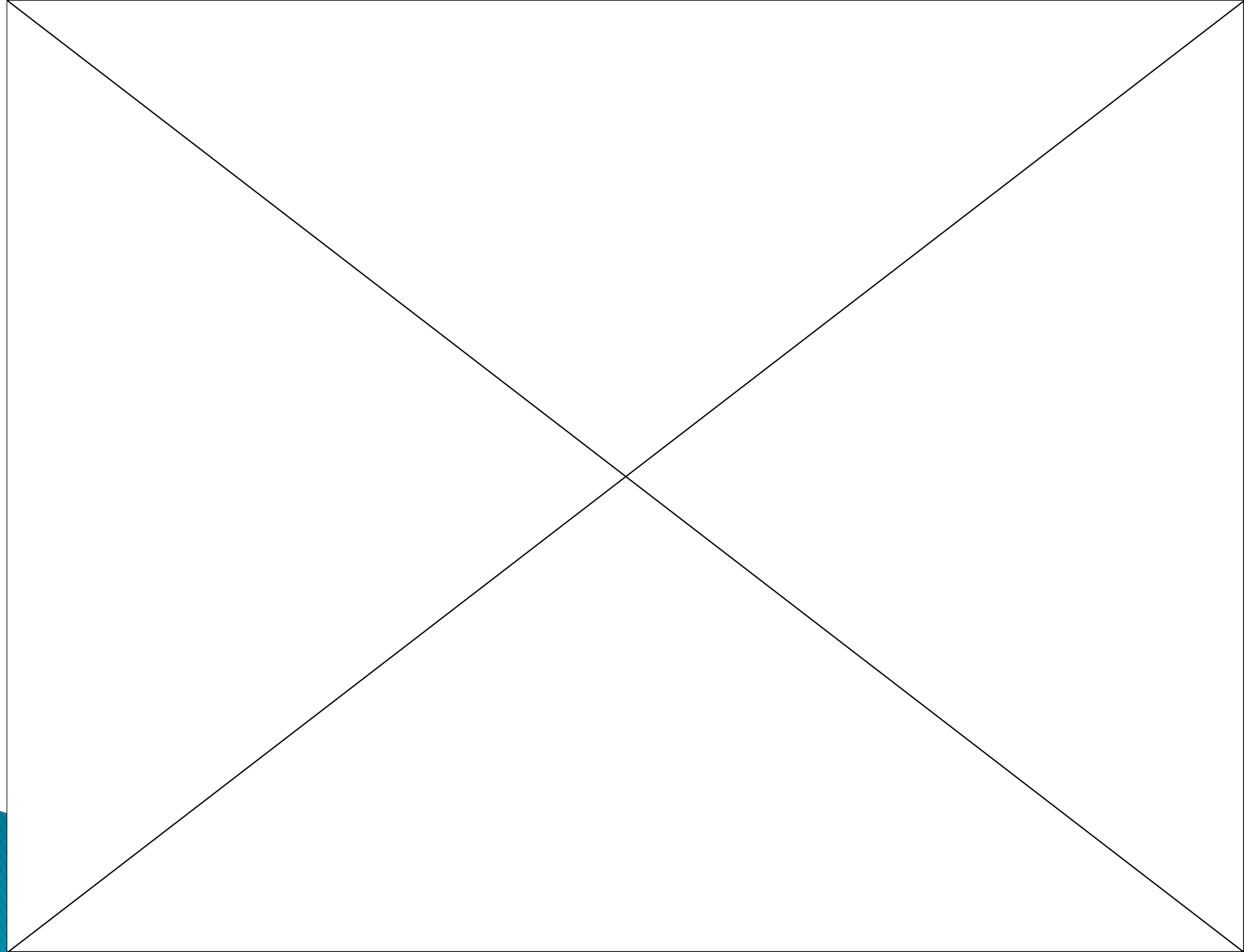
Decision Support Challenge

- Spreadsheets are good and popular, but:
  - Need download
  - Could have compatibility issues
  - Difficult to maintain latest updated version

- A Decision Support System (DSS) should preferably be:
  - Visually attractive
  - Interactive
  - Robust
  - Available online
  - Self-contained

Decision Support Challenge

- A Decision Support System (DSS) should have preferably:
  - Secured calculations
  - Clear instructions
  - Technical support available



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