

Daily Markov-Chain Simulation Model for Selection of Reproductive Programs in Dairy Herds

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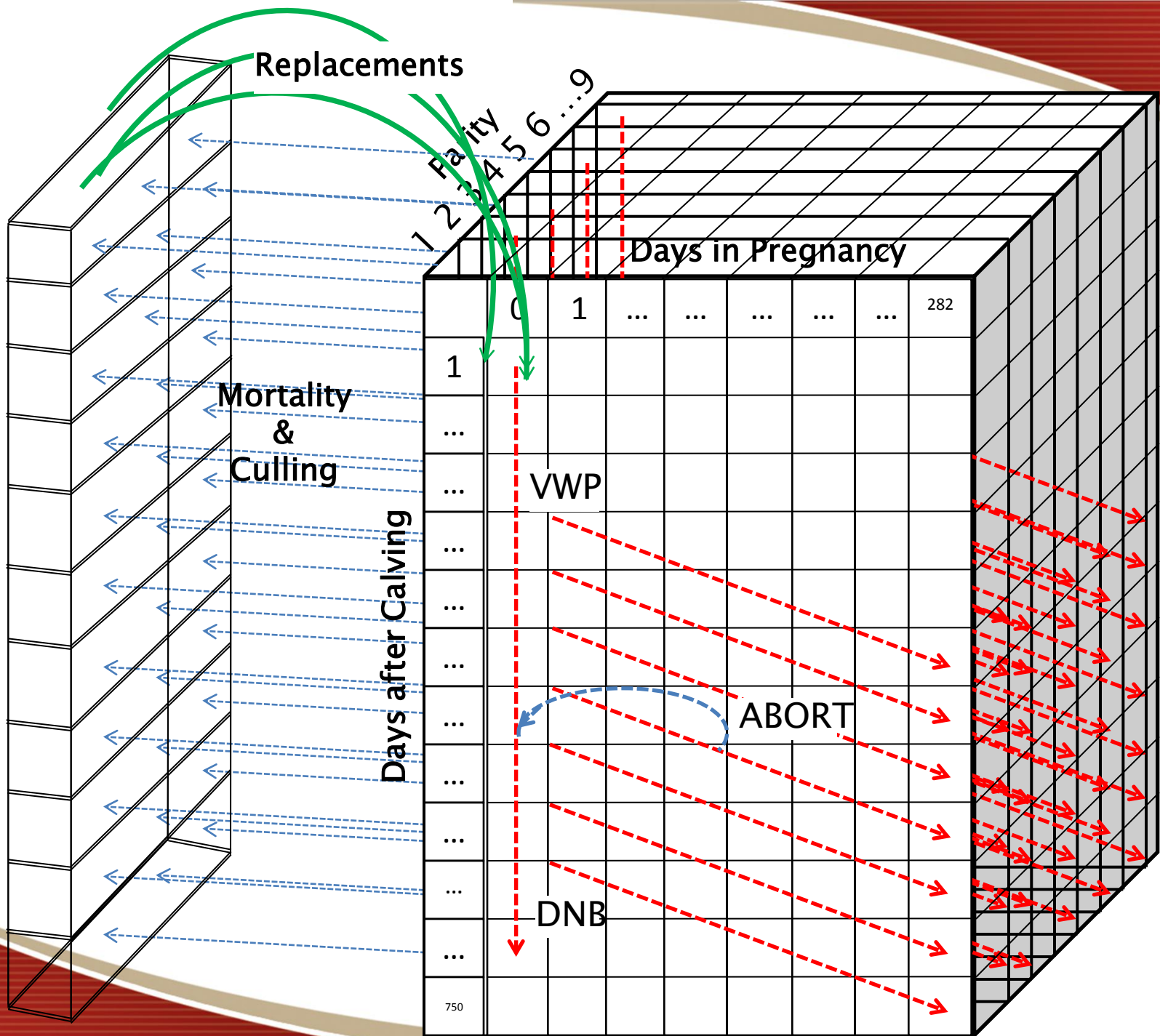


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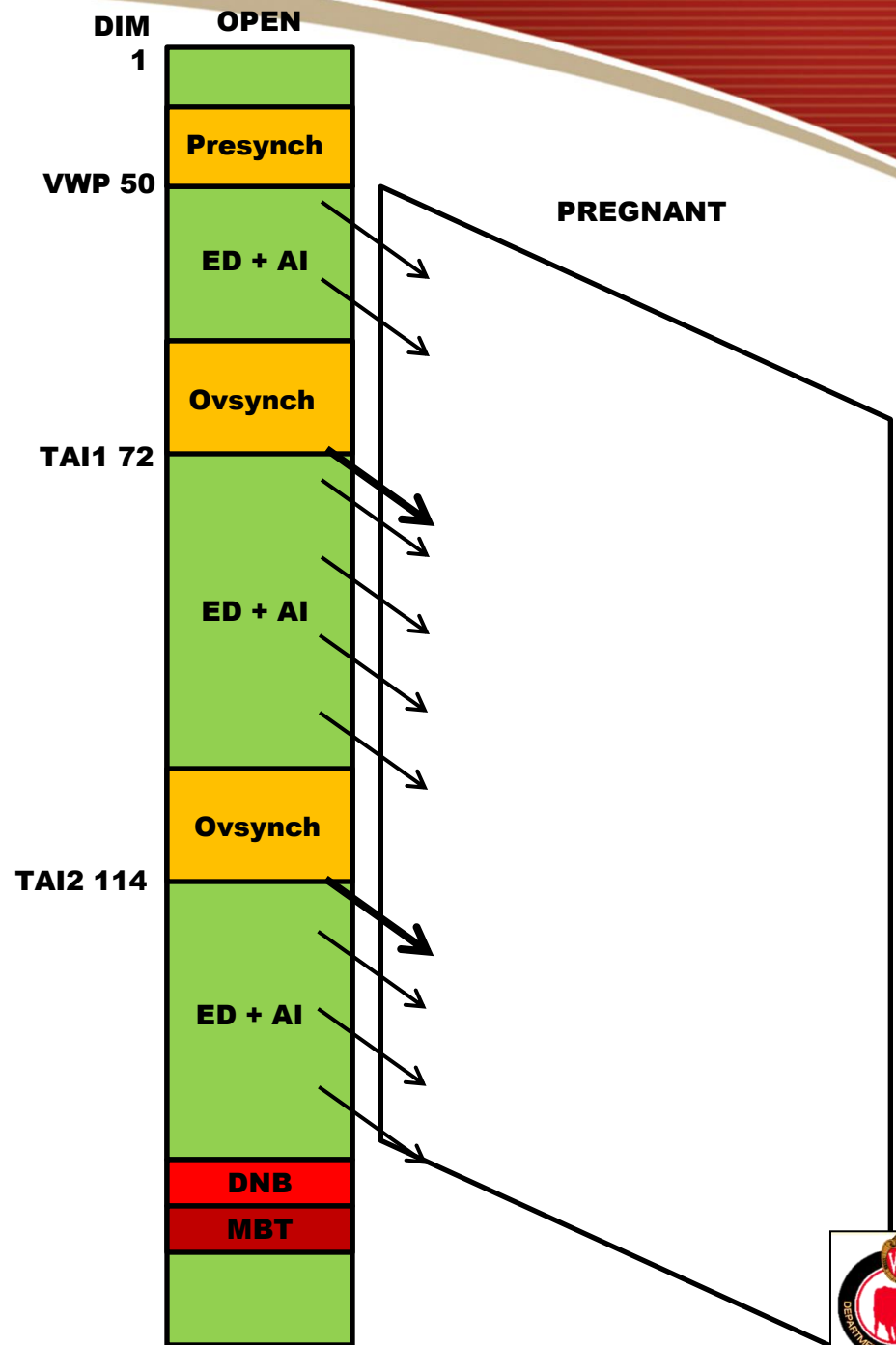
Objective

**Create a tool that allows
“economic based”
decision making for
selection of reproductive
management programs
in dairy farms**



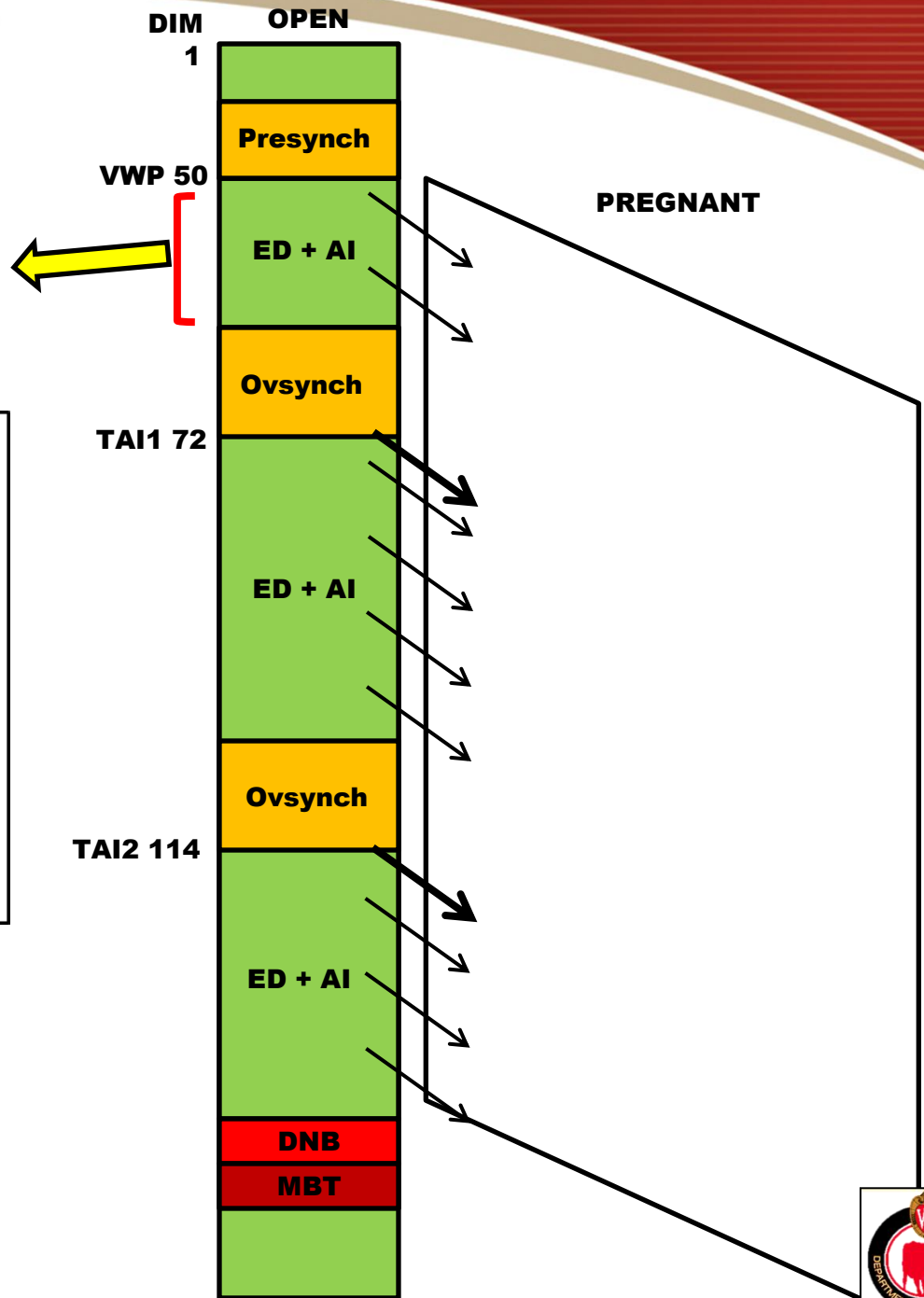
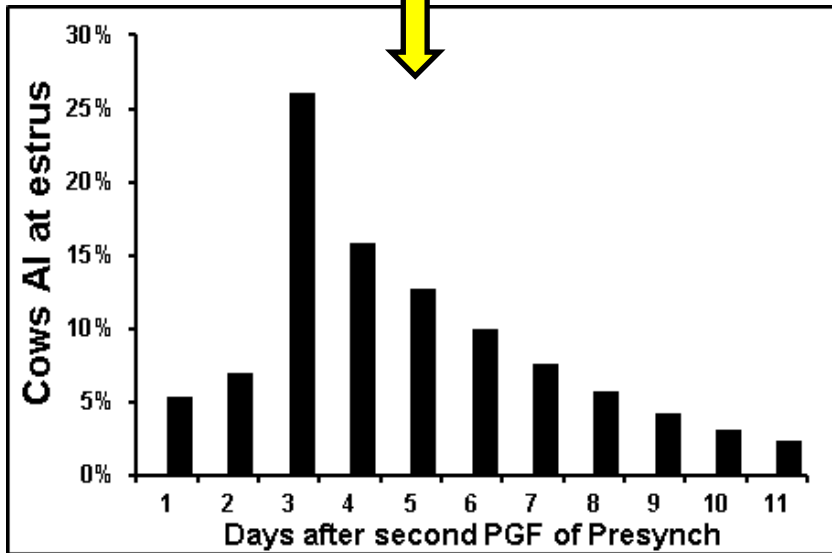


Probability of Pregnancy



Probability of Pregnancy

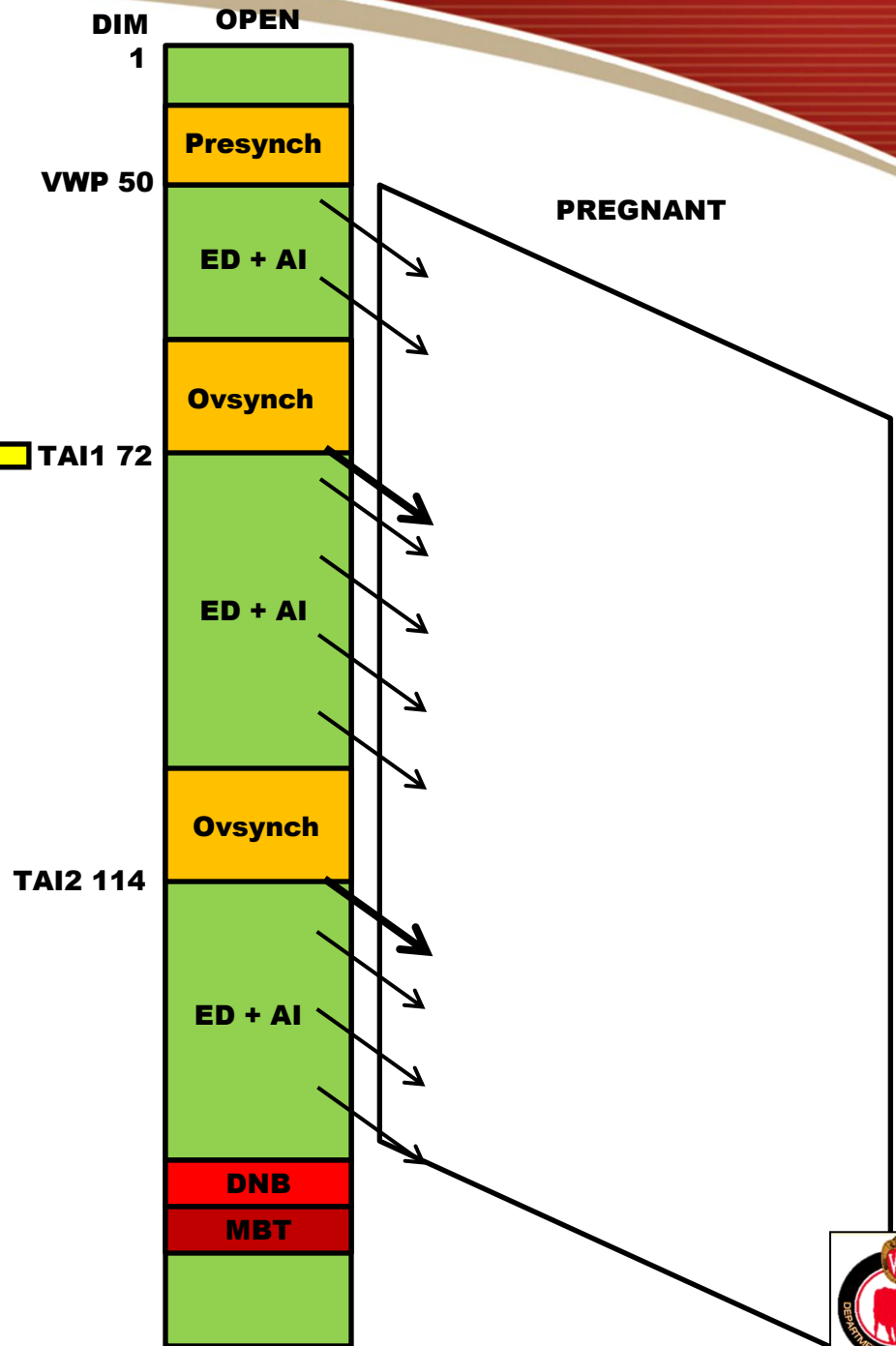
$$DPP_{DIM} = SR_{DIM} \times CRED$$



Probability of Pregnancy

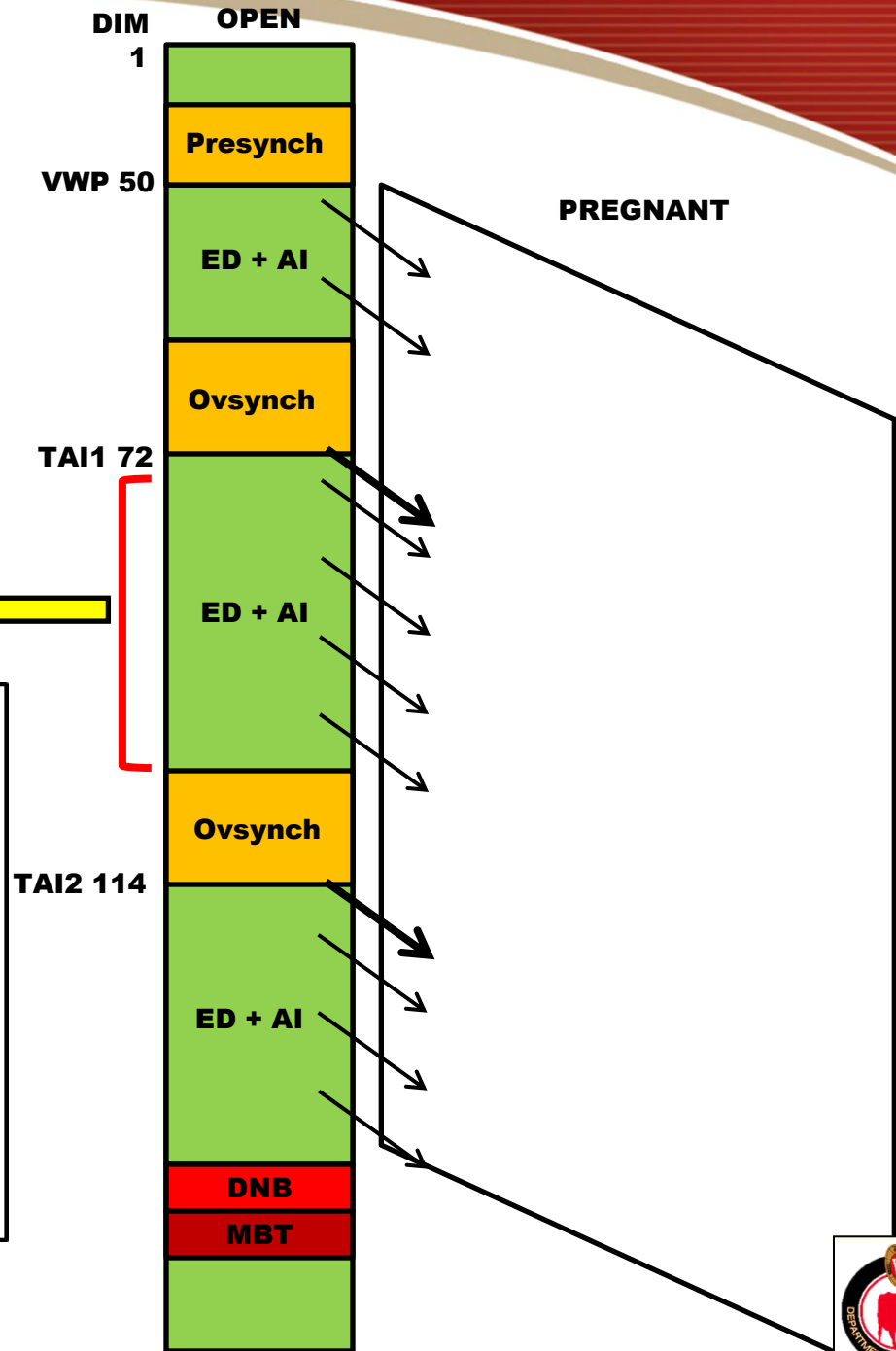
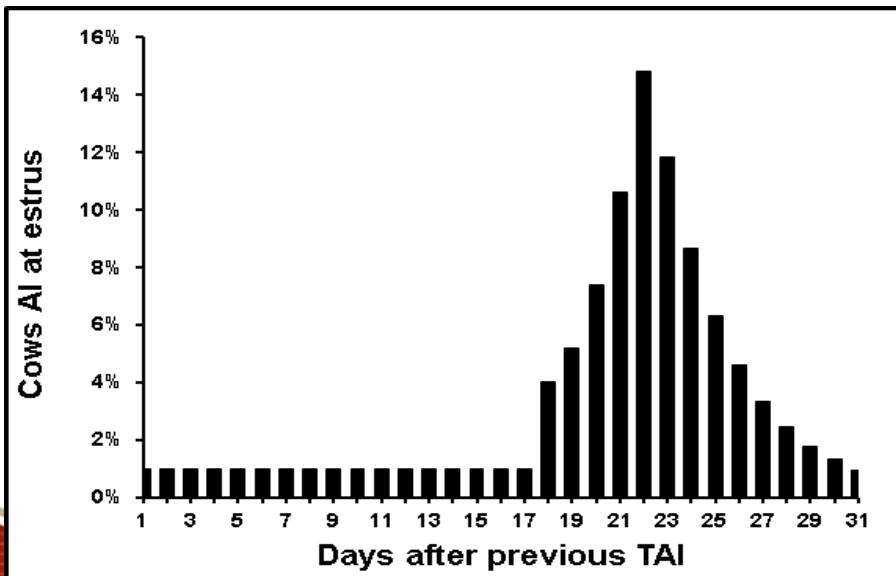
$$DPP_{DIM} = SR_{DIM} \times CRTAI$$

↓
 $BE = 1 - AI$










Probability of Pregnancy

$$DPP_{DIM} = SR_{DIM} \times CRED$$



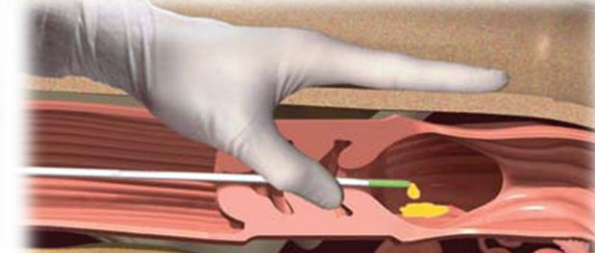
Program Net Value

$$NV_r = \sum_{l=1}^9 \sum_{DIM=1}^{750} \sum_{p=0}^{282} Ps_{l,DIM,p} \times [IOFC + CV + NRCC + MC + RCC + RPC]_{l,DIM,p}$$

-  **NV = net value**
-  **IOFC = Income Over Feed Cost**
-  **CV = calf value**
-  **NRCC = non-reproductive culling cost**
-  **MC = mortality cost**
-  **RCC = reproductive culling cost**
-  **RPC = reproductive program cost**

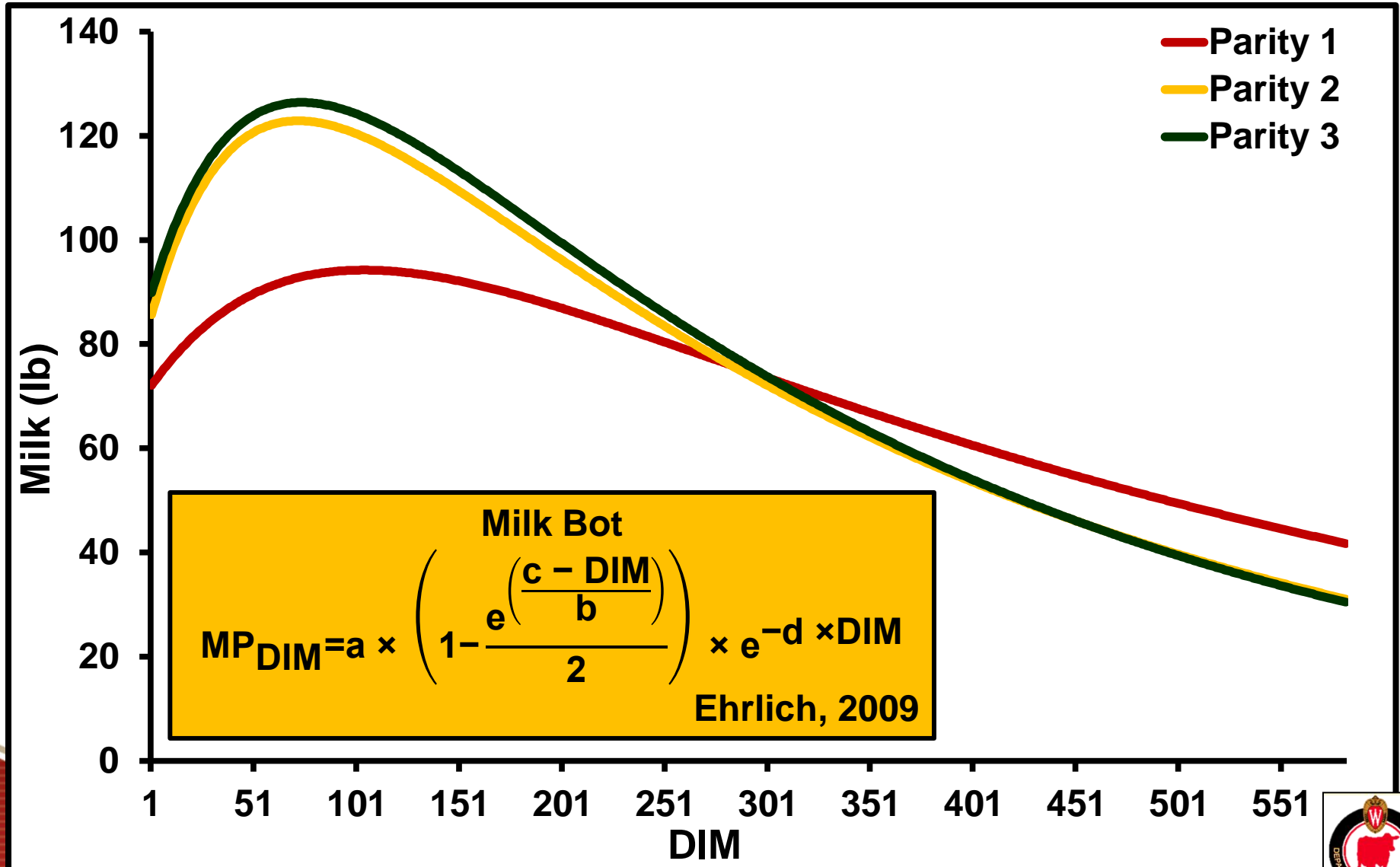


Data Inputs Case Study



Program	1 st AI			2 nd and subsequent AI		
	ED before 1 st TAI	² CR ED	CR TAI	ED before TAI	CR ED	CR TAI
TAI 1	0	-	42	0	-	30
TAI + ED 2	30	25	40	30	25	30
TAI + ED 3	40	25	38	40	25	30
TAI + ED 4	50	25	36	50	25	30
TAI + ED 5	60	25	34	60	25	28
TAI + ED 6	70	25	32	70	25	28
TAI + ED 7	80	25	30	80	25	28
TAI + ED 8	30	30	40	30	30	30
TAI + ED 9	40	30	38	40	30	30
TAI + ED 10	50	30	36	50	30	30
TAI + ED 11	60	30	34	60	30	28
TAI + ED 12	70	30	32	70	30	28
TAI + ED 13	80	30	30	80	30	28
TAI + ED 14	30	35	40	30	35	30
TAI + ED 15	40	35	38	40	35	30
TAI + ED 16	50	35	36	50	35	30
TAI + ED 17	60	35	34	60	35	28
TAI + ED 18	70	35	32	70	35	28
TAI + ED 19	80	35	30	80	35	28

Lactation Curves

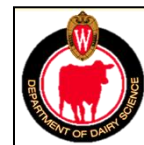


Economic Parameters

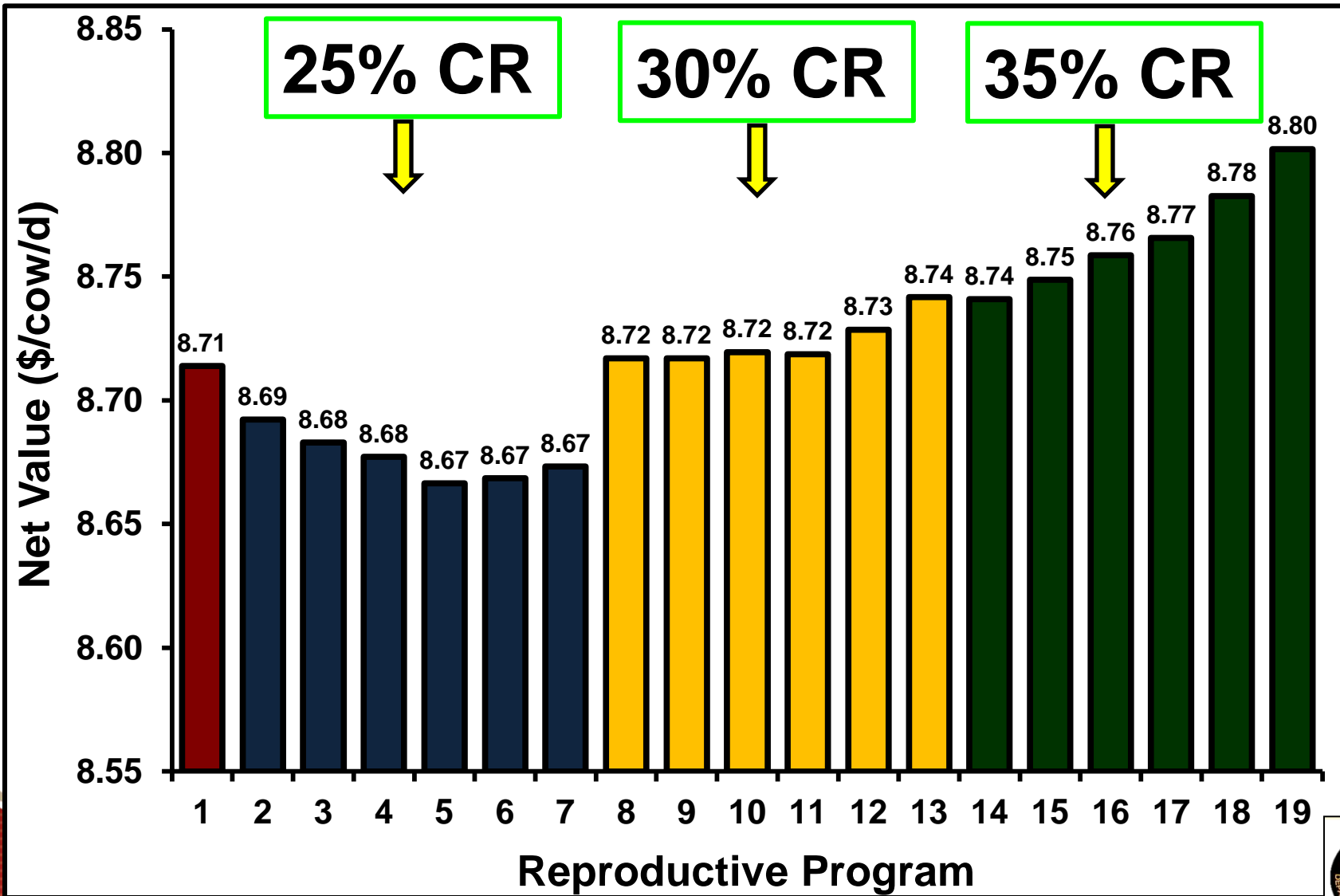


Item	Units	Value
Milk Price	(\$/kg)	0.36
Feed Cost Lactating	(\$/kg DM)	0.17
Female Calf Value	(\$/calf)	136
Male Calf Value	(\$/calf)	50
Heifer Replacement	(\$/heifer)	1302
Salvage Value	(\$/kg)	1.16

Wisconsin average prices April 2010 - April 2011

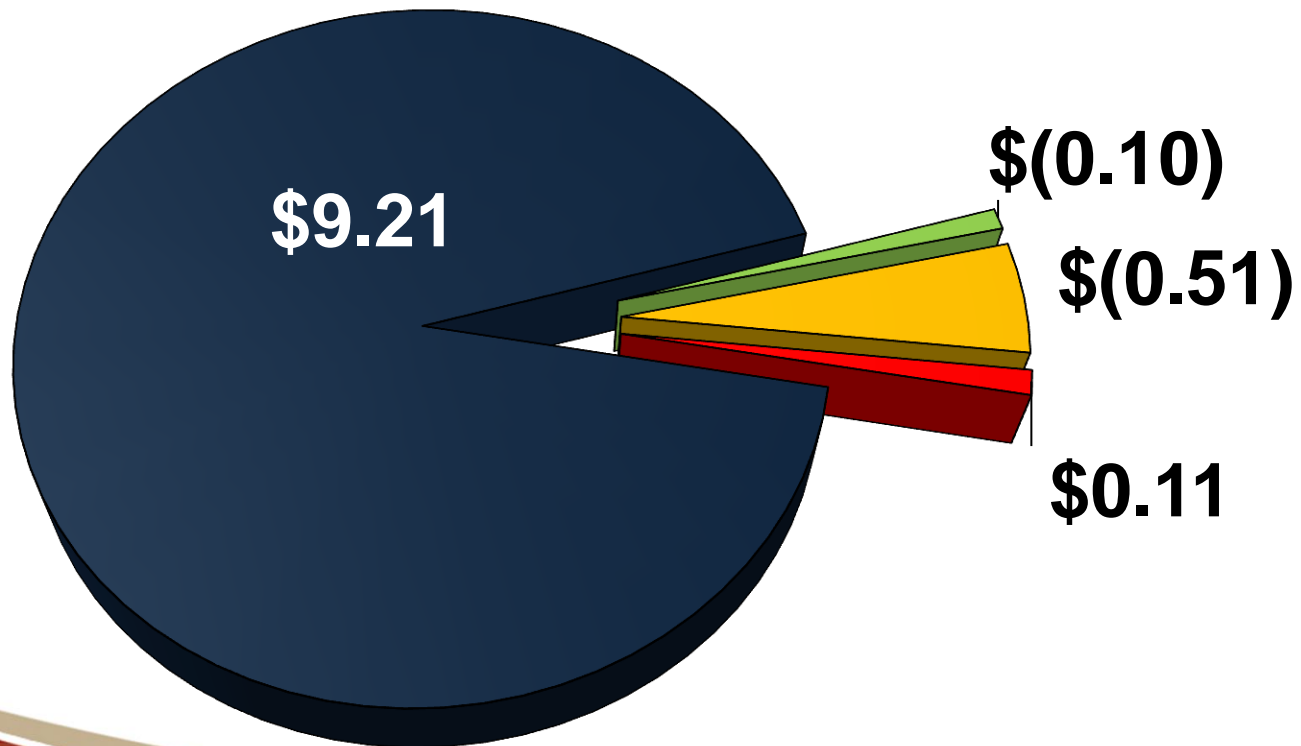


Economic Outcome

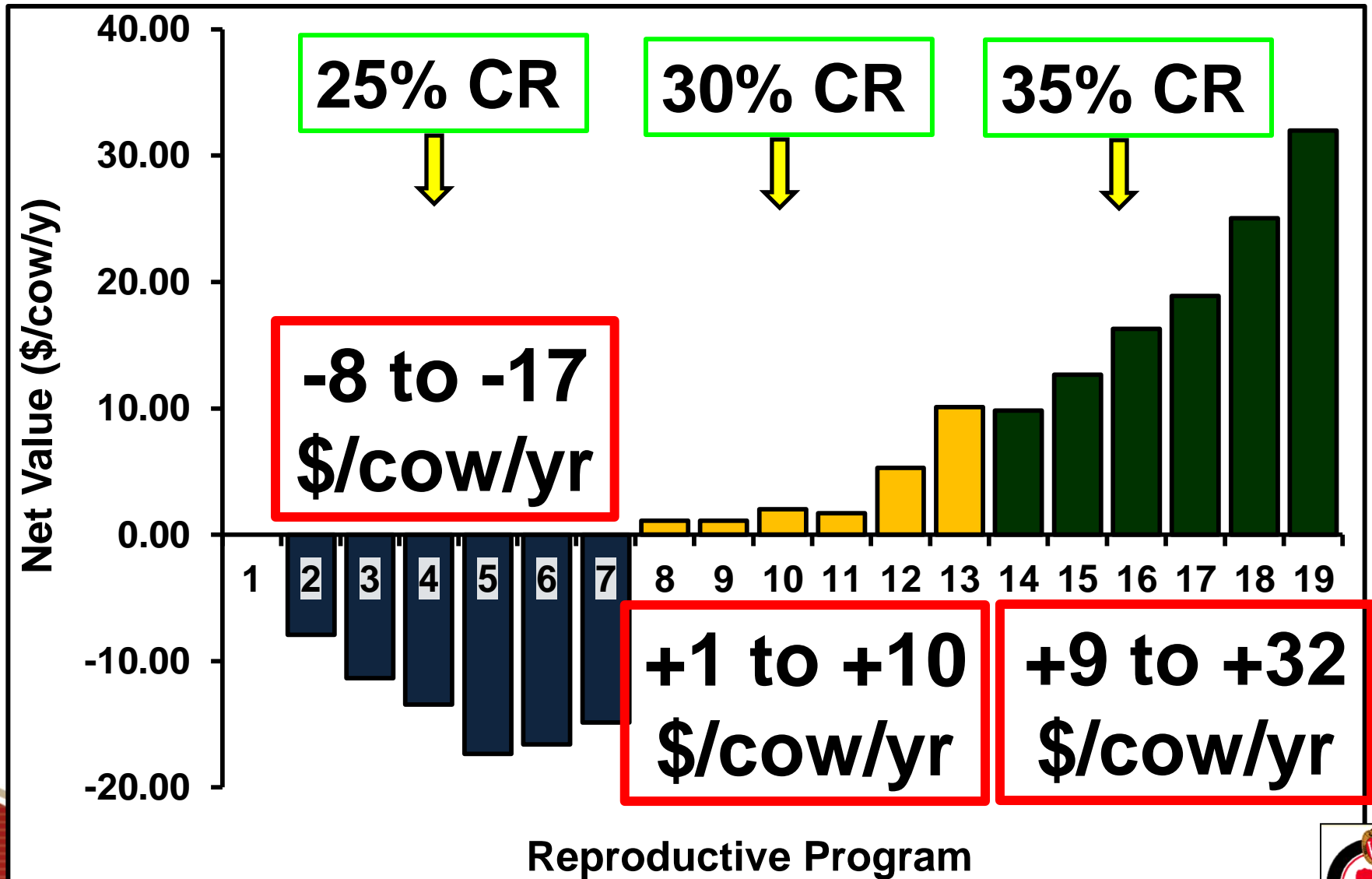


Relative Contribution to Net Value (\$/cow/d)

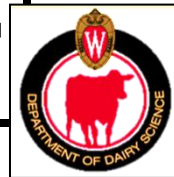
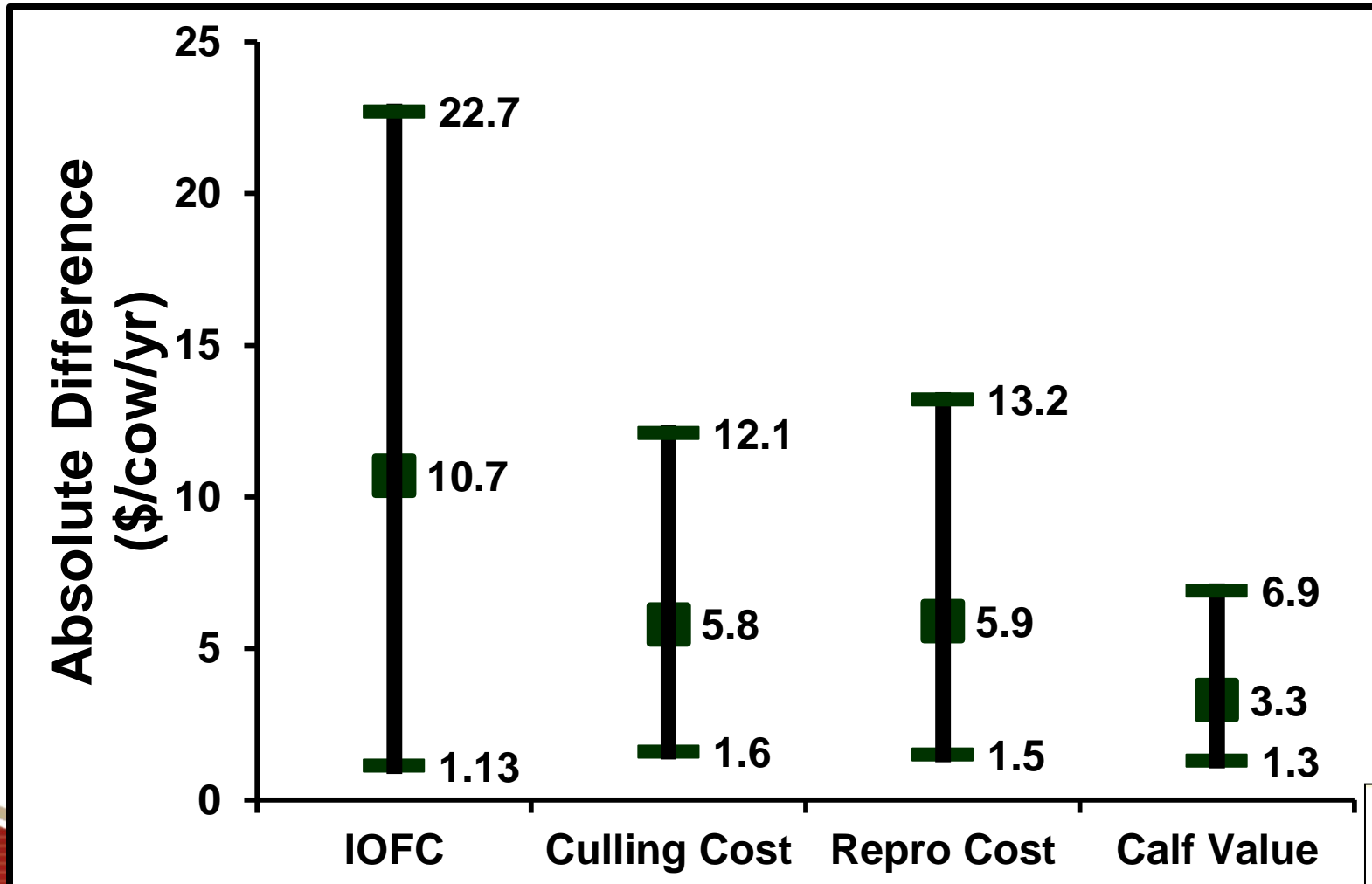
- IOFC
- Cull cost
- Repro Cost
- Calf value



Difference with 100% TAI



Relative Contribution to Net Value (\$/cow/yr)



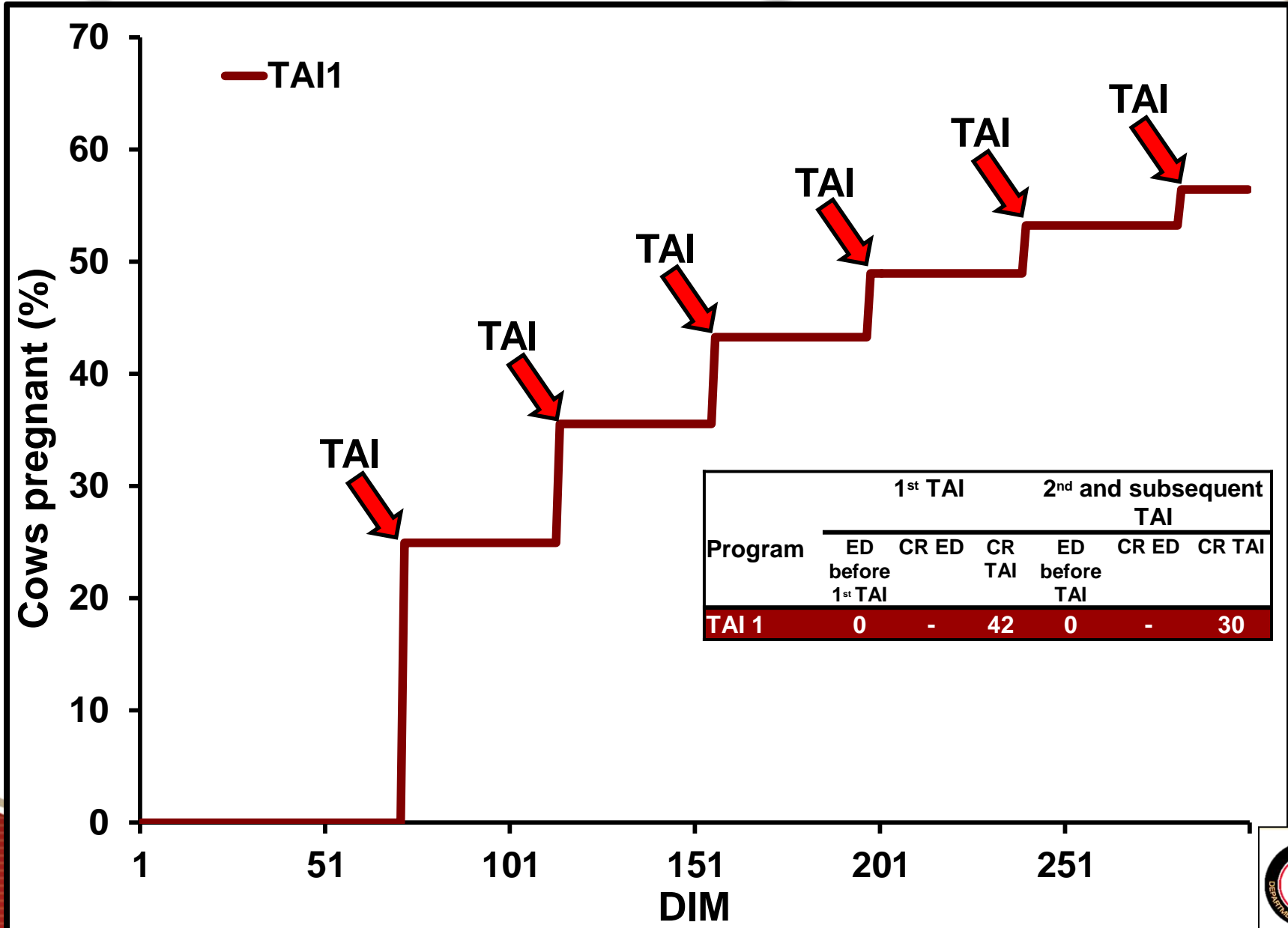
Reproductive Dynamics

Program	50-d PR	DO	CI
TAI 1	17%*	129	13.7
TAI+ED 5	14%	131	13.8
TAI+ED 11	16%	127	13.7
TAI+ED 17	18%	124	13.5
TAI+ED 19	20%	120	13.4

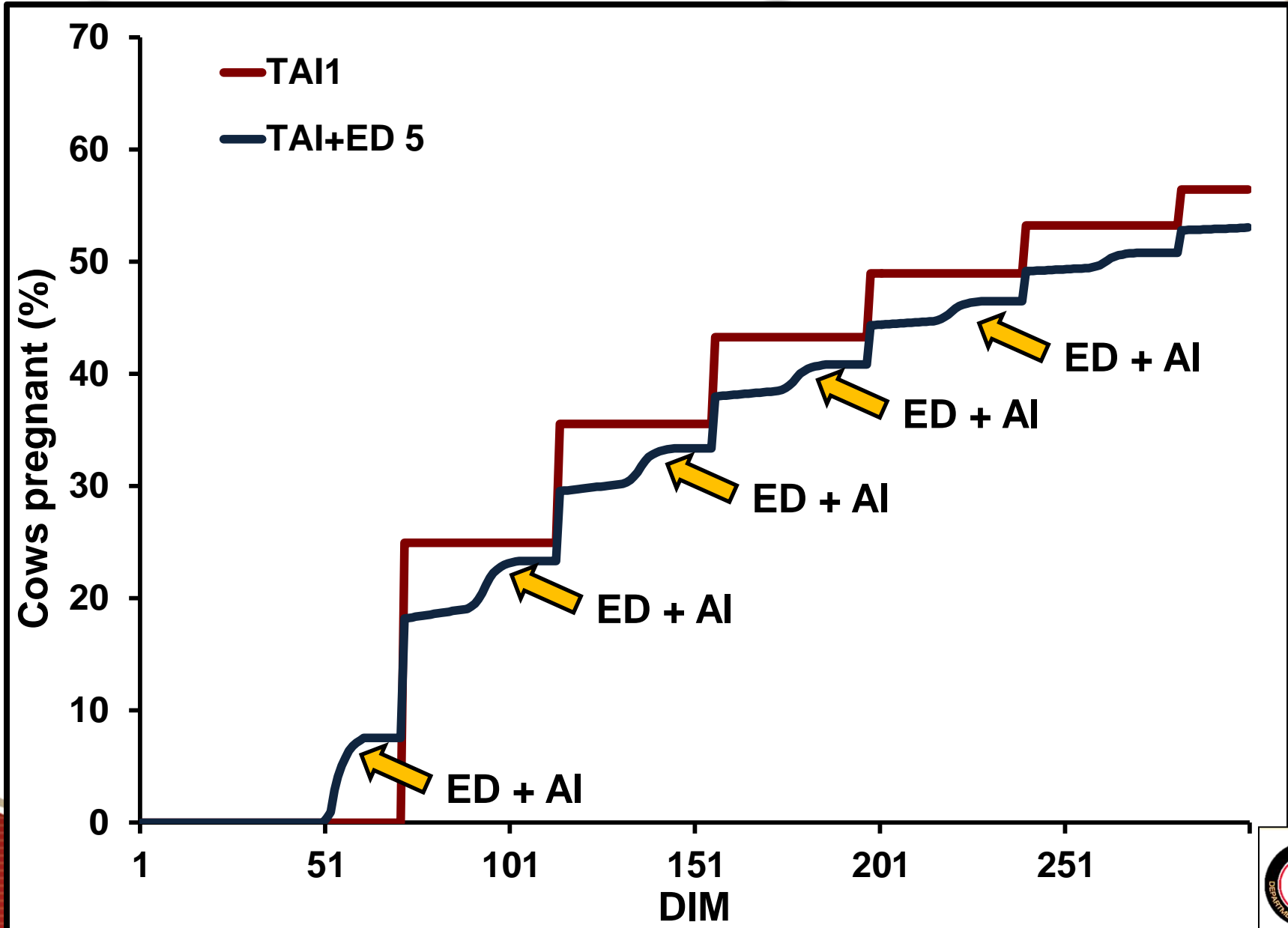
* 70d-VWP 21d-PR = 20%



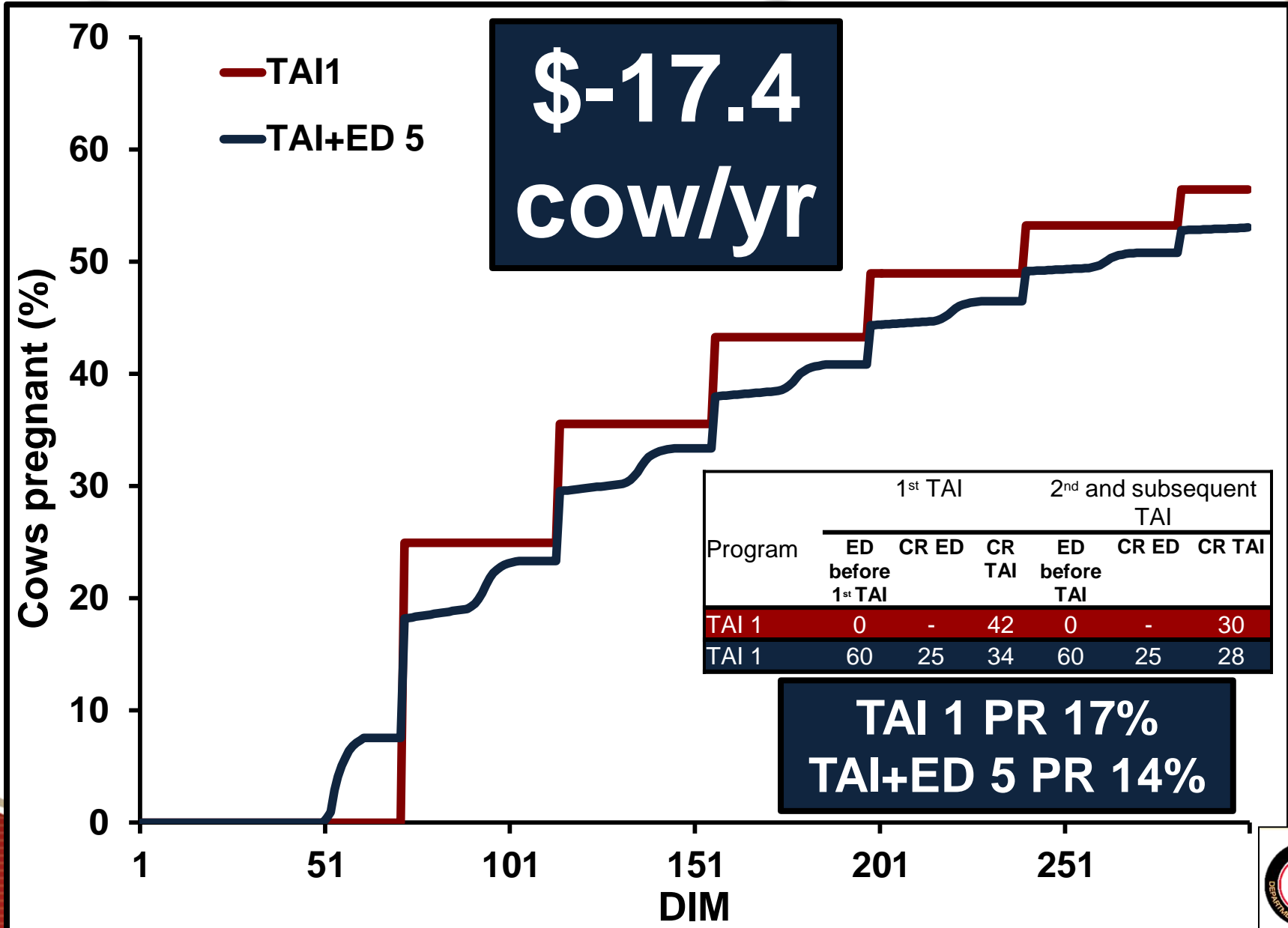
Reproductive Dynamics



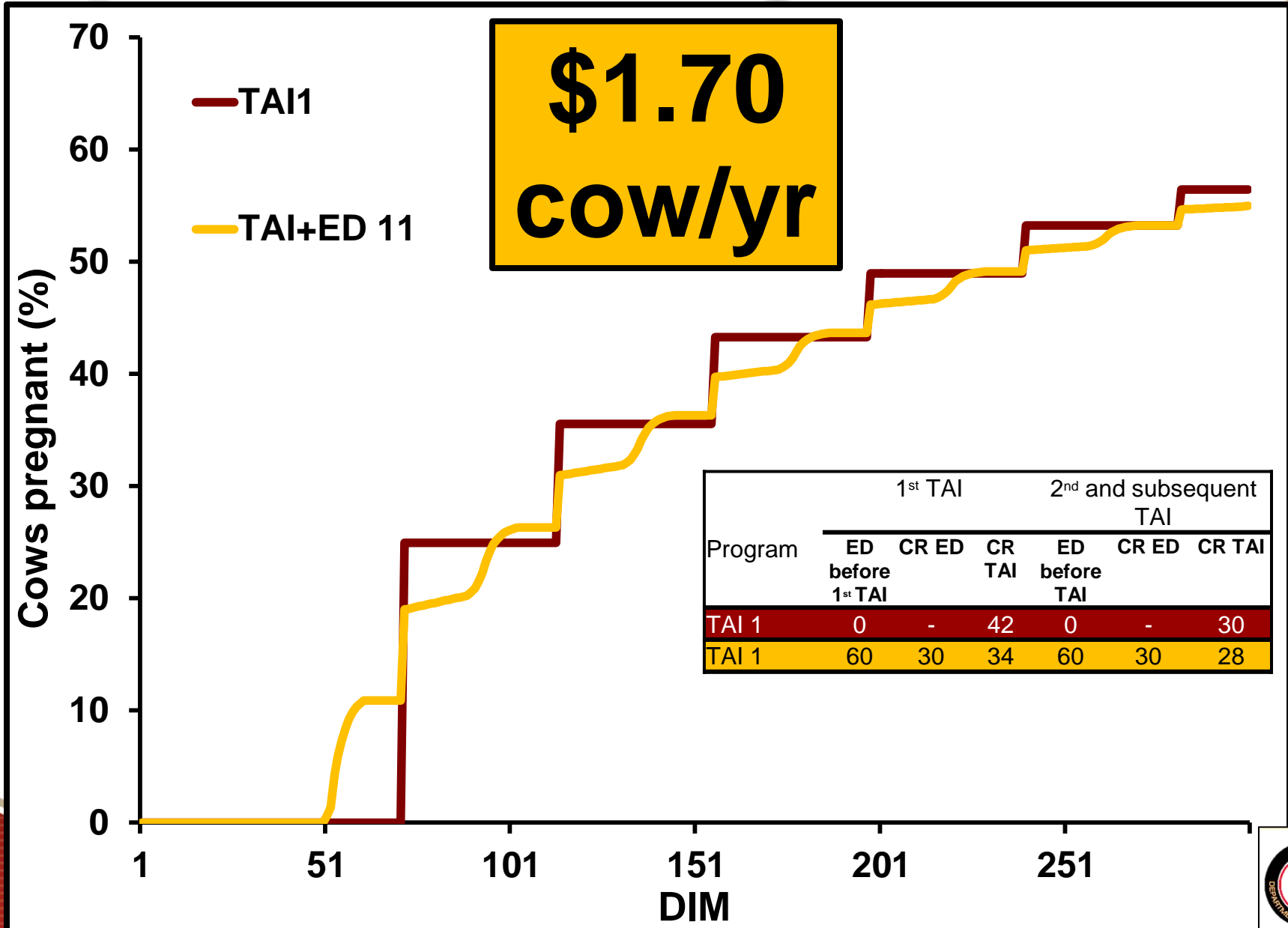
Reproductive Dynamics



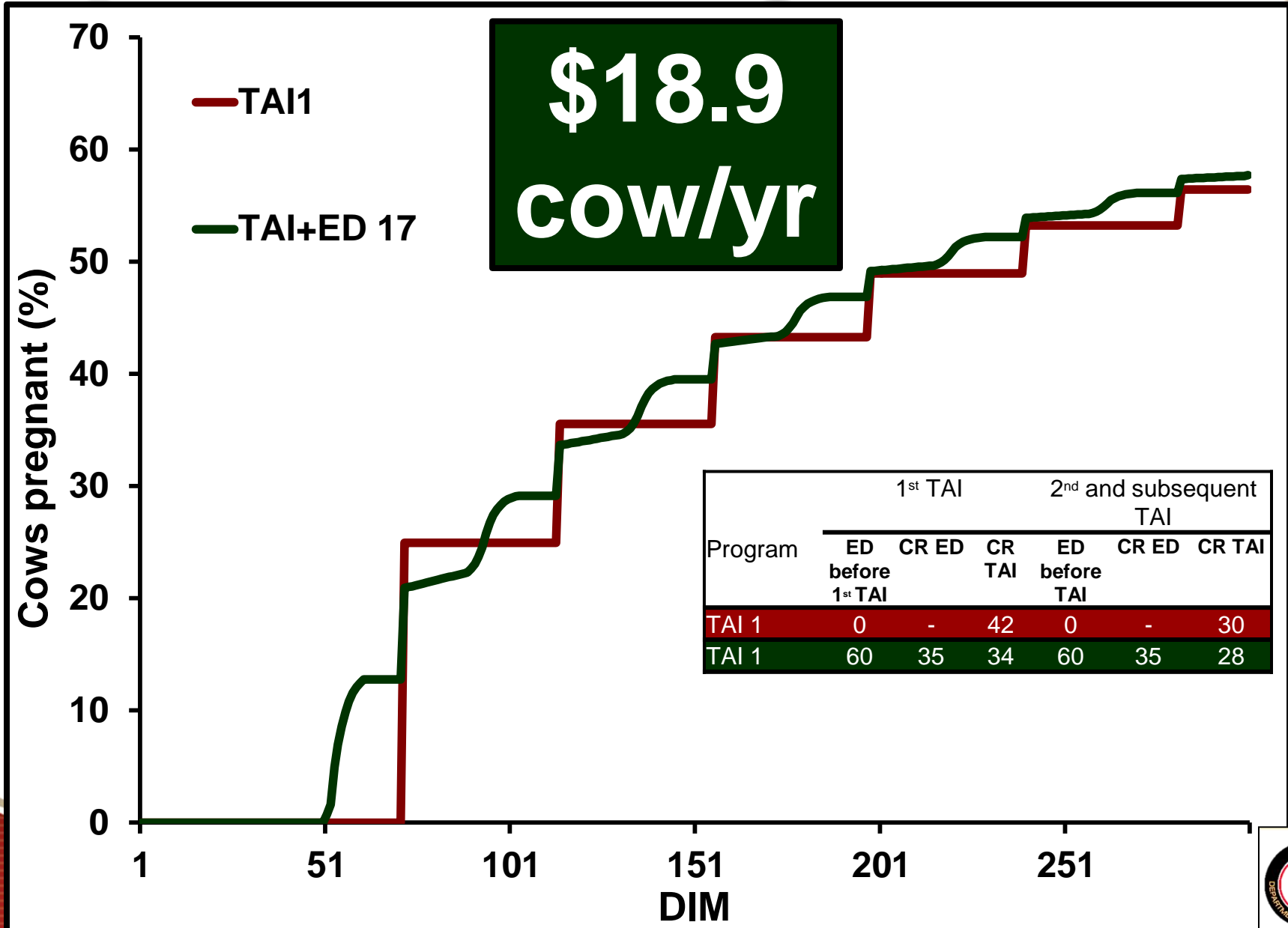
Reproductive Dynamics



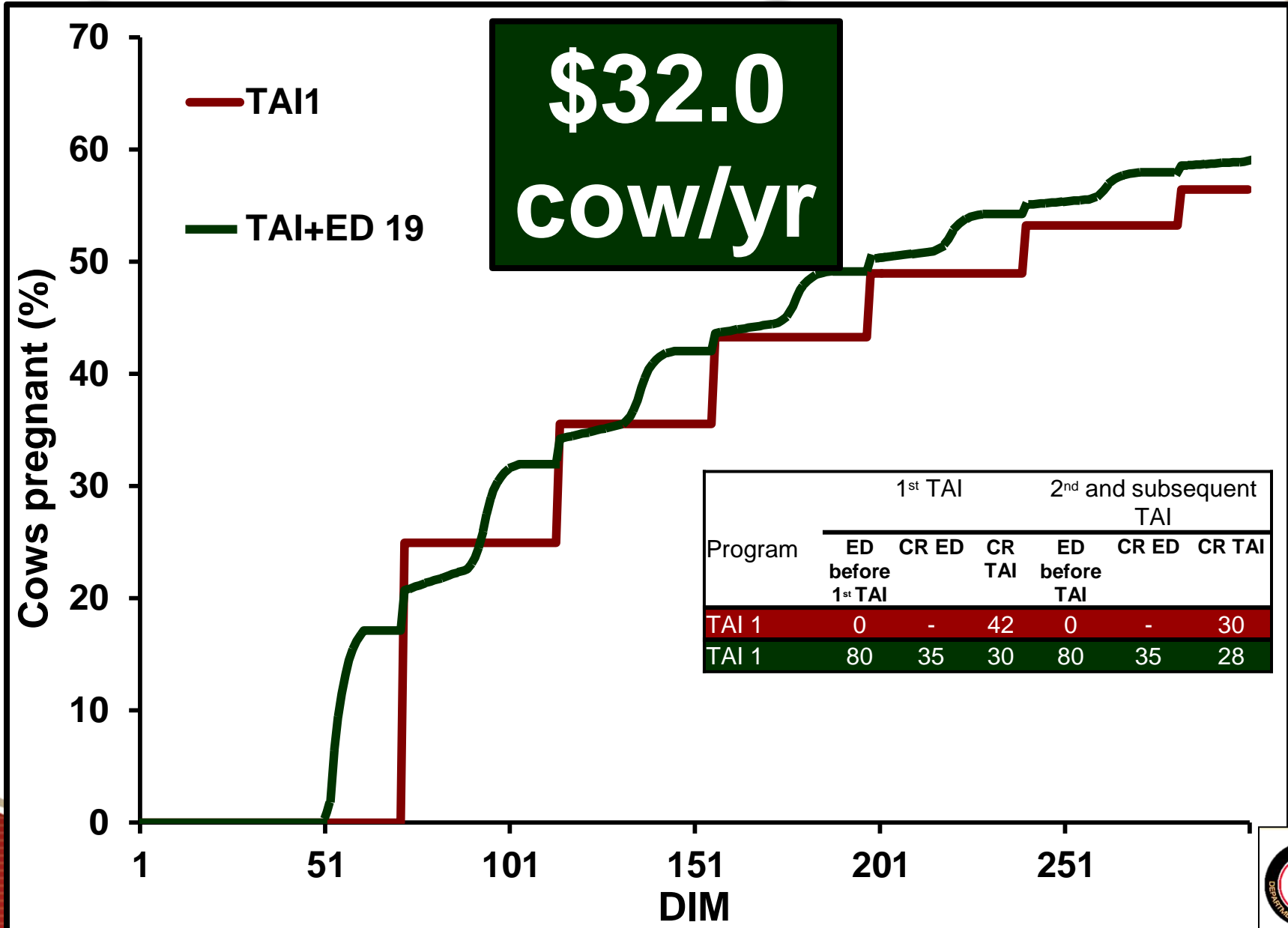
Reproductive Dynamics



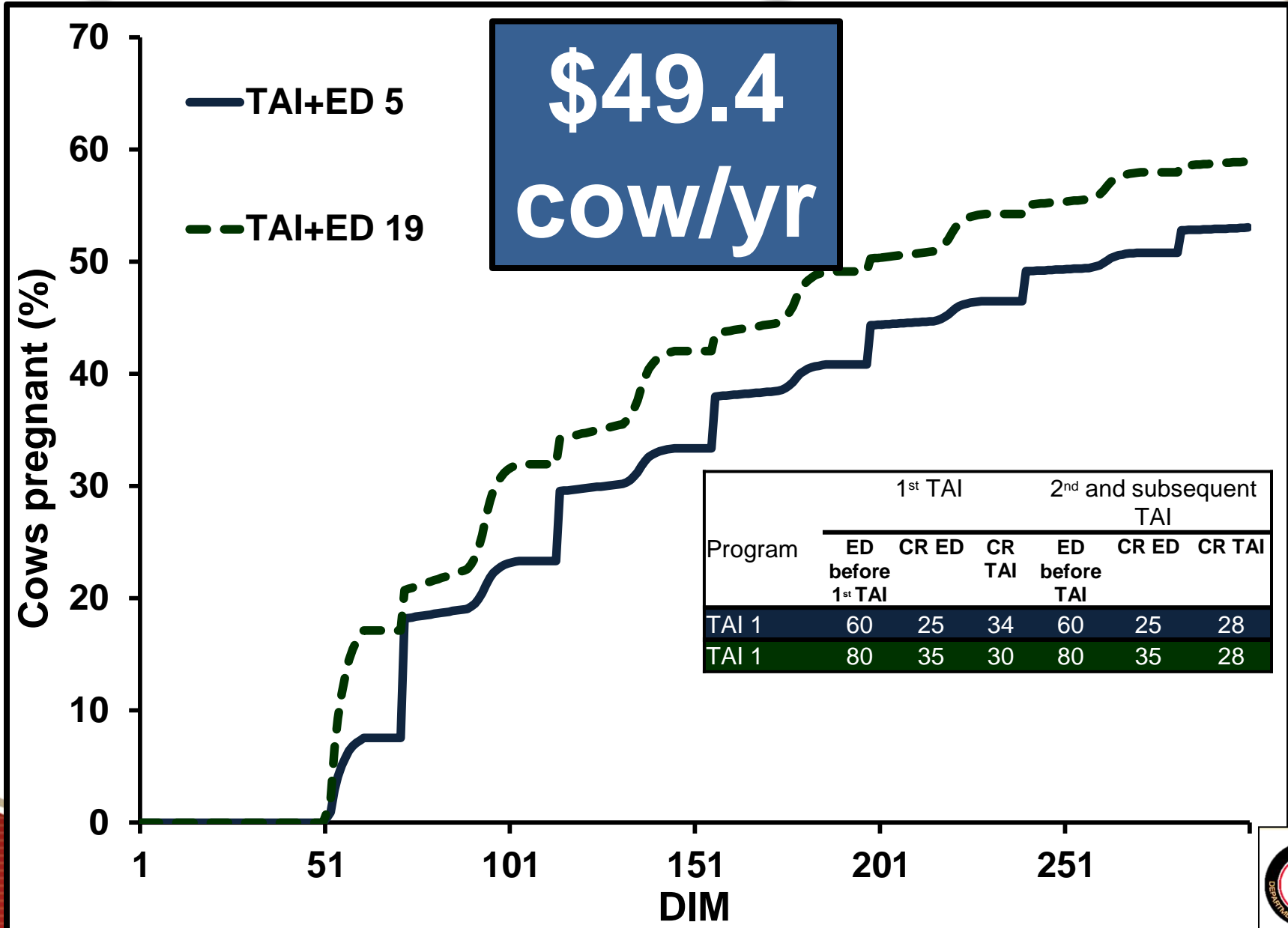
Reproductive Dynamics



Reproductive Dynamics



Reproductive Dynamics

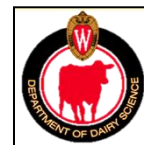


Summary

 **Adding ED to an effective 100% TAI program may be beneficial depending on the percentage of cows inseminated after estrus and the resulting CR.**

 **IOFC accounted for the major difference among programs.**

 **Culling and reproductive program cost were equally significant, whereas calf value was the lowest.**



Summary

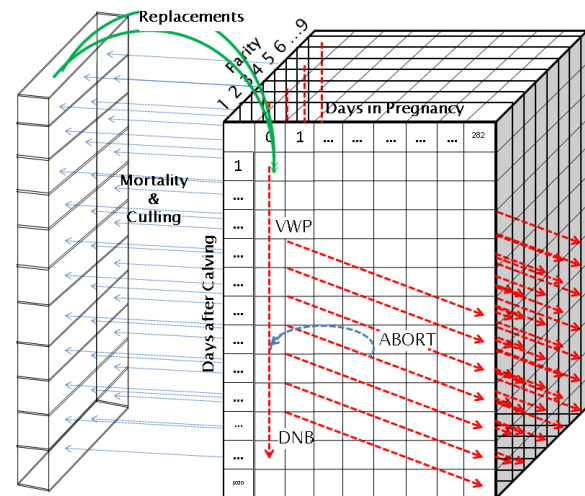
 **Simulation through daily Markov-chain model:**

 **multiple lactations**

 **detailed repro performance**

 **pregnancy losses**

 **high flexibility**



**Thank
you!**

