Dairy Management

WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

DEPARTMENT OF DAIRY SCIENCE
University of Wisconsin-Madison

UW Extension
University of Wisconsin-Extension

Economics of fertility in high-yielding dairy cows on confined TMR systems

Victor E. Cabrera
University of Wisconsin-Madison

International Cow Fertility Conference, New Science – New Practices, 18-21 May 2014
Castlecourt Hotel, Westport, Mayo, Ireland

USDA

Project Supported by USDA National Institute of Food and Agriculture Organic Agriculture Research and Extension Initiative Grant No. **2010-85122-20612**

NIFA

Implications

⇧**Profitability**
⇧Reproductive performance

Effective:
Oestrous detection
+ Synchronization

Feasible:
Earlier pregnancy diagnosis

Opportunity to:
Cow-level reproductive management

Introduction

Economic net return: Strongly associated to reproductive performance

⇧**Reproductive performance:**

Most efficient part of lactation curve

Ferguson and Galligan, 1999

↓Costs replacement and mortality

Galvao et al., 2013

↑On-farm replacements

Giordano et al., 2012

↓Relative reproductive costs

Giordano et al., 2012

21-d Pregnancy Rate: Best single index of reproductive performance

Ferguson and Galligan, 1999

Measure **Standardize** **Benchmark**

Rate at which eligible cows become pregnant in successive 21-d periods

Integrates many other parameters that indicate reproductive performance

Managers of modern US commercial dairy herds use 21-d PR index

Economic impact of reproductive programmes: Difficult to assess

Series of recent simulation studies: Provide interesting clues and further direction

Giordano et al., 2011:
Partial budgeting, DSS

Giordano et al., 2012:
Daily Markov chains, DSS

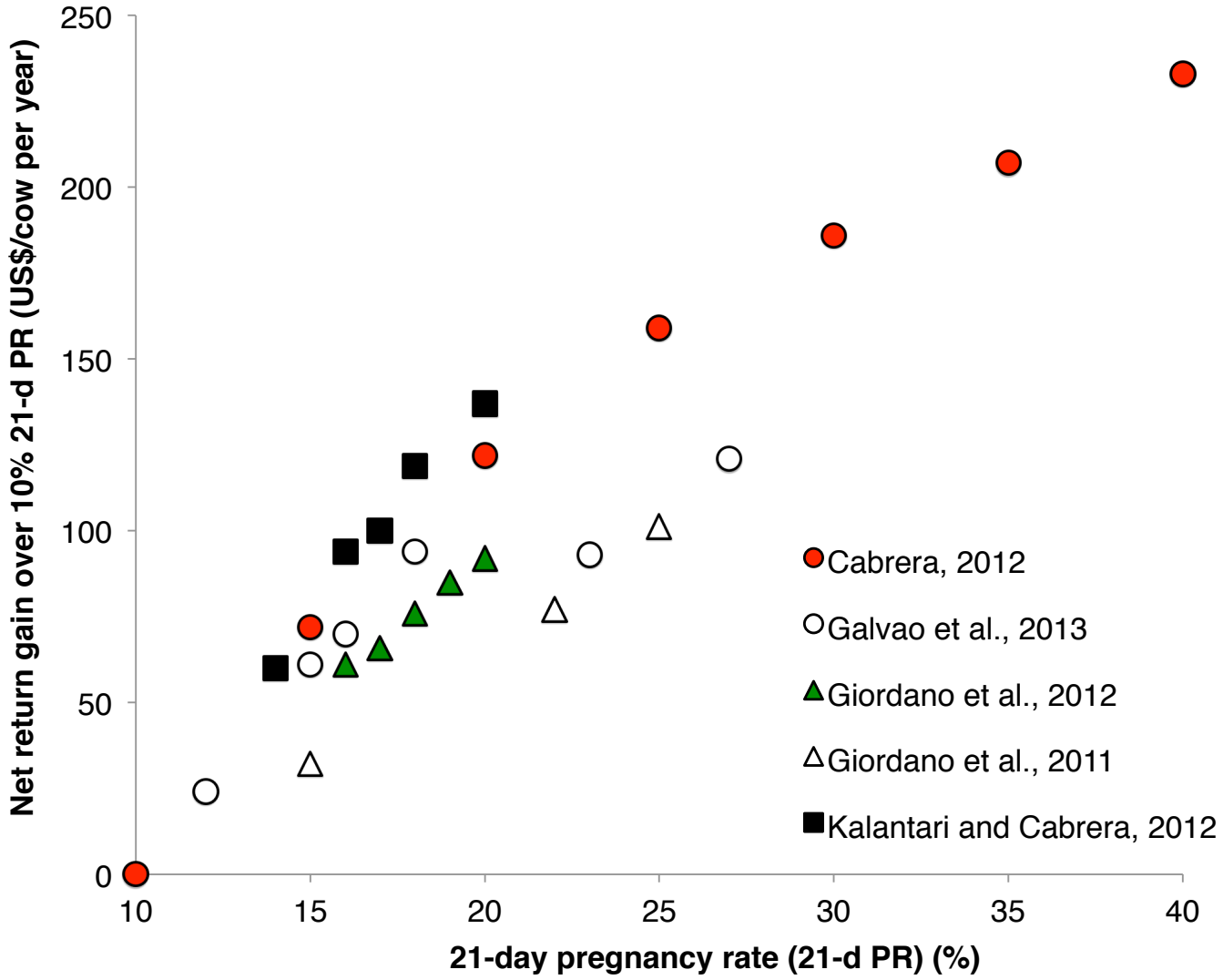
Cabrera, 2012:
Markov-Chain, DSS

Kalantari and Cabrera, 2012:
Markov-Chain, DSS

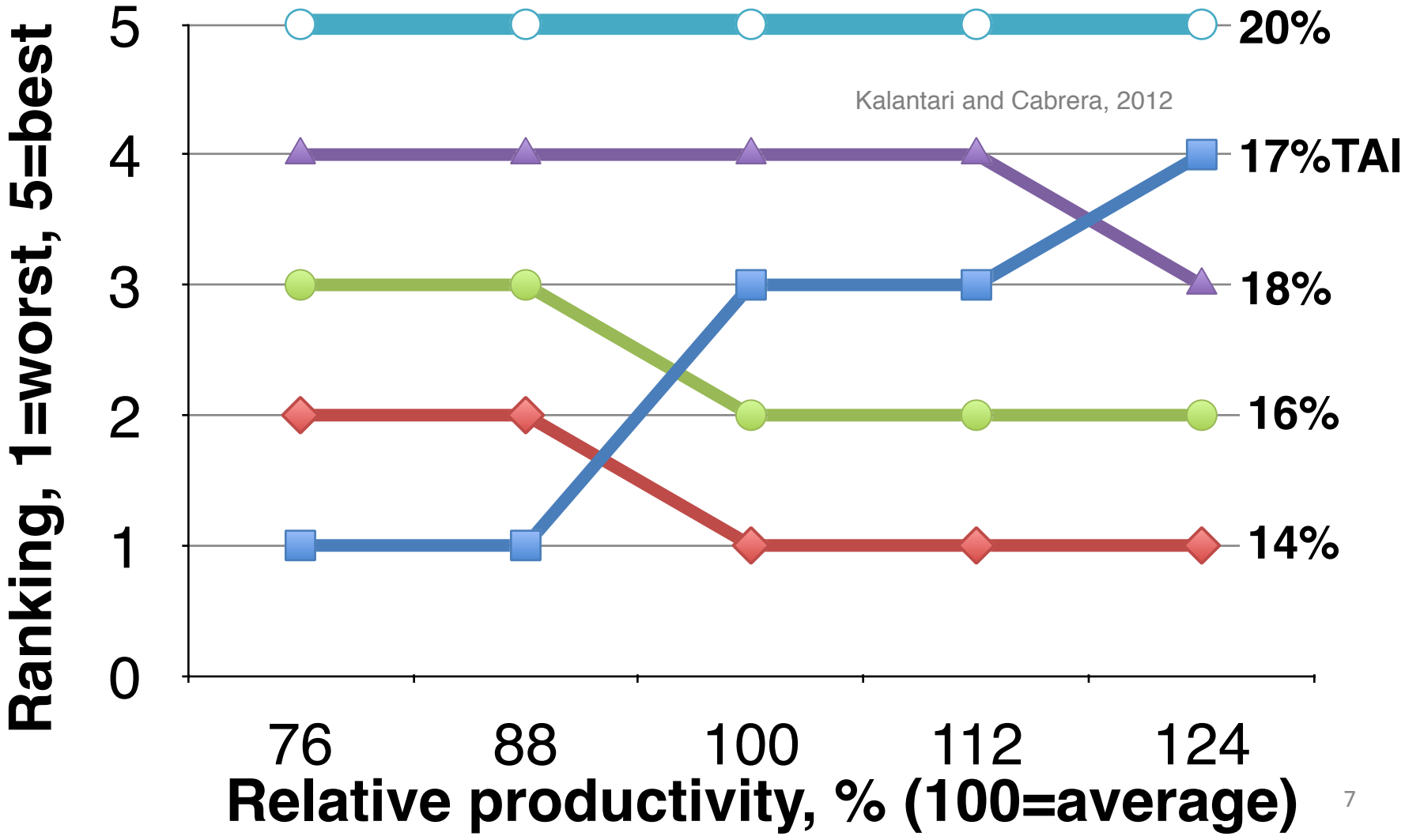
Giordano et al., 2013:
Decision theory

Galvao et al., 2013:
Monte Carlo

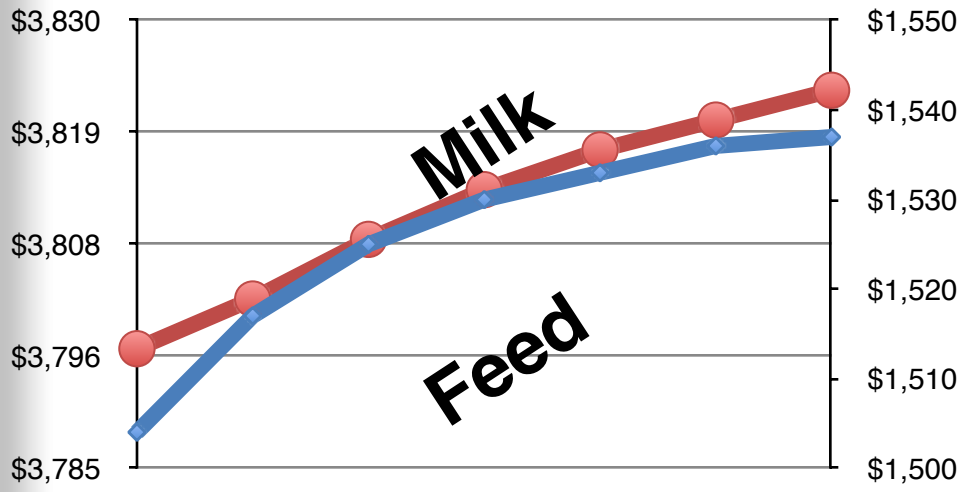
The economic value of improving reproductive performance



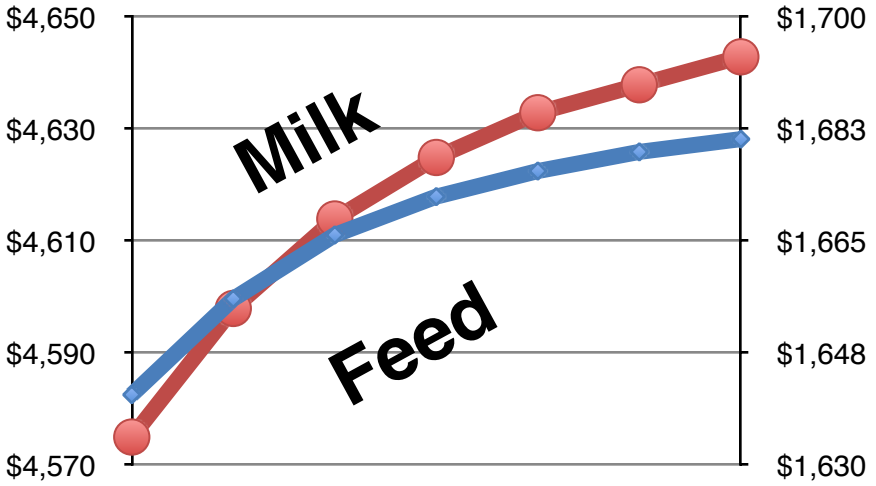
Reproductive programs value ranking vs. herd's milk productivity



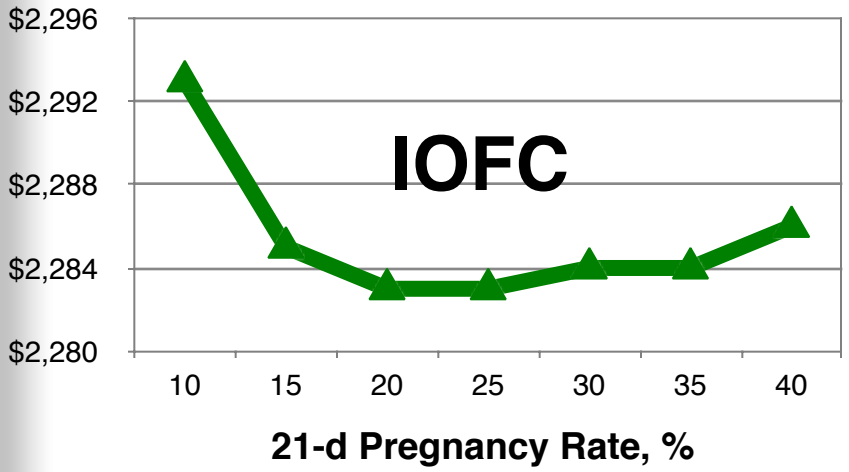
PR vs. milk, feed, and IOFC ($/cow.yr)

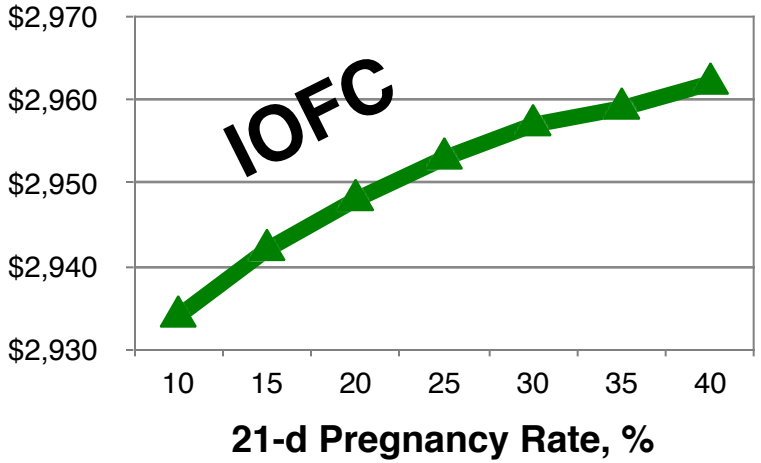


11,000 kg/cow.yr



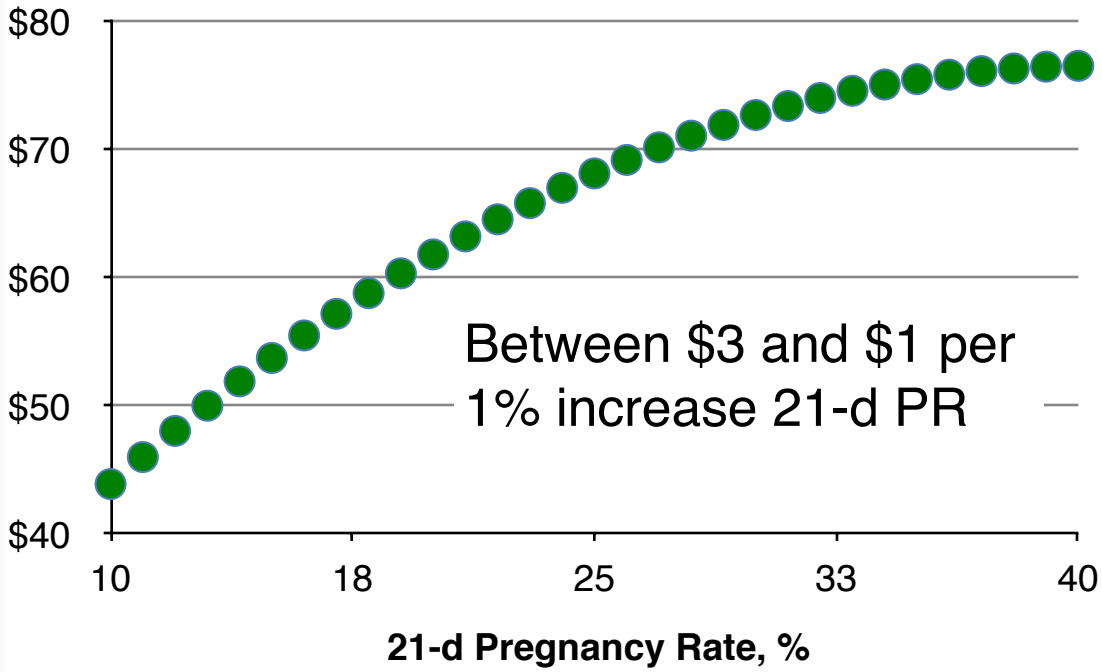
13,600 kg/cow.yr





Cabrera, 2012

PR vs. calf sales ($/cow.yr)



Return ($/cow.yr) =

- 0.0352 (21-d PR)^2

+ 2.8476 (21-d PR)

+ 18.93 (R^2=0.996)

♂♀Calf value = $100

Cabrera, 2012

Study	♂♀Calf value, $	Gain, $/1% 21-d PR
Galvao et al., 2013	*$140*	***$1 to $3****
Giordano et al., 2012	*$90*	***$2 to $1***

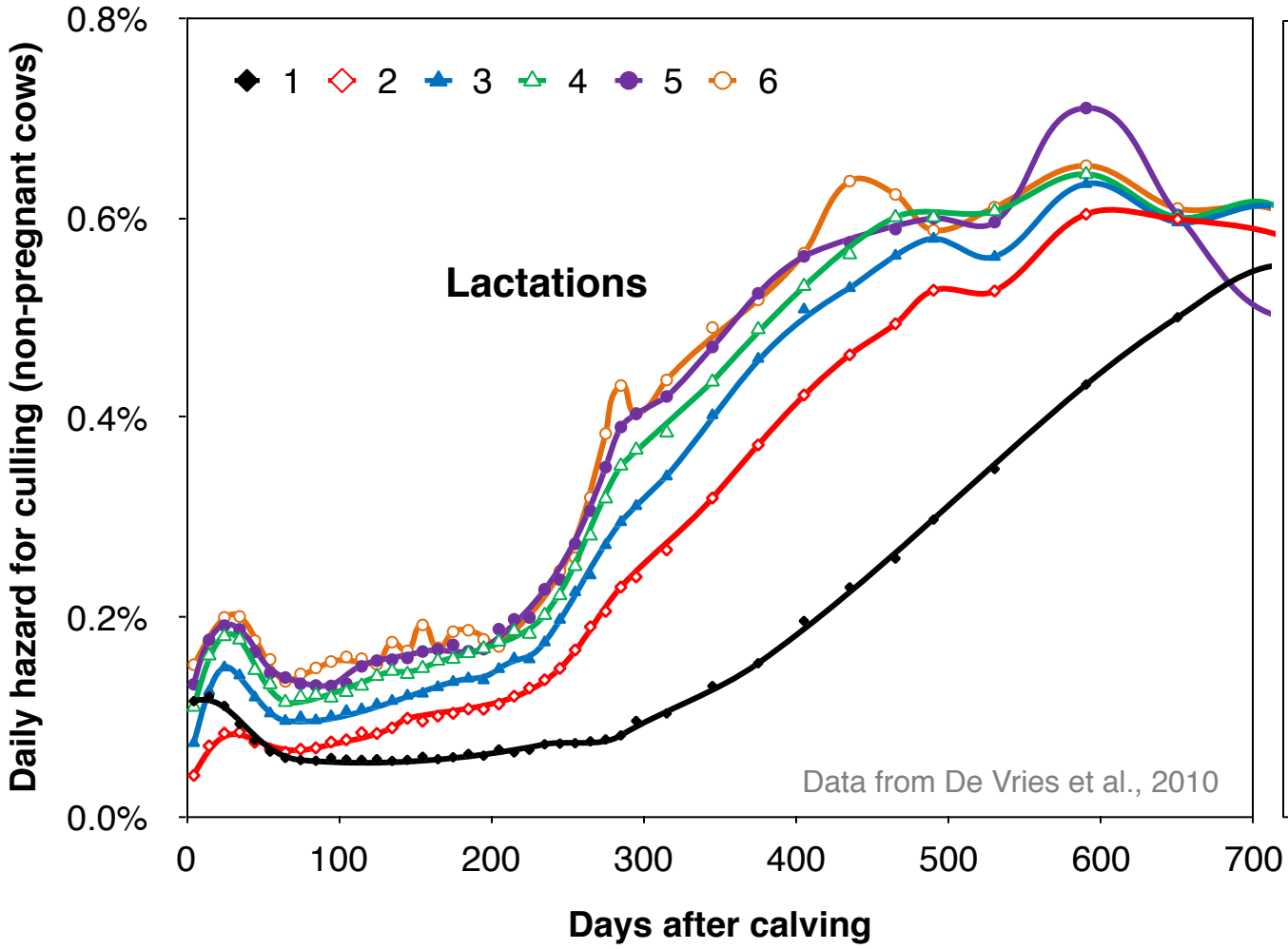
PR vs. replacement supply

⇧21-d PR → ⇧ Selective culling Souza et al., 2013

21d-PR, % (different reproductive programs)	Replacement balance (per 1,000 cow herd) when breeding cutoff was at 300 DIM	NEW breeding cutoff to balance the heifer supply and demand, DIM	Approximated net return change compared to 300 DIM breeding cutoff, $/cow.yr
14	*-14*	*310*	*-5*
15	*0*	*300*	*0*
16	*15*	*281*	*+5*
17	*20*	*270*	*+6*
18	*38*	*240*	*+7*
19	*40*	*240*	*+8*
20	*48*	*235*	*+9*

From Giordano et al., 2012

PR vs. replacement & mortality costs



Lower Costs
$/cow.yr
⇧1% 21-d PR

$4 to $1
Cabrera, 2012

$4 to $3
Giordano et al., 2012

$27 to $4
Galvao et al., 2013

Pregnant **= Less risk than non-pregnant (e.g., 75% less risk)**

Mortality **= Proportion of culling risk (e.g., 17% of that risk)**

PR vs. reproductive costs

- ⇧PR (no investment) → ↓ Reproductive costs
- ⇧PR may require ↑ investments
- Depends on investments vs. ⇧PR
- Seems to be inconsistent among studies

$/cow.yr ⇧1% 21-d PR

-$4 ⟷ **+$4**

http://DairyMGT.info/Tools

The Wisconsin-Cornell Dairy Repro$ Tool could be used for farm-specific assessments

Oestrus detection, synchronisation, or a combination

Most high yielding USA herds use a combination

78% OD & 87% TAI Caraviello et al., 2006

Common reproductive practice:

TAI protocol and perform inseminations at detected oestrous in between Giordano et al., 2012

Recent economic studies:

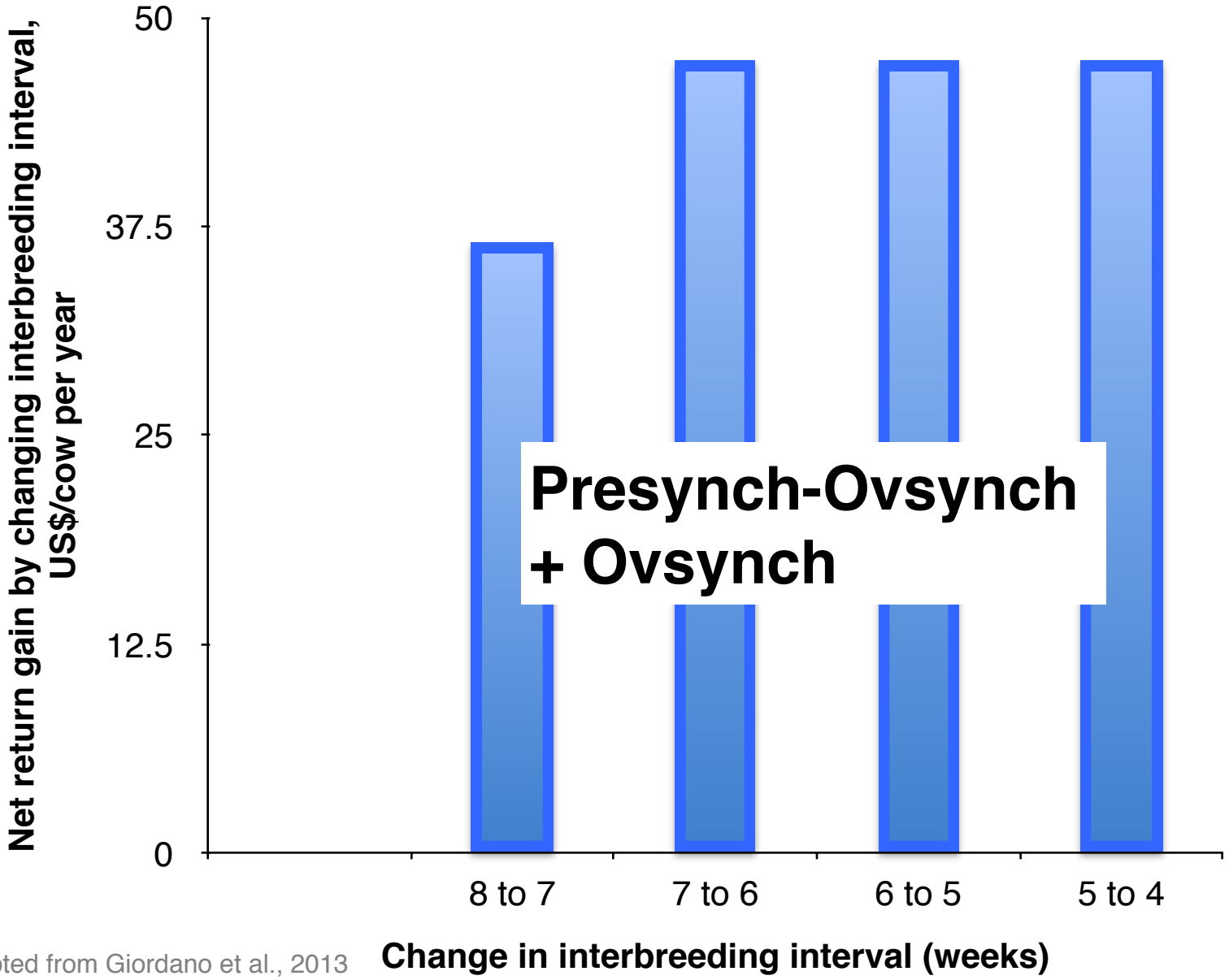
OD or TAI main core, but combinations studied Giordano et al., 2011

Presynch-Ovsynch + Ovsynch with a focus on combination with OD Giordano et al., 2012; Galvao et al., 2013

Economic effect of TAI with OD

	Net return gain TAI vs. TAI + OD, $/cow.yr				
	TAI CR, %		*60% OD CR, %*		
Study *Programme*	***First Serv.***	***Later Serv.***	***25***	***30***	***35***
Giordano et al., 2011					
Double Ovsynch + D32 Ovsynch	*45*	*30*		***14***	
Double Ovsynch + Double Ovsynch	*45*	*39*		***-12***	
Giordano et al., 2012					
Presynch-Ovsynch + Ovsynch	*42*	*30*	***-17***	***2***	***19***
Galvao et al., 2013					
Presynch-Ovsynch + Ovsynch	*33*	*25*	***23***	***57***	

Interbreeding interval vs. net return



Adapted from Giordano et al., 2013

Blood or milk-based pregnancy tests

Potentially effective when used earlier than conventional methods – **Shorten IBI**

Earlier pregnancy diagnosis with a **chemical test** could have some important drawbacks:

1. **Lower accuracy**
    a. **False positive (issue of sensitivity)**
    b. **False negative (issue of specificity)**
    c. **Questionable diagnoses (inconclusive)**
2. **Larger proportion of early pregnancy losses**

Accuracy of blood chemical test for early pregnancy diagnosis

Compared to conventional ultrasound or palpation

↓ **Sensitivity** → **2-3%** → **Re-synch** → **Preg. loss**

↓ **Specificity** → **2-3%** → **Longer IBI** → **Time loss**

↓ **Conclusive** → **3-9%** → **Re-test/Longer IBI**

↑ **Preg. Losses** → **6-6.6%/week** → ↓**Specificity**

Adapted from Giordano et al., 2013

d31Chemical vs. d39 Palpation

CT31 vs. RP39; 35 vs. 42 d IBI @ 50% OD

= -795

+535 (sensitivity %)

+305 (specificity %)

-305 (pregnancy losses %)

-39 (questionable diagnoses %)

-1.8 (cost of test $)

	Sensitivity %	Specificity %	Pregnancy losses %	Questionable diagnoses %	Test Cost $
Baseline	*98*	*98*	*6.0*	*3.3*	*2.4*
Positive	***≥96***	***≥95***	***≤9.0***	***≤27***	***≤7.5***

d25 Chemical vs. d32 Ultrasound

CT25 vs. TU32; 28 vs. 35 d IBI @ 50% OD

= -638

+450 (sensitivity %)

+253 (specificity %)

-253 (pregnancy losses %)

-34 (questionable diagnoses %)

-1.9 (cost of test $)

	Sensitivity %	Specificity %	Pregnancy losses %	Questionable diagnoses %	Test Cost $
Baseline	*97*	*97*	*6.6*	*8.5*	*2.4*
Positive	***≥95***	***≥94***	***≤10***	***≤34***	***≤7.0***

The value of a cow and reproduction

Important relationship for decision-making

Opportunities for cow-level reproductive management. E.g.,

High value cow → more inseminations

Low value cow → lower quality semen

Associated economic values could be used to enhance the value of reproductive programs. E.g.,

The value of a new pregnancy

The cost of a pregnancy loss

The cost of an additional day open

The value of a cow

Long-term expected net return of a cow compared with that of an imminent replacement

Critical factors

- **Cow's productivity level in relation to herd mates**
- **Replacement's genetic improvement in relation to herd mates**
- **Cow's current conditions**
    - **Lactation**
    - **Days after calving**
    - **Pregnancy status**

The value of a cow