

Approaches to Enhancing Lambing Rate from Out of Season Breeding

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Today the high temperature was 83°F
11.5 hours of sunlight





Outline

- Reproductive Efficiency – Lambing rate as a measure of reproductive efficiency
- Seasonality of reproduction in sheep
- Consequences of seasonal reproduction
- Out-of-season breeding
 - benefits and strategies

Reproductive Efficiency has the Single Largest Impact on Flock Productivity and Profitability

Lambing rate –

Global measure of reproductive efficiency

Flock Lambing Rate

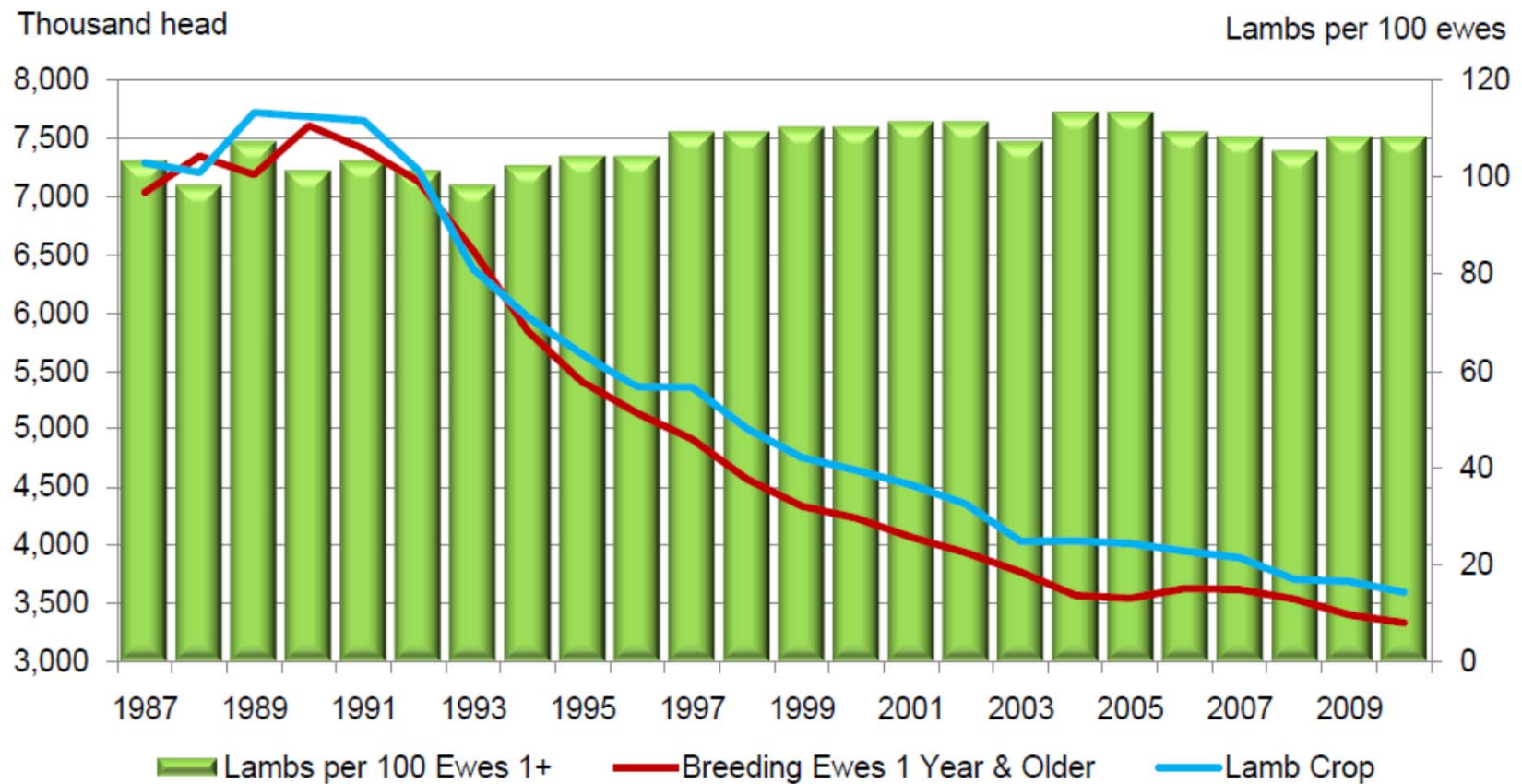
- Lambs born per ewe (exposed at beginning of the breeding season)
- Lambs born is a function of:
 - Proportion of ewes lambing
 - Prolificacy (lambs born per ewe lambing)

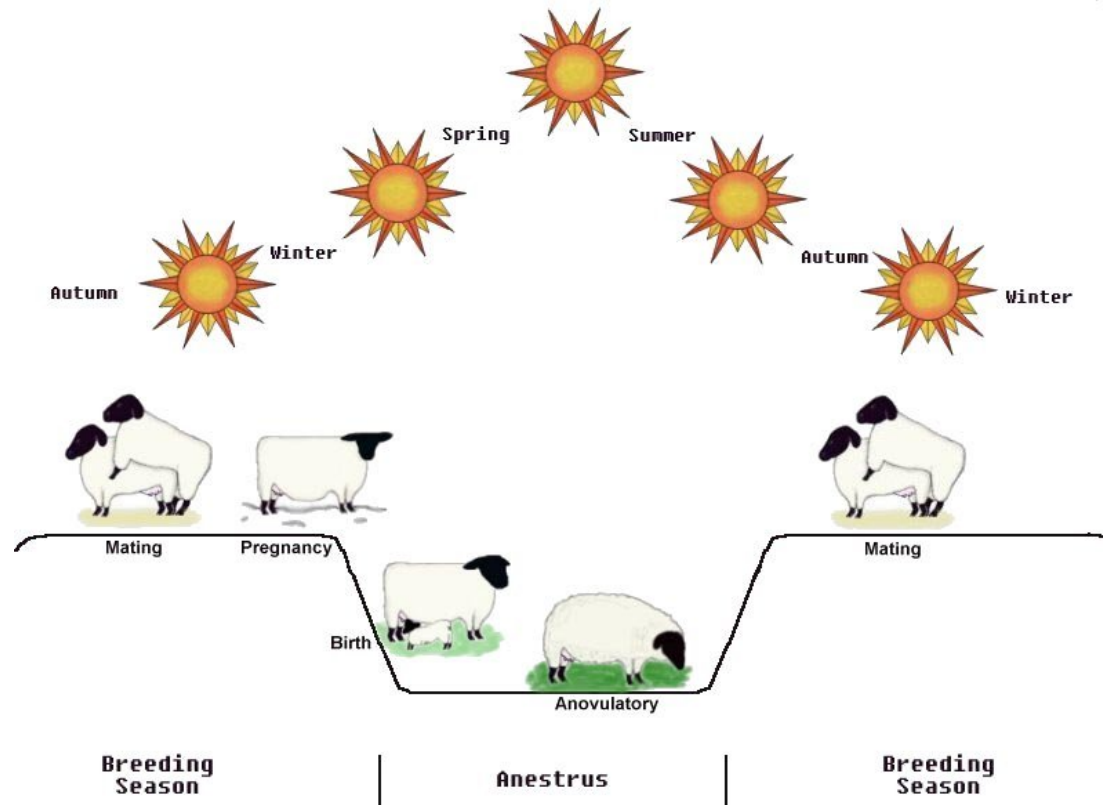
Flock Lambing Rate

- If we introduced rams to 100 ewes
- 90 ewes lambed (**proportion lambing** = 90%)
- 180 lambs produced
- **Prolificacy** = $180/90 = 200\%$
- **Lambing rate** = $180/100 * 100 = 180\%$ ($0.9 * 200$)

US Lambing Rate

Graph 8. Ewes, Lamb Crop and Lambing Rate - United States

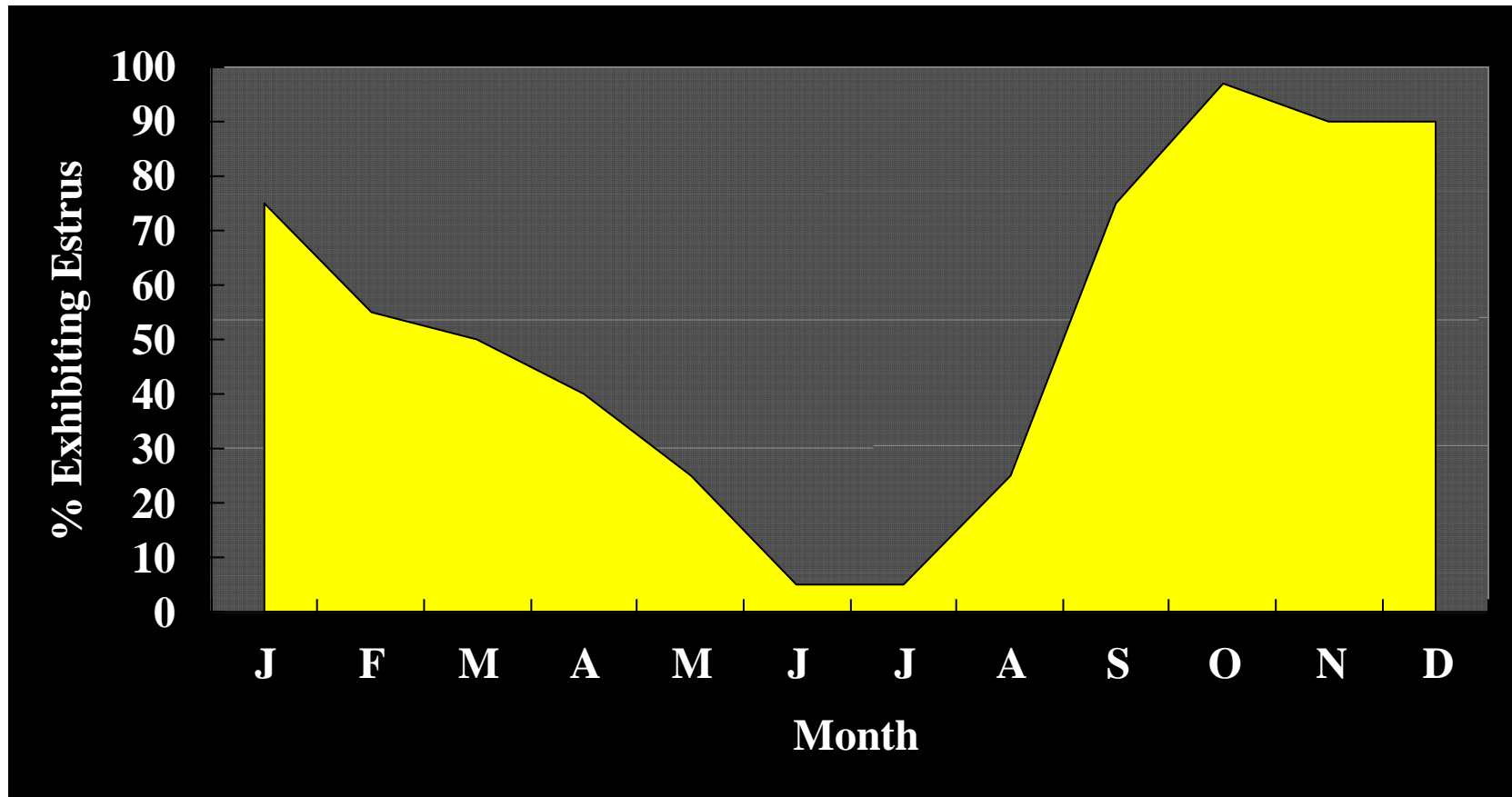




SEASONALITY OF REPRODUCTION

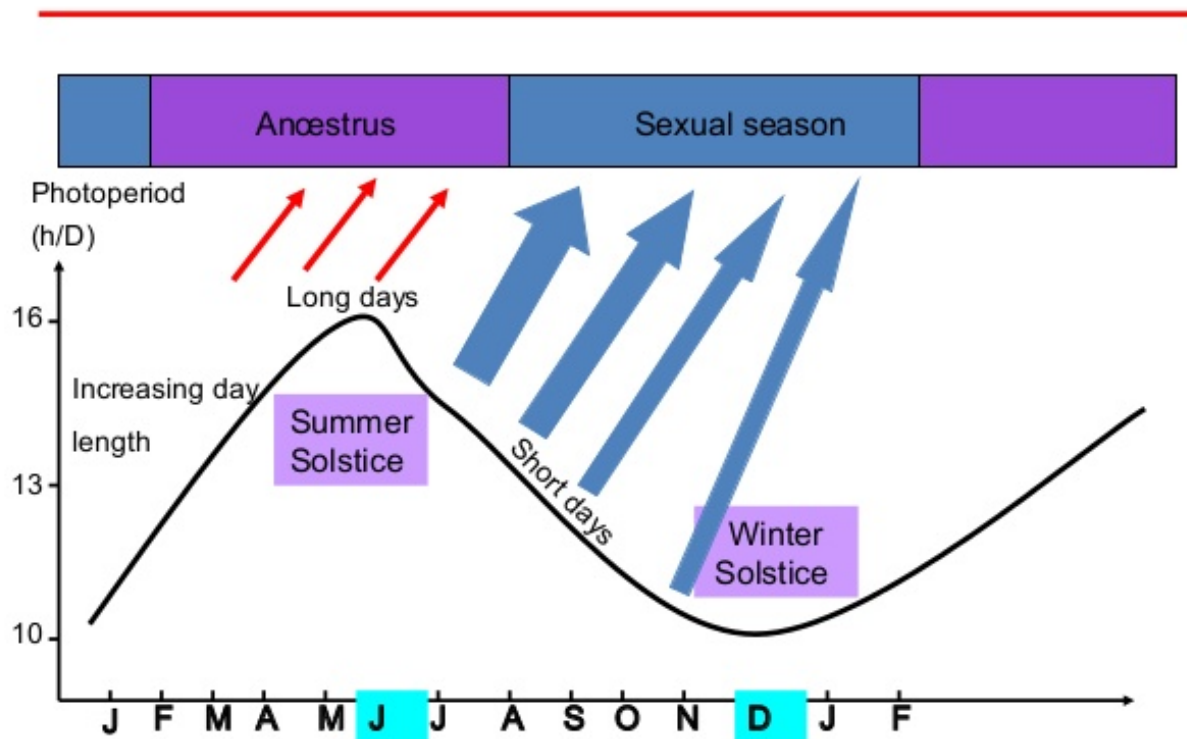
Seasonality of Reproduction in Sheep

- In temperate regions sheep are reproductively active during a limited defined season

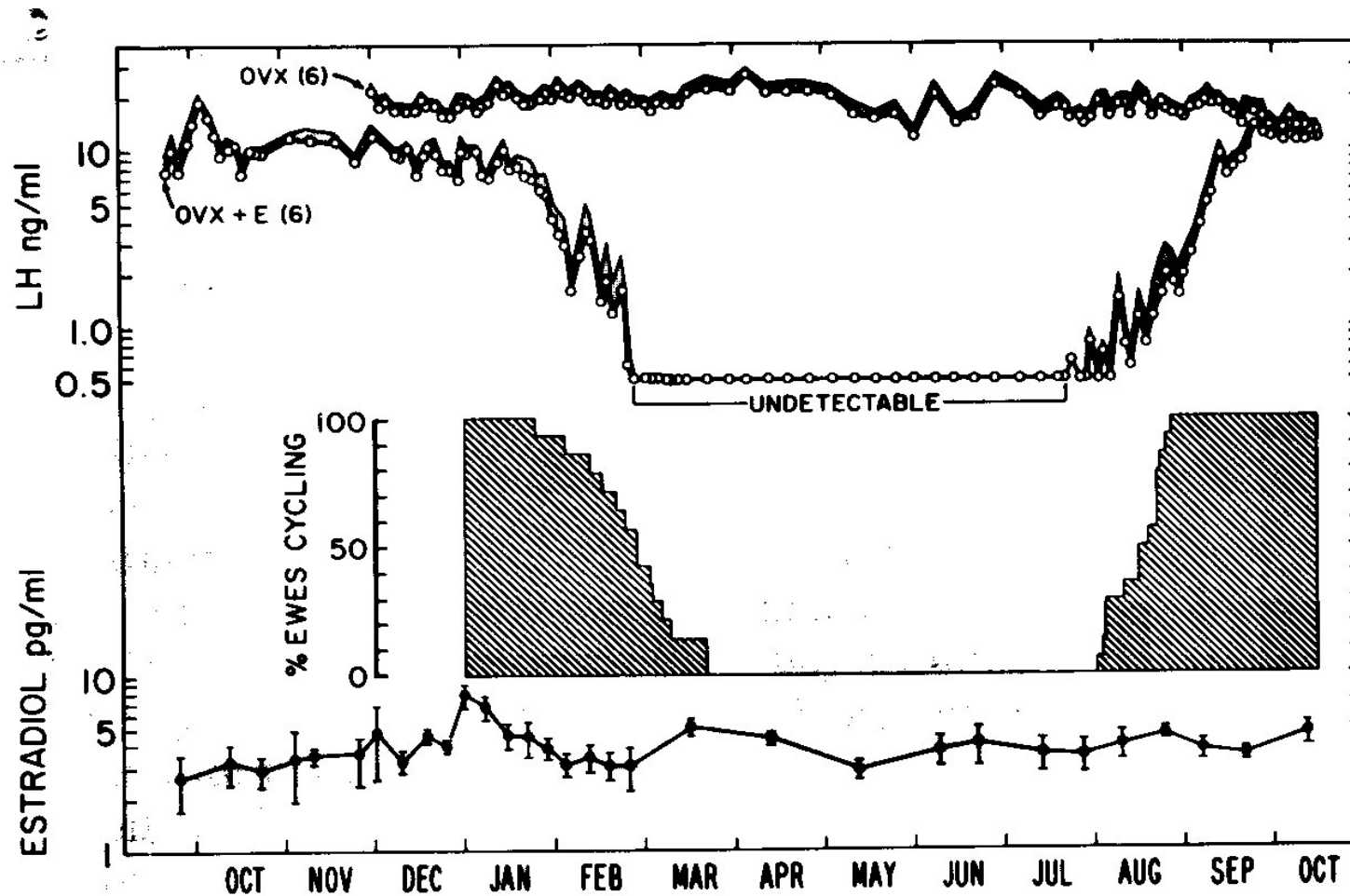


Timing of Seasonality of Reproduction in Sheep

Involvement of Photoperiod



LH Measure of Reproductive Activity is Suppressed During Anestrous Season



Seasonal Changes in the Sensitivity to Estradiol Negative Feedback
(Legan et al., 1977).

CONSEQUENCES OF SEASONALITY OF REPRODUCTION

Consequences of Seasonality of Reproduction

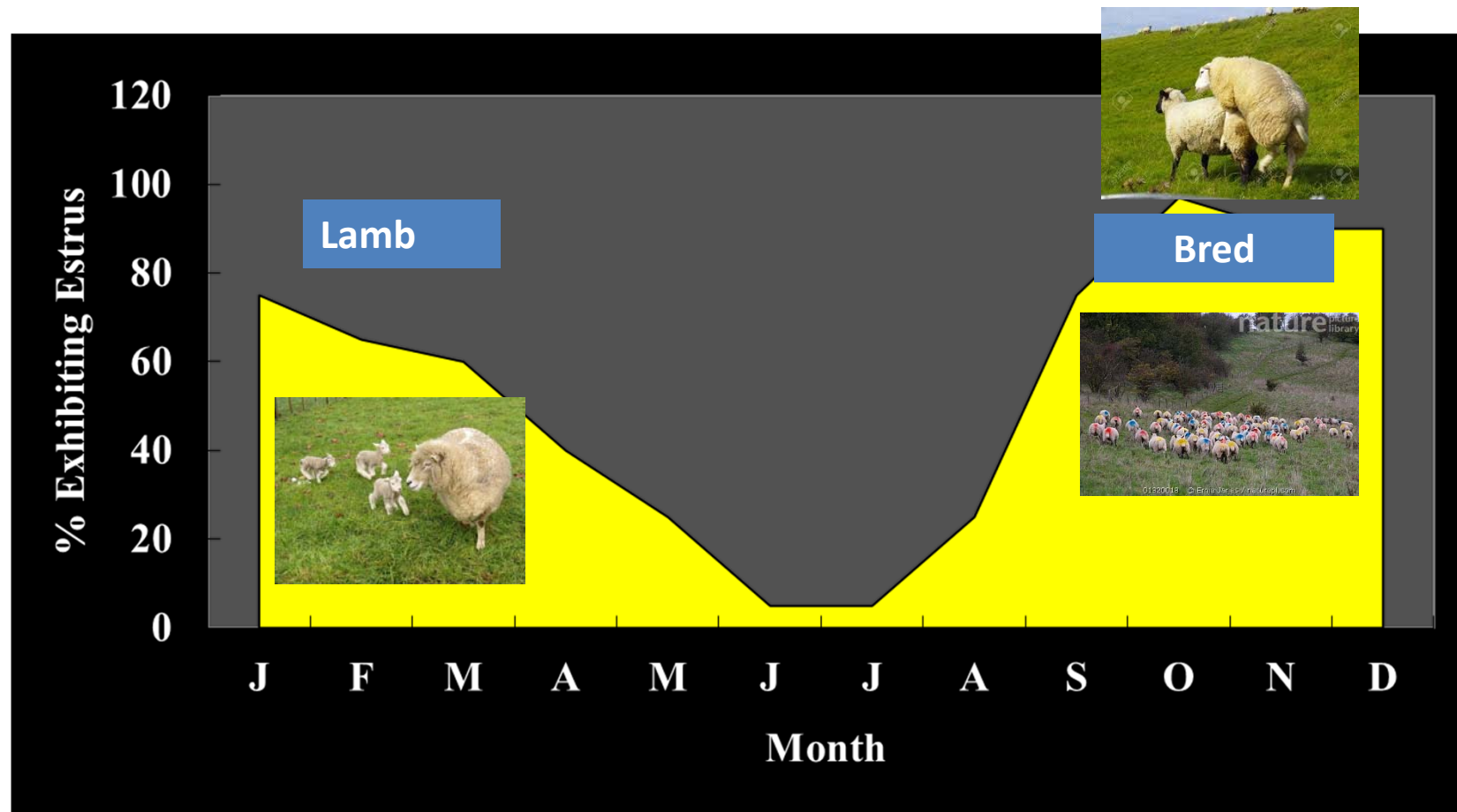
- Lower annual and lifetime productivity of the ewe
- Significant variation in lamb prices
 - Gluts in lamb supply and depressed prices
- Variation in lamb supply

Seasonality of reproduction results
in Low Lambing Frequency

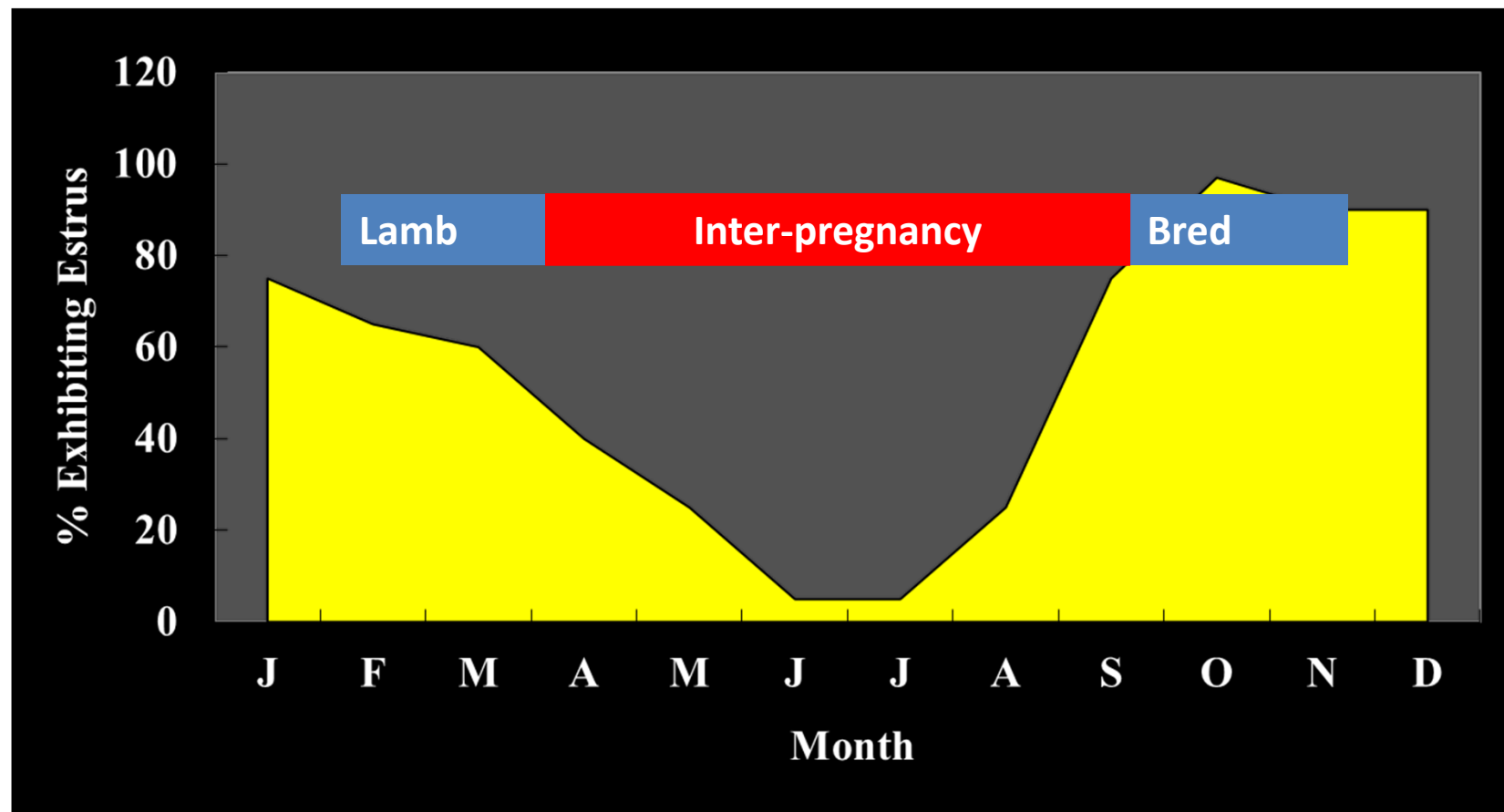
1 lambing per year

Major factor limiting lambing
rate/productivity and profitability

Traditional Annual Lamb Production Cycle



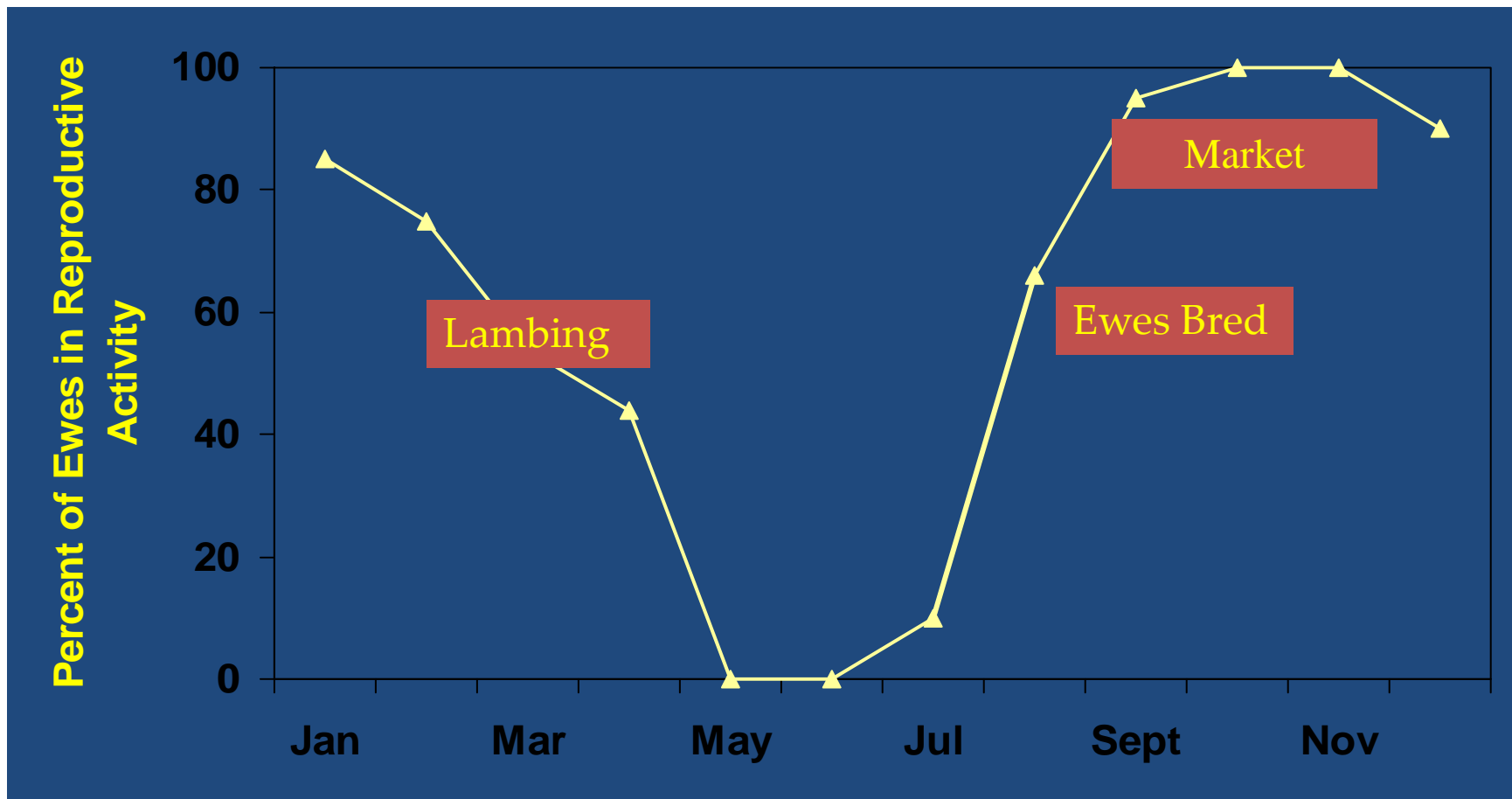
Traditional lamb production is associated with a long (7-month) inter-pregnancy period



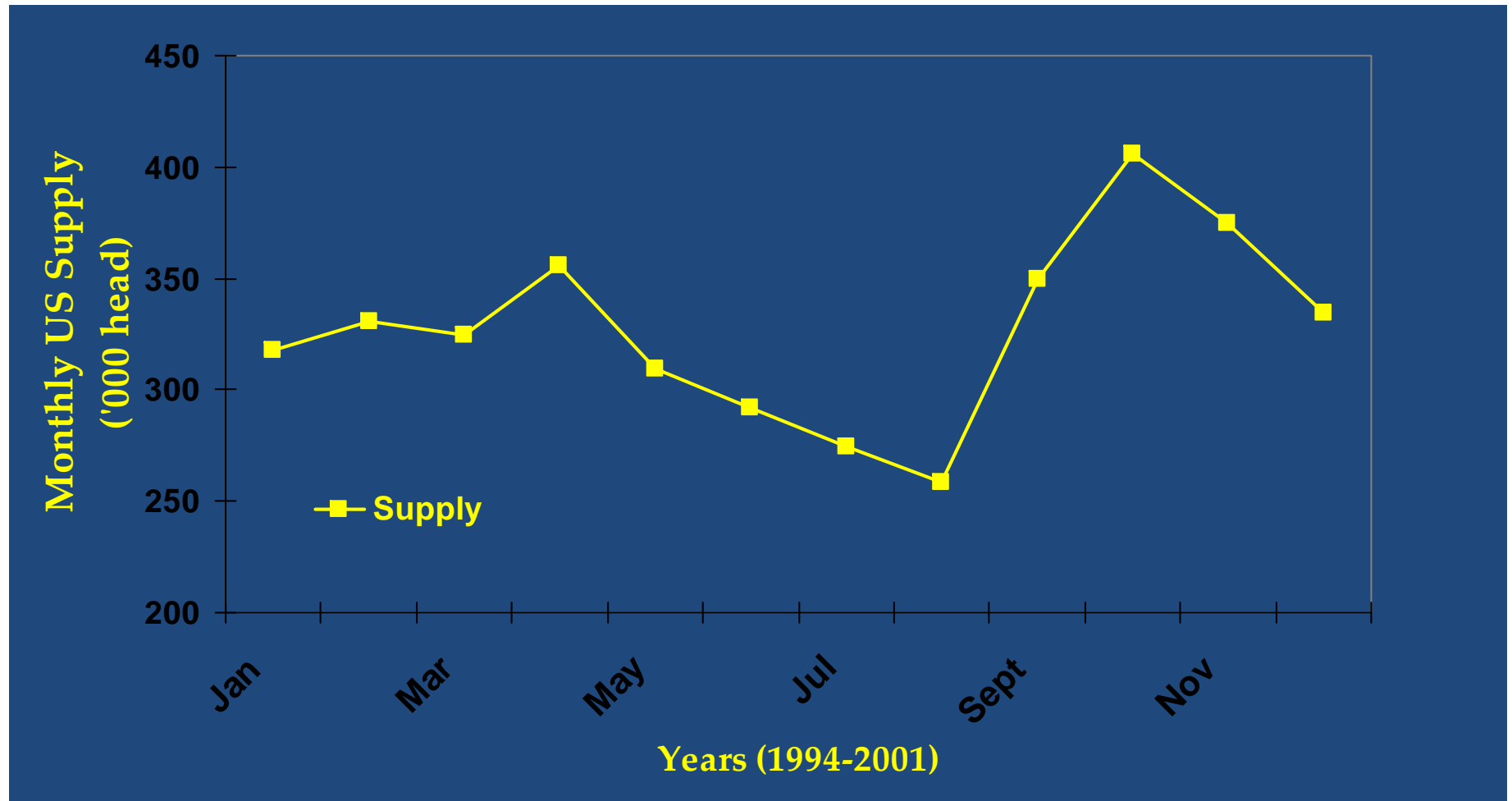
Seasonality of reproduction results
in most lambs marketed at **low**
lamb prices

Limits profitability

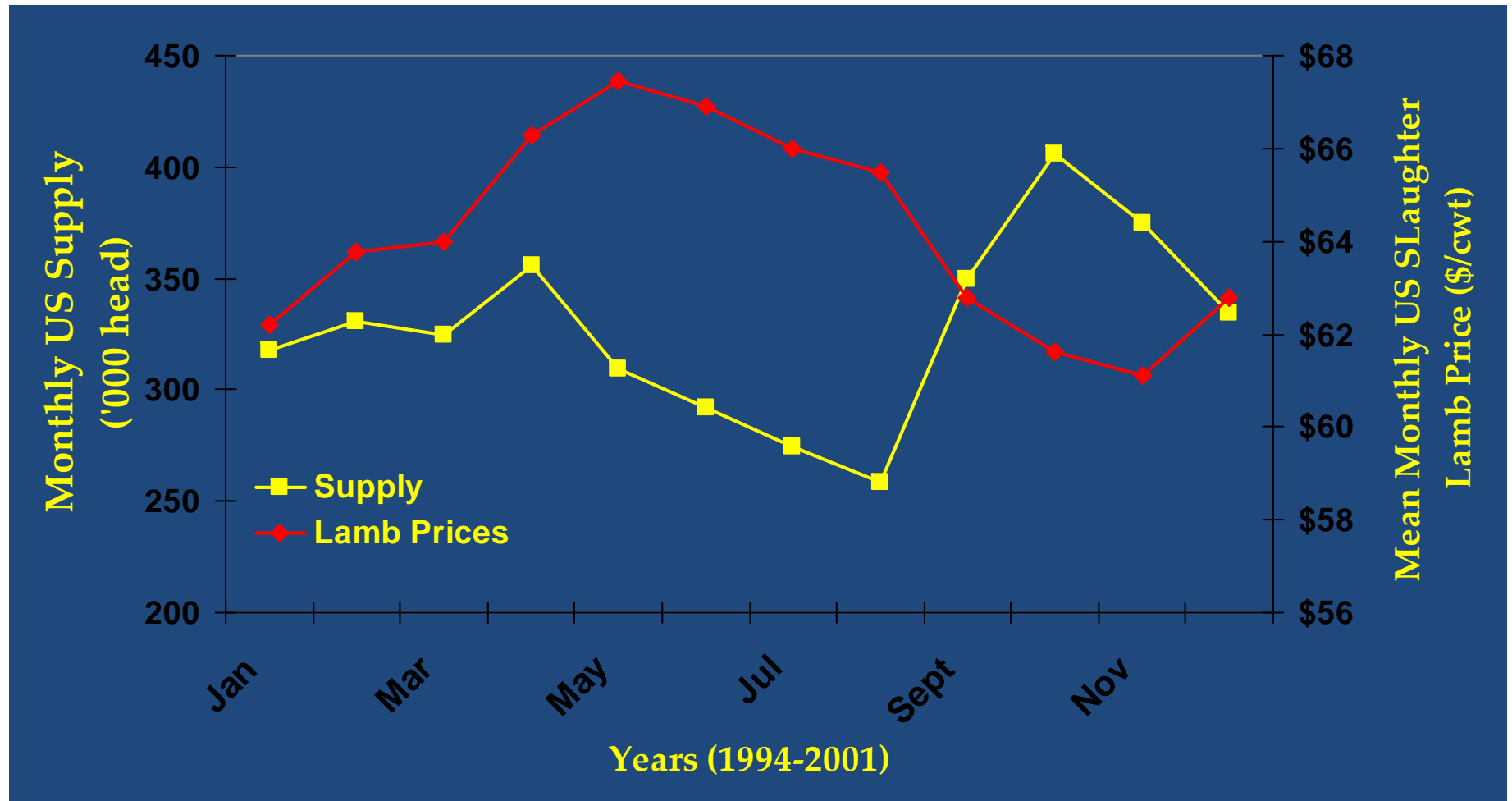
Seasonality of Reproduction in Ewes results in Most Lambs Being Sold at Lower than Average Prices



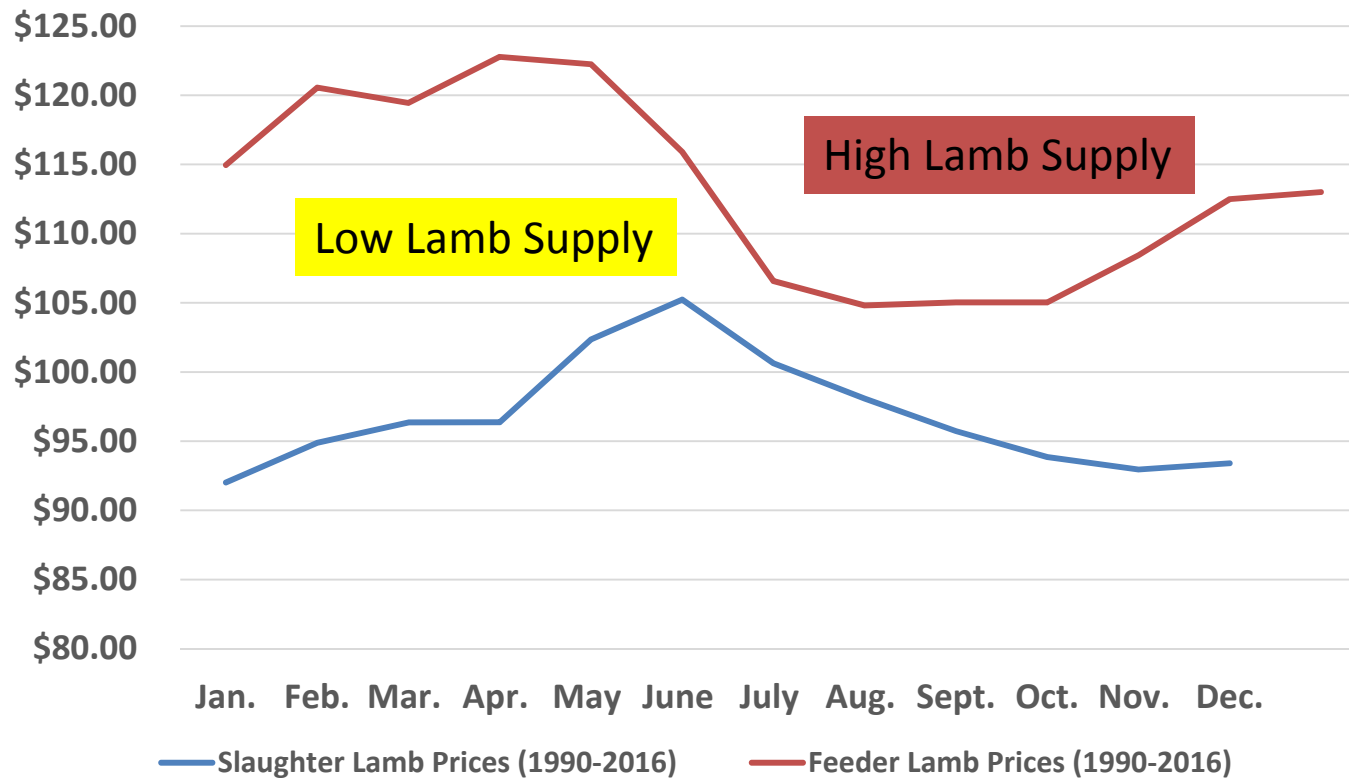
Seasonal Reproduction Results in Inconsistent Lamb Supplies and Market Gluts



Seasonality of reproduction results in most lambs marketed at low lamb prices



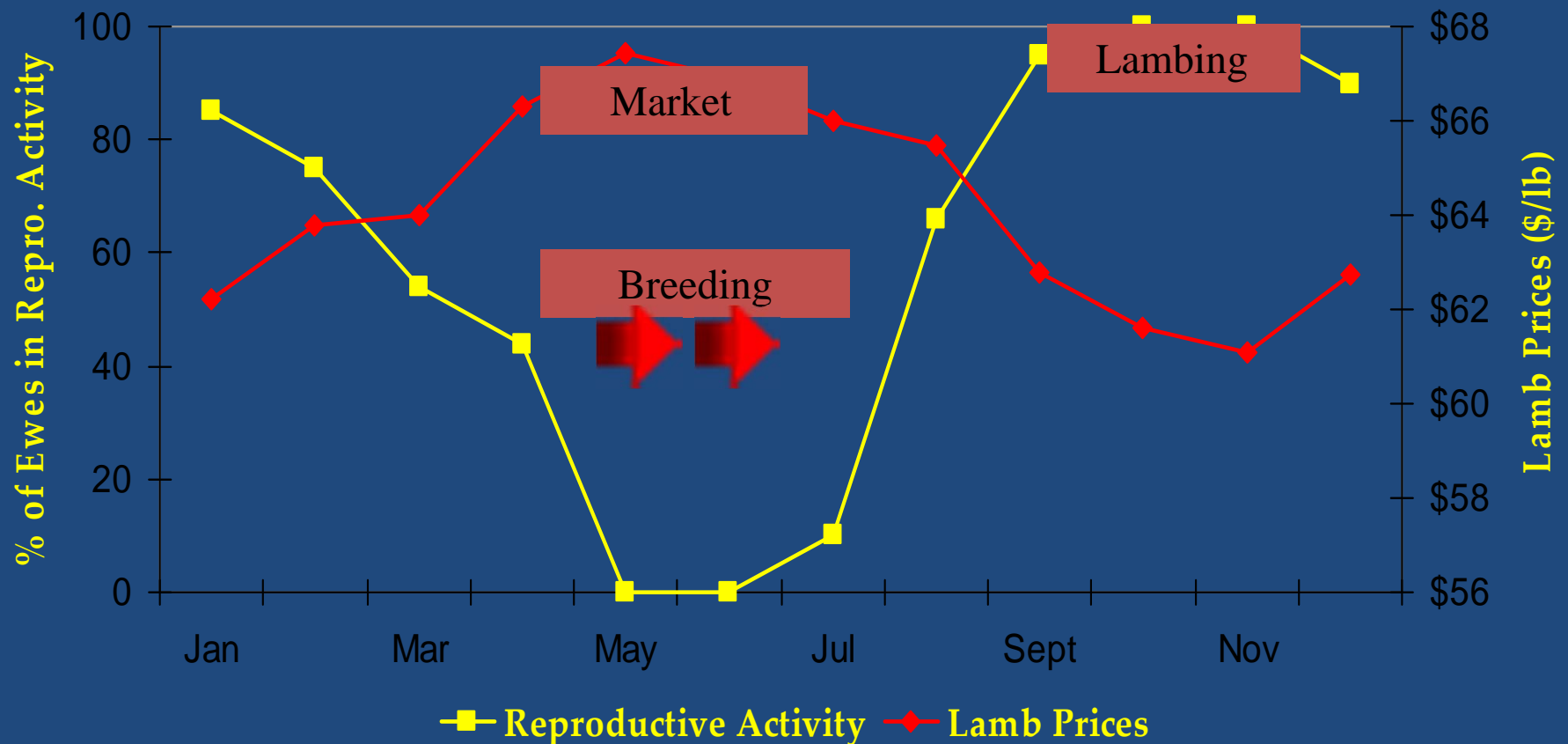
Monthly Slaughter and Feeder Lamb Prices (1990-2016)



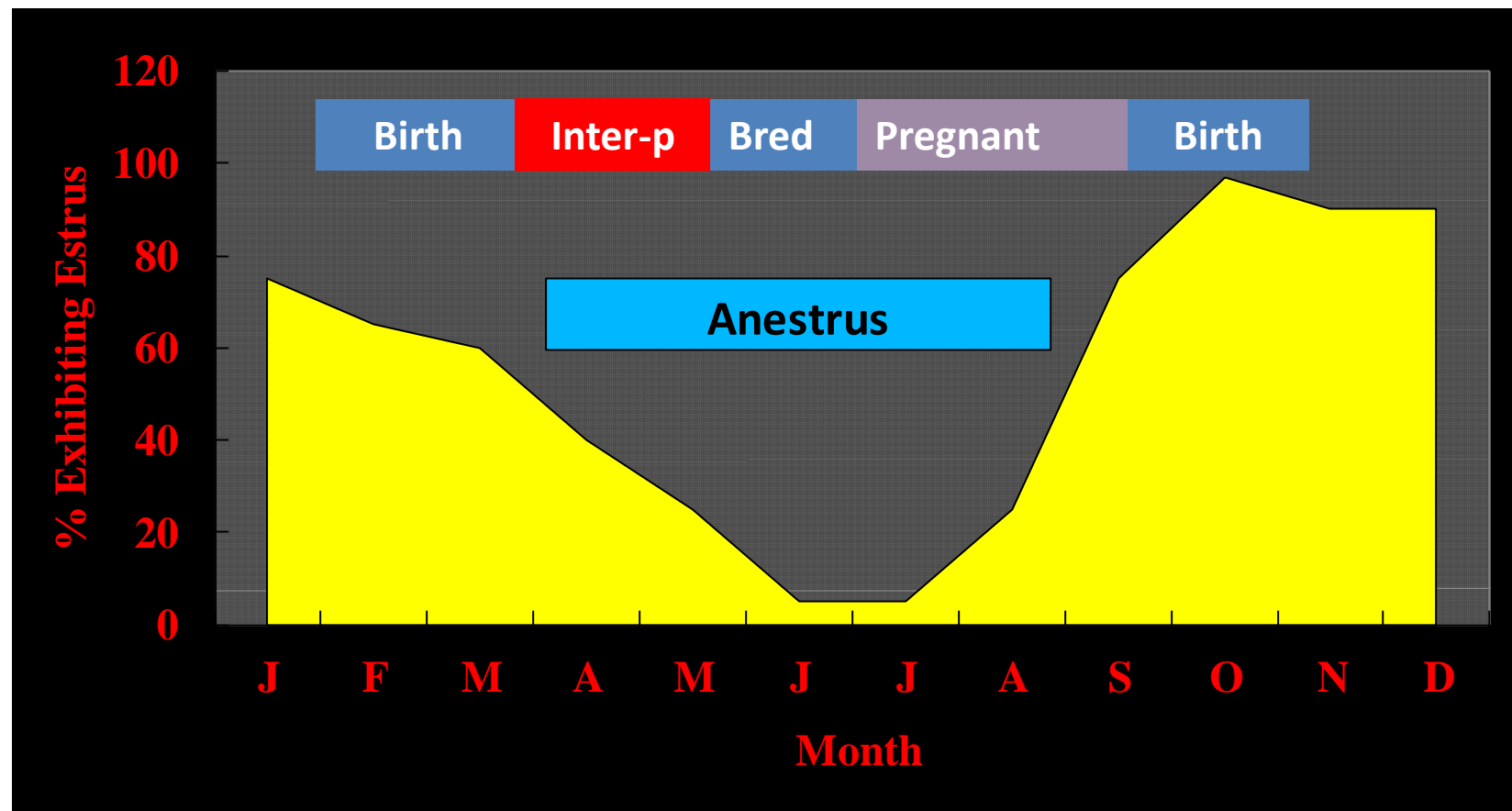
Goal for Out-of-Season Breeding

Target Higher Prices

Out-of-Season Breeding Allows you to Target Periods of High Lamb Prices



Out-of-Season Breeding means re-Breeding
During Seasonal Anestrus
shortens the inter-pregnancy period

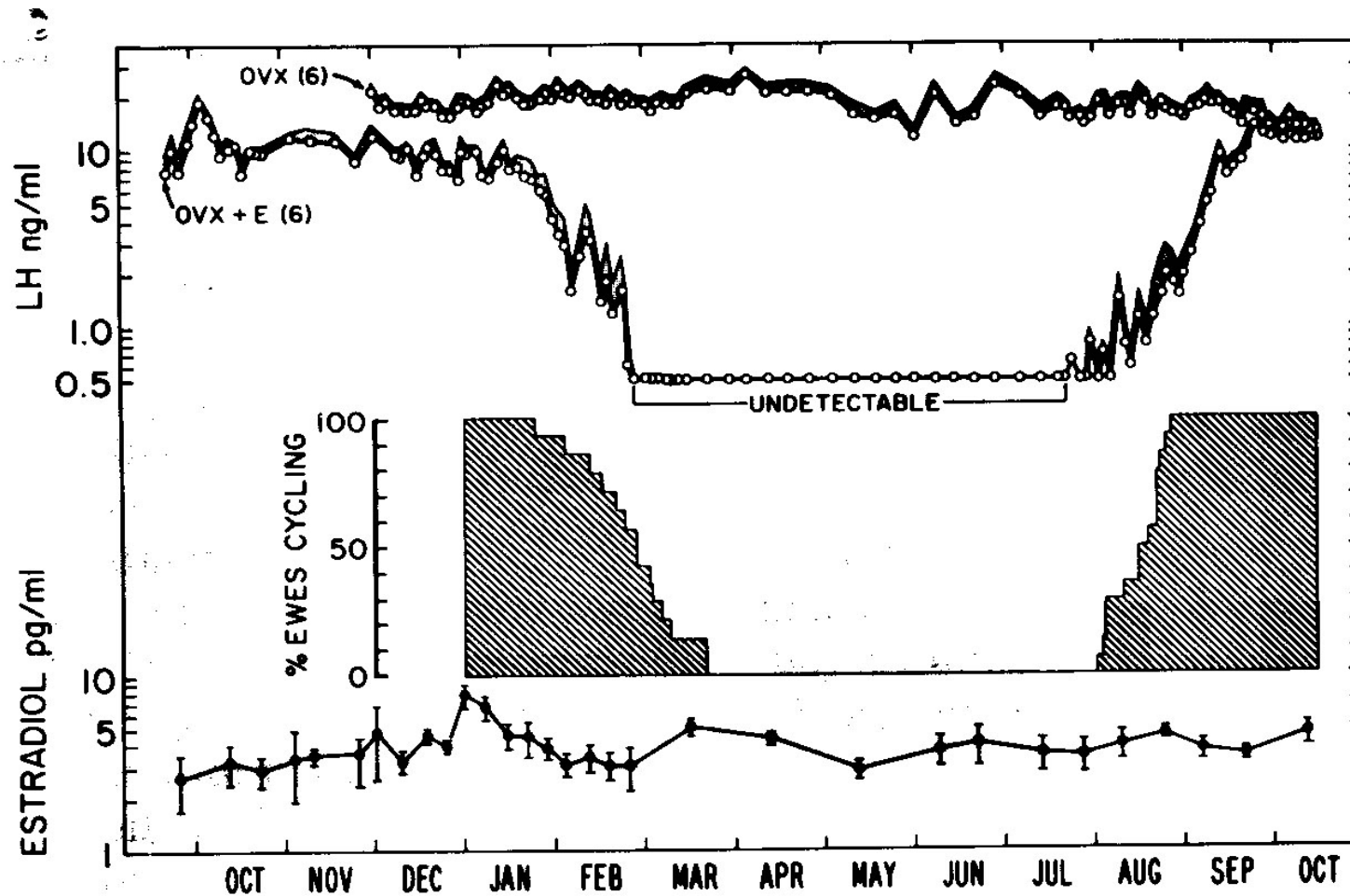


How Do we Get Ewes to Breed Out-of-Season?

- We reactivate the reproductive system!!



The Ewe is a Seasonally Polyestrous Animal



Seasonal Changes in the Sensitivity to Estradiol Negative Feedback
(Legan et al., 1977).

How do we Reactivate the Reproductive System of Seasonal Anestrous Ewes?

- Make the ewe think its fall (short days/breeding season)
 - Light manipulation
 - Cheap, natural but not always practical
 - Melatonin treatment
 - Relatively natural but not available or approved for use
- The “male /ram effect”



Abrupt Ram Introduction Reactivates the Reproductive System

Increases LH Secretion in Anestrous Ewes

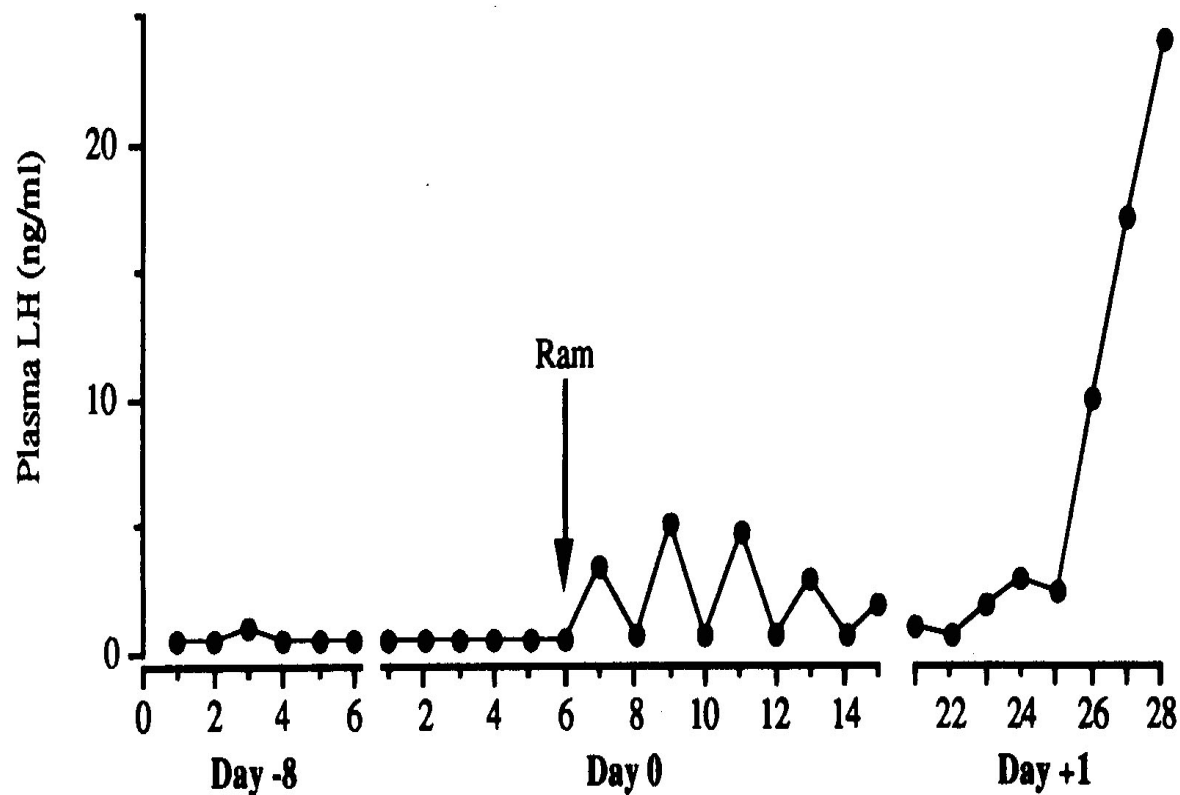
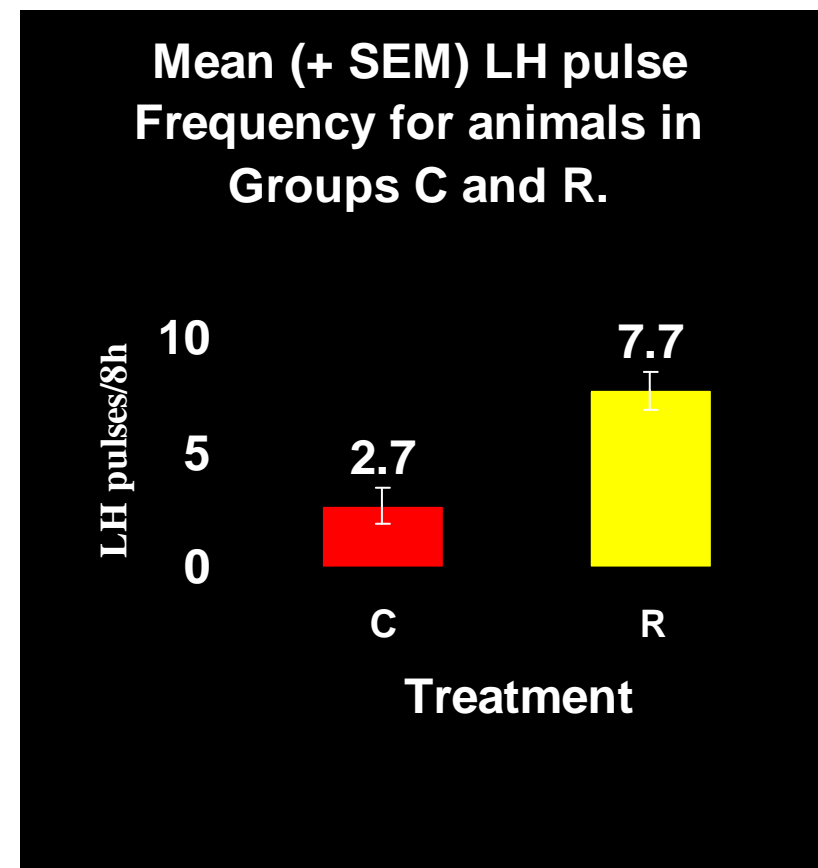
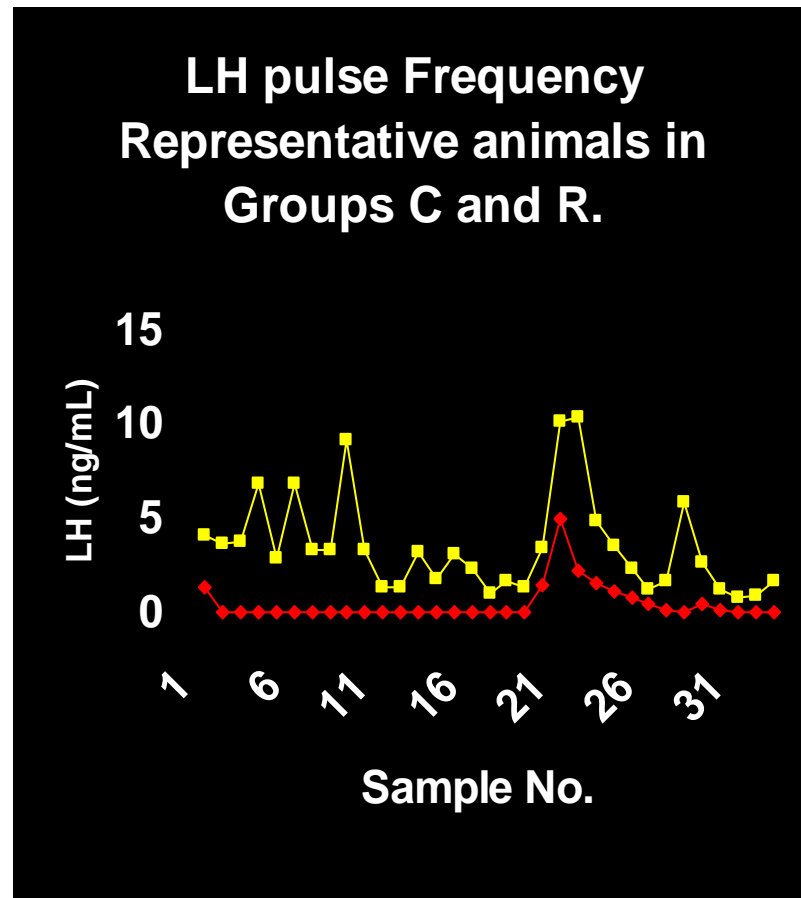
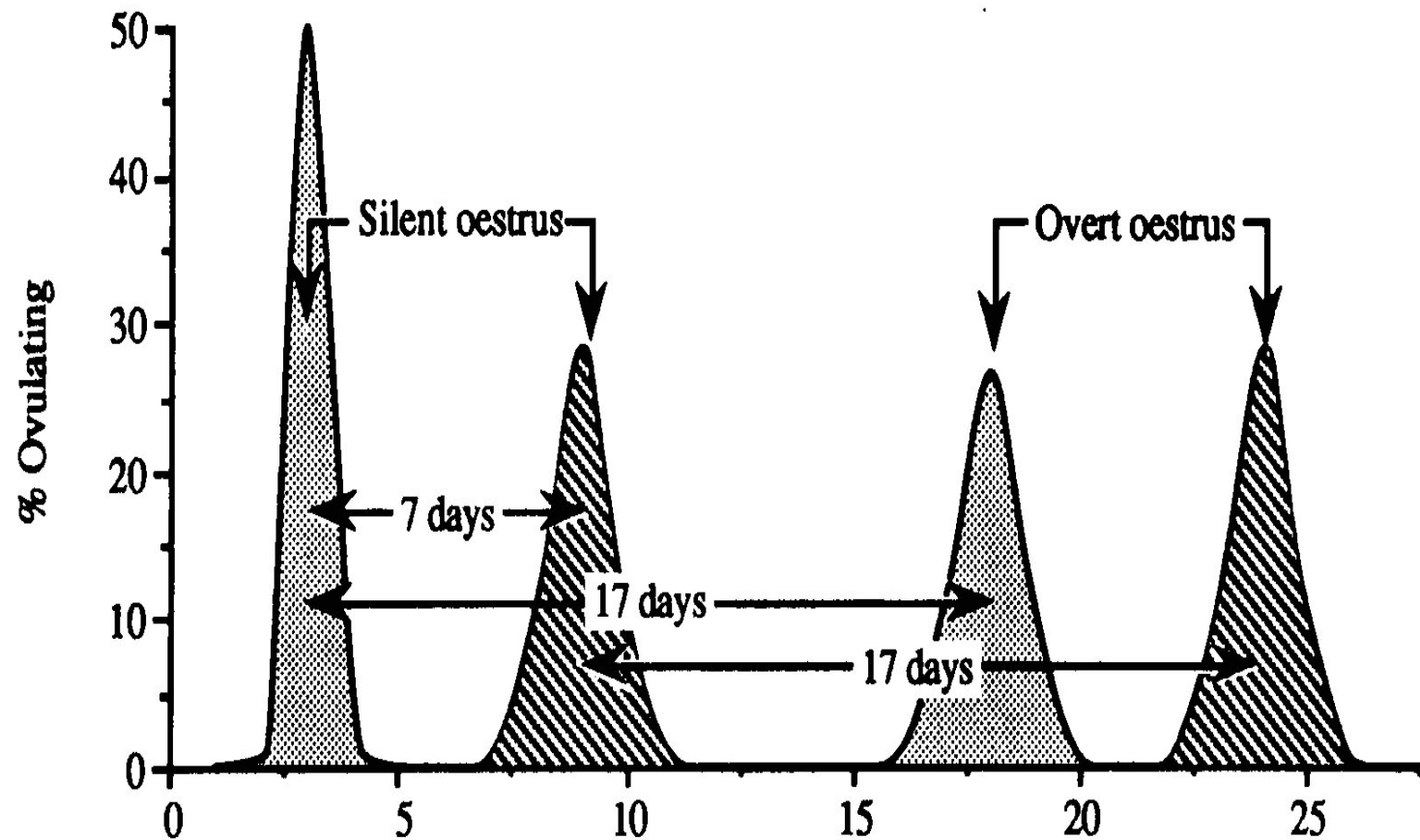


Fig. 2. Changes in the plasma concentrations of LH in a ewe one week before (Day -8), immediately before (Day 0) and 24 h after (Day +1) the introduction of rams. After Poindron *et al.* (1980).

RI increases secretion of LH in anestrus ewes (Knights et al., 2002)



Abrupt RI - “Ram-effect” reactivates the reproductive system and induces ovulation and estrus in some ewes



(Oldham and Martin, 1978)

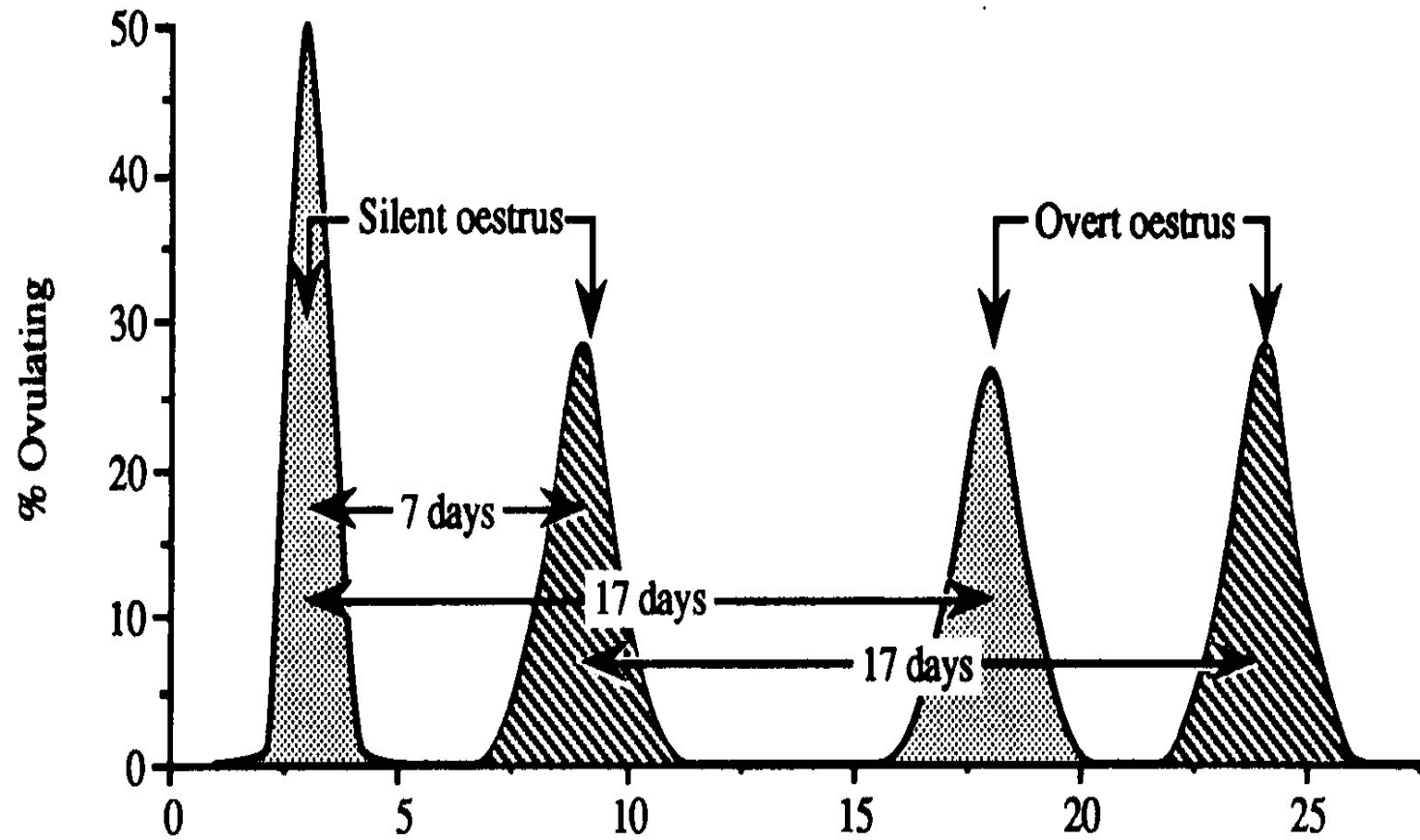
**The Ram effect is the Key to successful
breeding of ewes out of season!**

**MANY APPROACHES TO IMPROVE
LAMBING RATE IN OUT-OF-SEASON
BREEDING IS BASED ON HARNESSING
AND IMPROVING THE RAM-EFFECT
RESPONSE**

Progestserone Pre-treatment

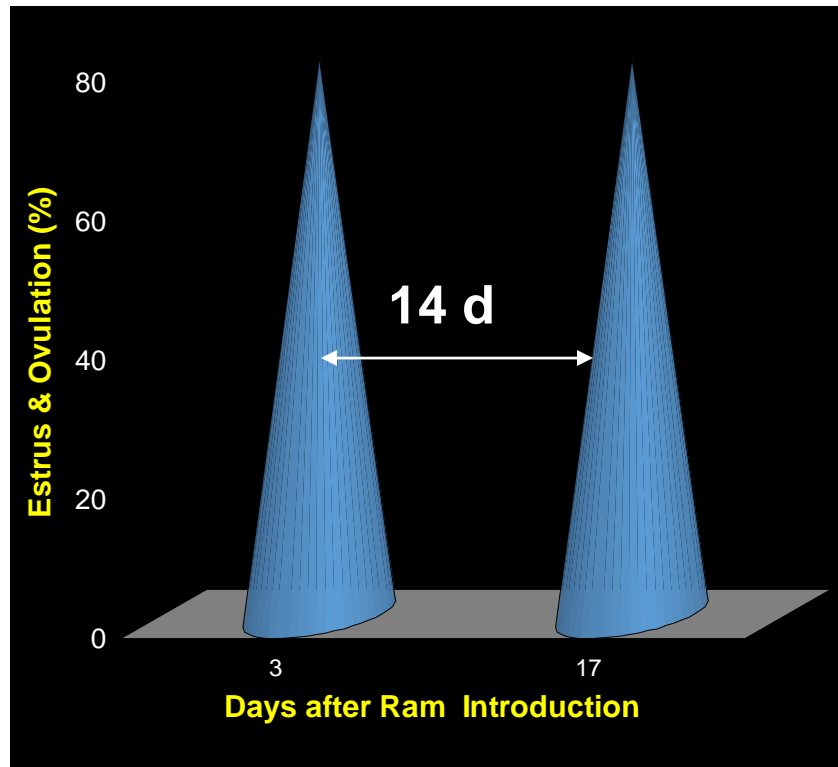
Breeding Dry mature Females Out-of-Season/Spring using CIDRs

Response of Anestrous Ewes to Abrupt RI - “Ram-effect”



(Oldham and Martin, 1978)

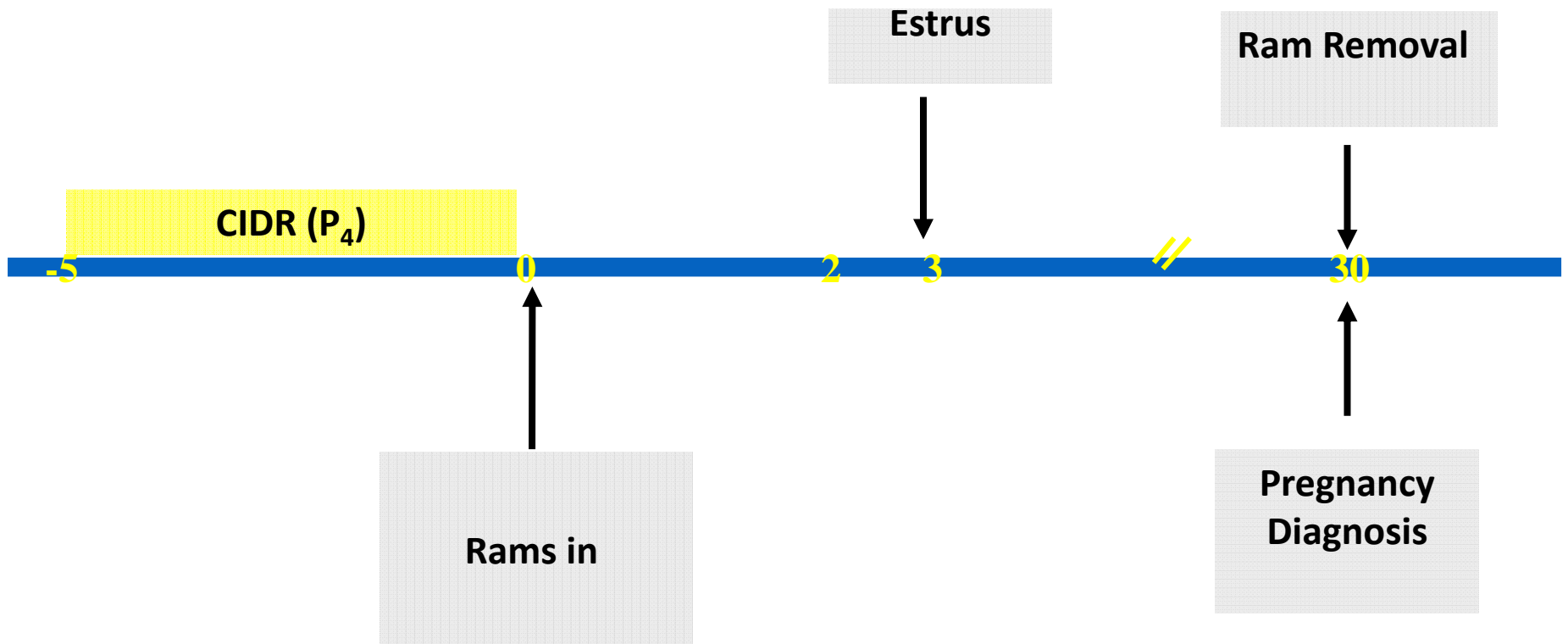
Progesterone-pretreatment and Ram/buck introduction



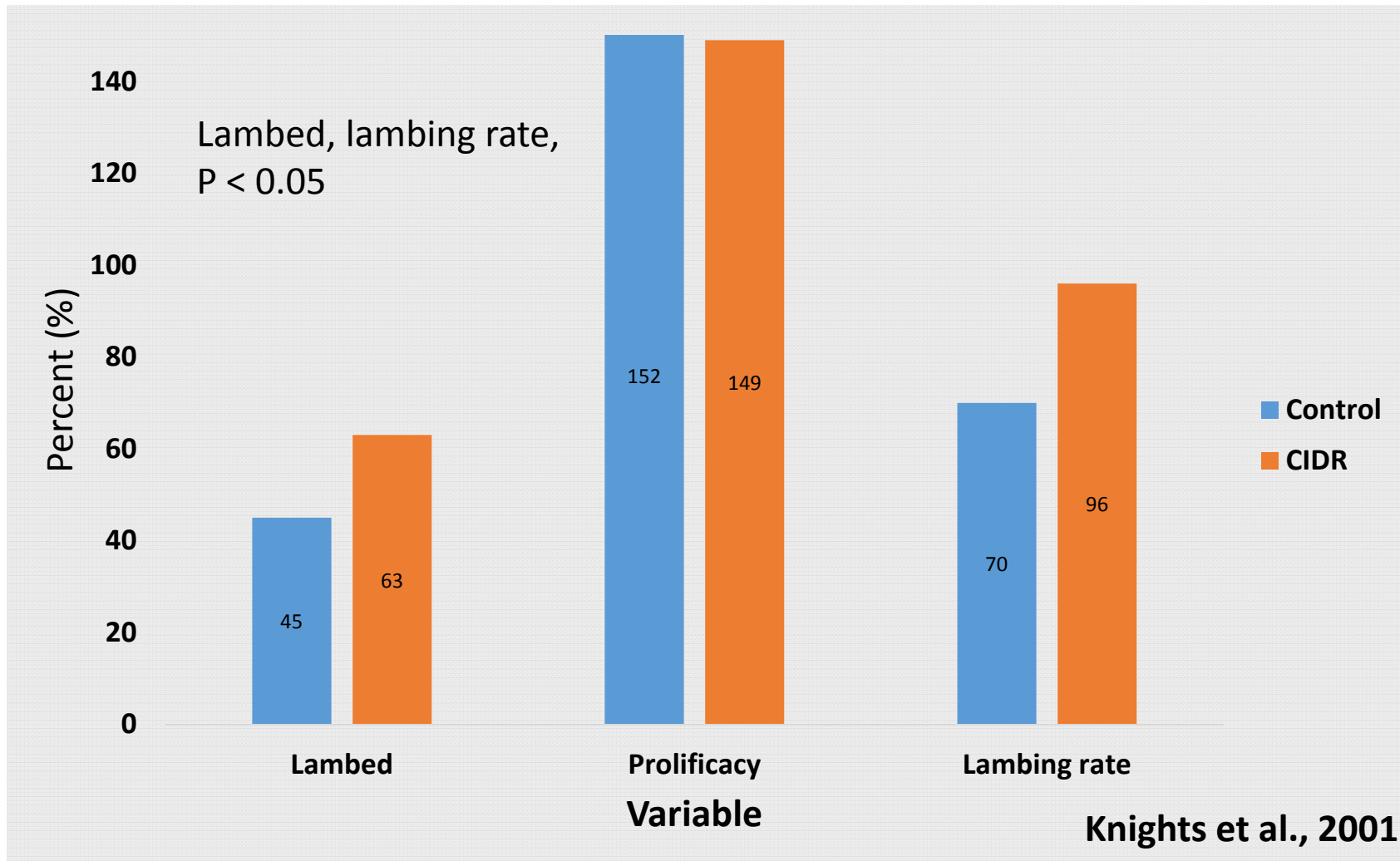
- **Effects of Progesterone**

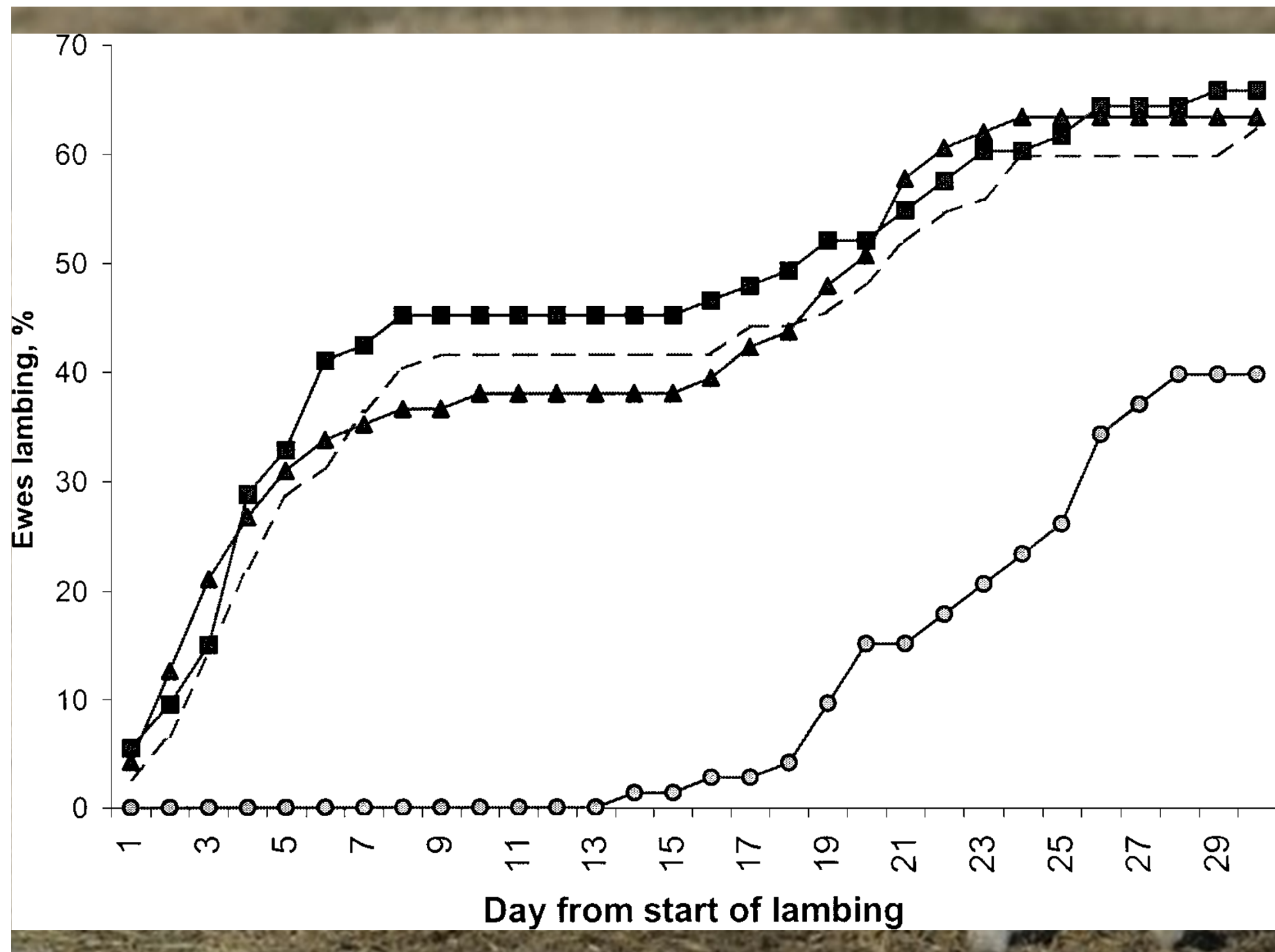
- Females express estrus at first ram-induced ovulation (females have opportunity to become pregnant before losing response to male)
- Prevents premature regression of (corpus luteum) CL

Treatment Schedule for Spring Breeding (Out-of-Season)

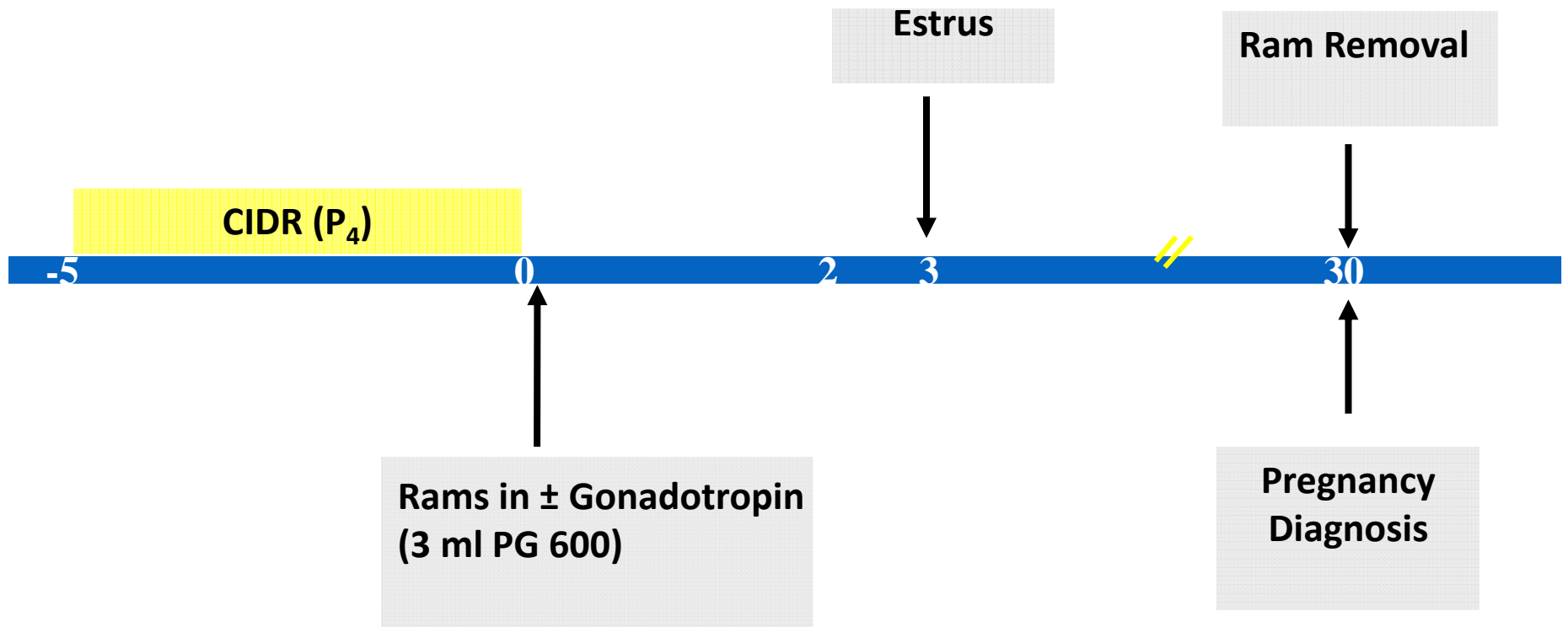


Reproductive Response of Progesterone (CIDR) Pre-treated Dry Anestrous Females

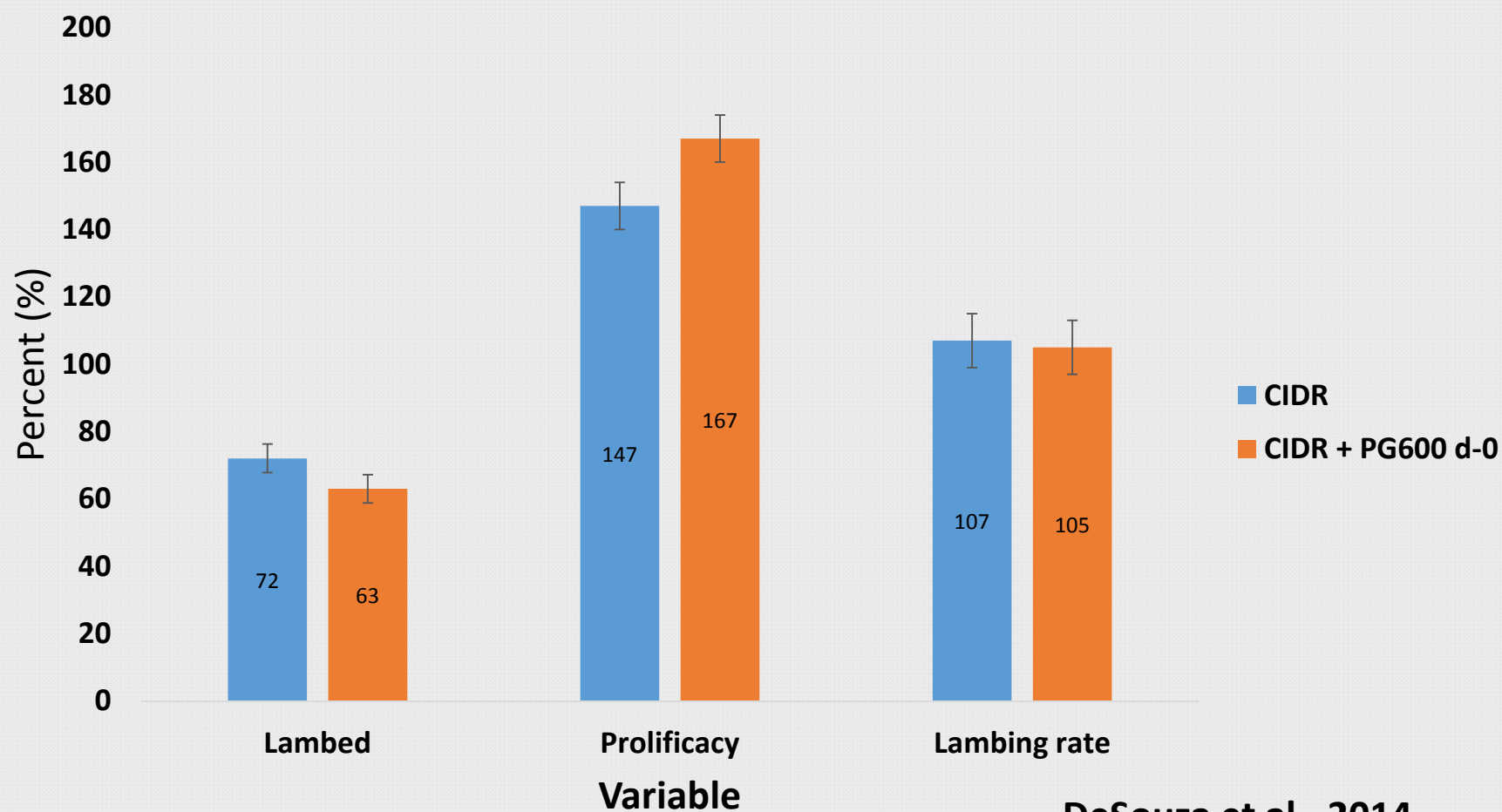




Another Approach for Spring Breeding (Out-of-Season)



Reproductive Response of Dry Anestrus Females Treated with P.G. 600[®] administered at CIDR Removal



DeSouza et al., 2014

Improving Lambing Rate in Out-of-Season Breeding Systems

- Breeding and selection
 - Choose the right breed
 - Tropical breeds
 - Dorset, Polypay, Finn-sheep
 - Select the right animals
 - h^2 for season length = 0.26
 - Select replacements from ewe lambs born in fall
 - Breed the right animals
 - Heterosis probably high



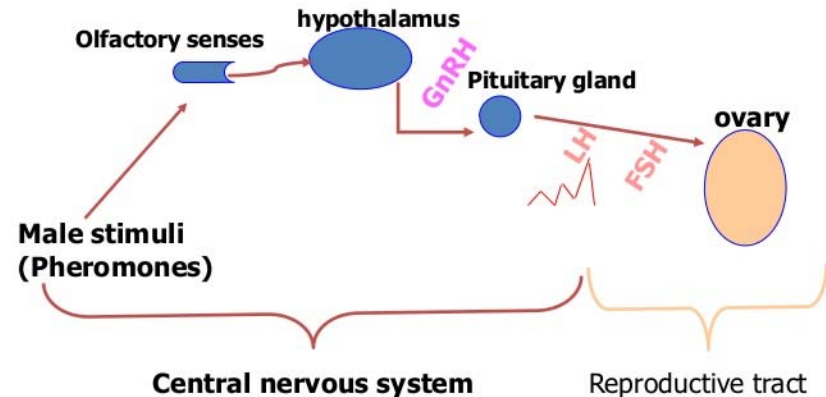
Improving Lambing Rate in Out-of-Season Breeding Systems

- Separate ewes from rams prior to breeding period

- At least 1 month prior to breeding
- Ewes can become refractory to the ram
- New/novel rams evoke the response

Natural method: The «male effect»

How it works



Improving Lambing Rate in Out-of-Season Breeding Systems

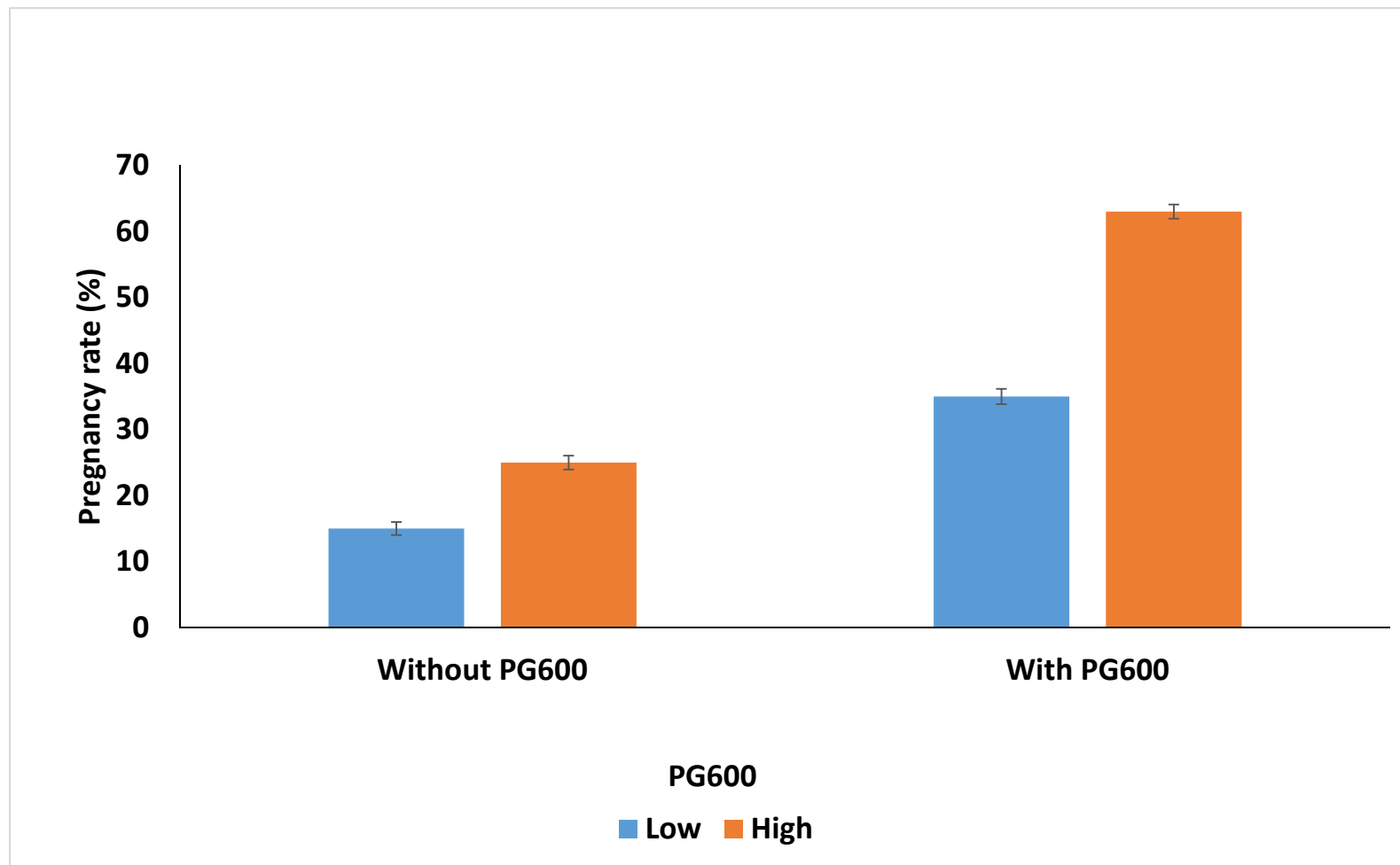
Season
Suckling
Low body
condition score



- Wean lambs from ewes
 - 1 month prior to breeding
- Ensure ewes are in good body condition
 - Improve nutrition



Improving Nutrition will Improve Pregnancy Rate in Lactating Ewes in Out-of-Season Breeding



Improving Lambing Rate in Out-of-Season Breeding Systems

- **Ram power** Ewe:ram ratio should not to exceed 18:1



Improving Lambing Rate in Out-of-Season Breeding Systems

- Manage the breeding area



- Keep in smaller lots first 2-3 days after ram introduction to maximize the ram effect (greater contact)
- Avoid single ram lots if possible

Improving Lambing Rate in Out-of-Season Breeding Systems

- Conduct breeding soundness examination on rams



Improving Lambing Rate in Out-of-Season Breeding Systems

- “Prime” the male
 - Melatonin treatment
 - Improve semen characteristics
 - Improve libido
 - Improve male effect



OPTIMIZING PROLIFICACY

LR = % lambing X prolificacy

Approaches to Optimize Prolificacy

- Selection and breeding
 - Breeding and selection –cheapest and most practical approach
 - Genetic diversity

Table 2. Average breed performance 2011 – GenOvis program

Breeds	# Ewes	# Born	# Lambings	Aver. born per lambing	Aver. weaned per lambing	Aver. Birth wt (kg)	Aver. Adj 50-wt (kg)	Aver. Adj 100-wt (kg)	Aver. ADG (kg)	Aver. # lambings/ ewe/yr
Border Cheviot	32	50	32	1.56	1.50	4.3	21.2	35.7	0.28	1.00
Border Leicester	44	74	48	1.54	1.33	4.5	20.2	35.7	0.29	1.09
Canadian	283	537	303	1.74	1.56	5.6	27.1	39.8	0.25	1.09
Clun Forest	74	109	75	1.45	1.35	0.0	22.0	32.1	0.20	1.01
Charollais	80	153	84	1.82	1.68	5.0	26.8	46.8	0.40	1.05
Corriedale	10	14	10	1.40	1.40	5.2	28.4	44.7	0.31	1.00
Dorset-Horned	14	27	14	1.93	1.79	0.0	21.9	33.4	0.23	1.00
Dorper	139	251	168	1.49	1.34	3.9	20.0	35.7	0.30	1.21
Dorset-Polled	1,837	3,140	2,030	1.55	1.39	4.7	23.6	37.0	0.27	1.11
Finnish Landrace	32	89	37	2.41	2.19	3.1	21.6	36.2	0.29	1.16
Hampshire	325	542	361	1.50	1.32	5.1	26.0	45.1	0.37	1.11
Ile de France	103	178	112	1.59	1.44	4.4	25.2	41.4	0.31	1.09
Icelandic	100	178	100	1.78	1.68	3.9	19.1	29.8	0.22	1.00
Katahdin	34	58	34	1.71	1.50	4.2	19.0	39.0	0.38	1.00
North Country Cheviot	305	488	305	1.60	1.48	5.3	24.6	36.2	0.24	1.00
Oxford	8	13	8	1.63	1.63	5.9	23.2	43.9	0.41	1.00
Polypay	615	1,441	757	1.90	1.68	4.5	23.3	37.7	0.29	1.23
Rideau	4,082	10,522	4,507	2.33	1.90	3.8	22.5	38.9	0.33	1.10
Romanov	1,054	3,601	1,120	2.95	2.33	2.9	20.8	35.8	0.30	1.16
Shropshire	14	24	14	1.71	1.64	0.0	24.2	43.9	0.38	1.00
Suffolk	844	1,489	900	1.65	1.45	5.0	25.1	43.4	0.36	1.07
Tunis	9	11	9	1.22	0.89	5.6	20.5	27.3	0.14	1.00
Texel	243	349	243	1.44	1.31	4.6	23.8	34.1	0.20	1.00

Approaches to Optimize Prolificacy

- Other management practices
 - Nutritional management
 - Flock composition

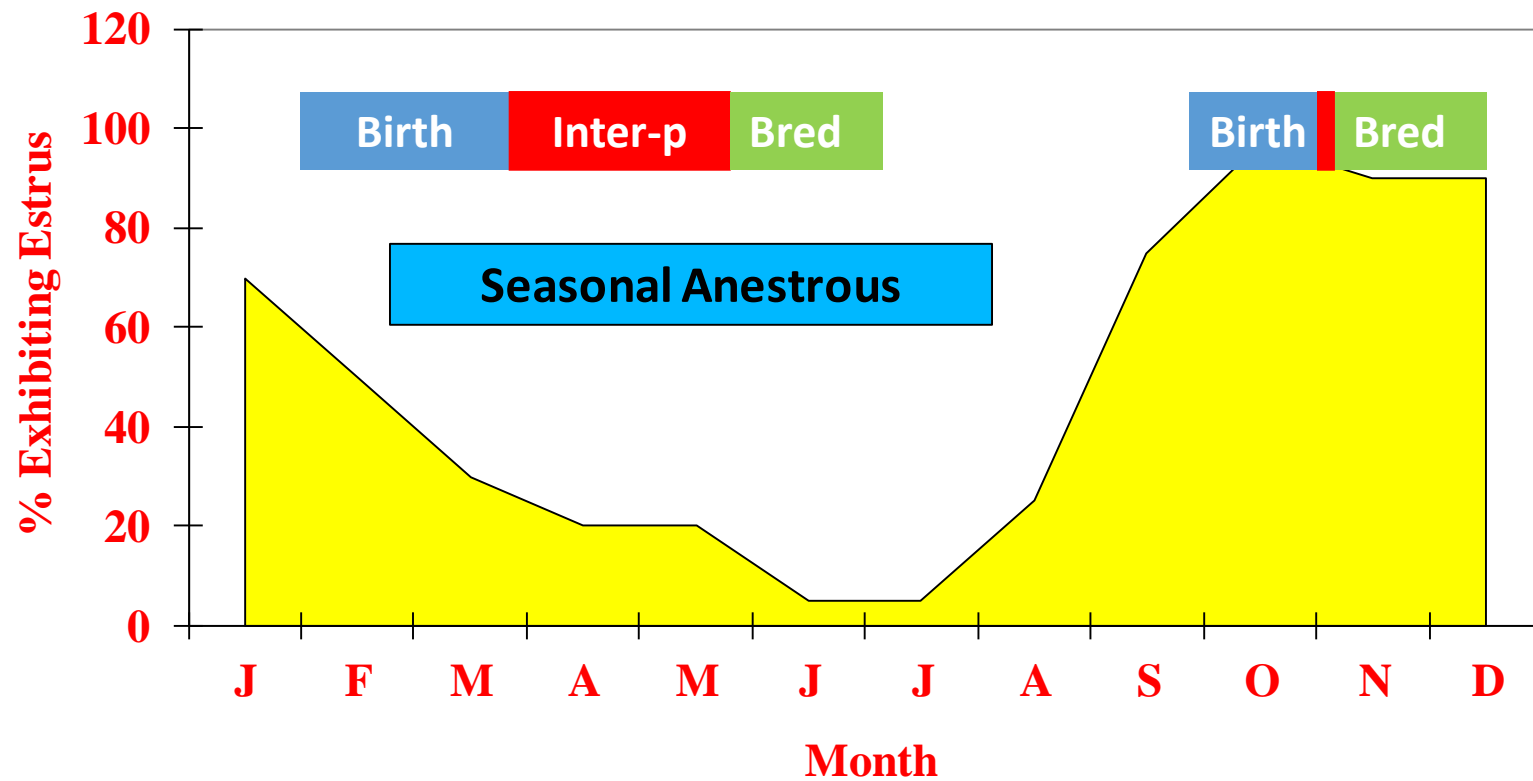
Other Goals for Out-of-Season Breeding

- Opportunity to improve annual and lifetime ewe productivity
- Improve consistency in lamb supply
- Fewer Losses to Predators
- Improve Profits

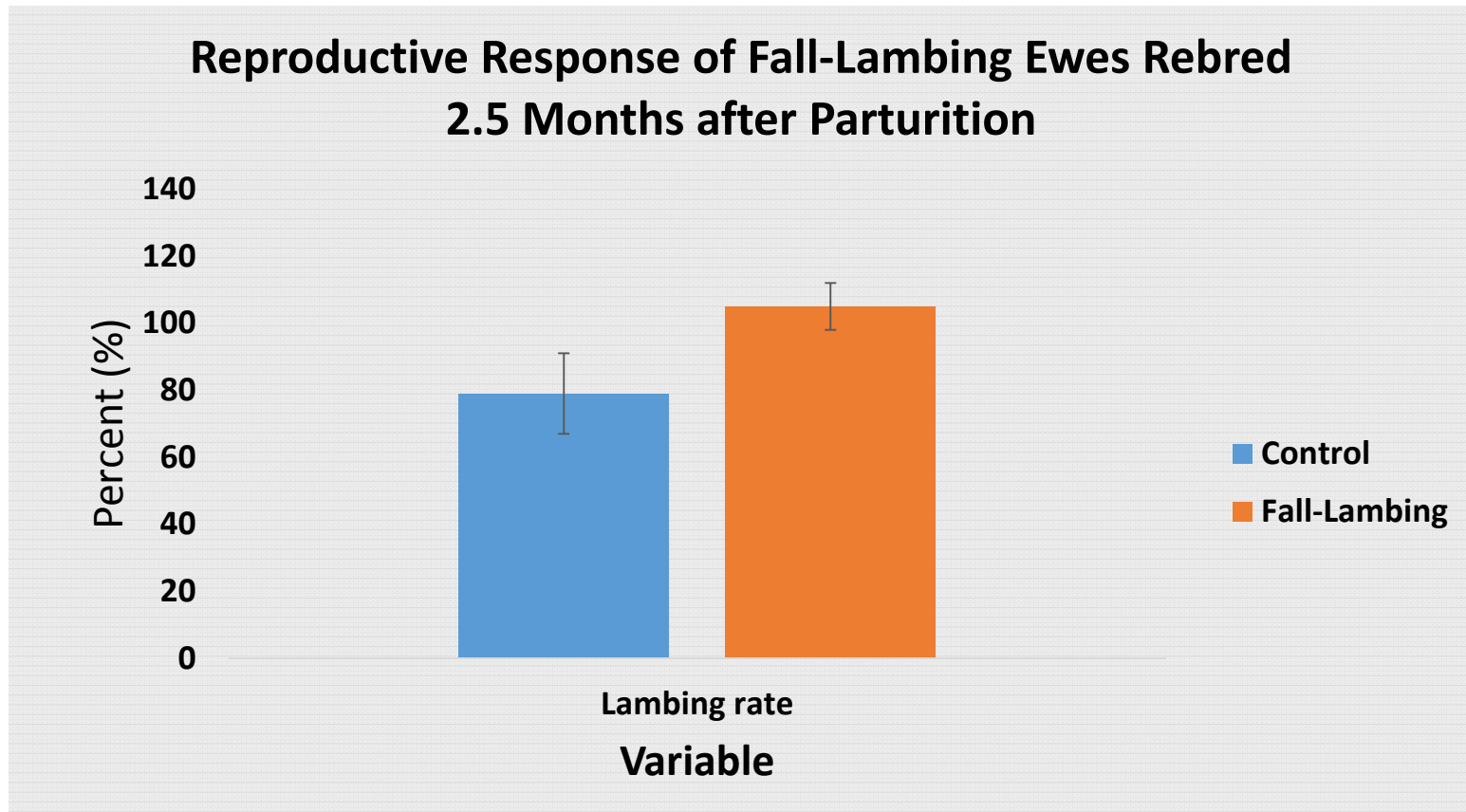
Taking Further Advantage of Fall Lambing/Out of Season Breeding

Re-breeding of Fall- lambing Females

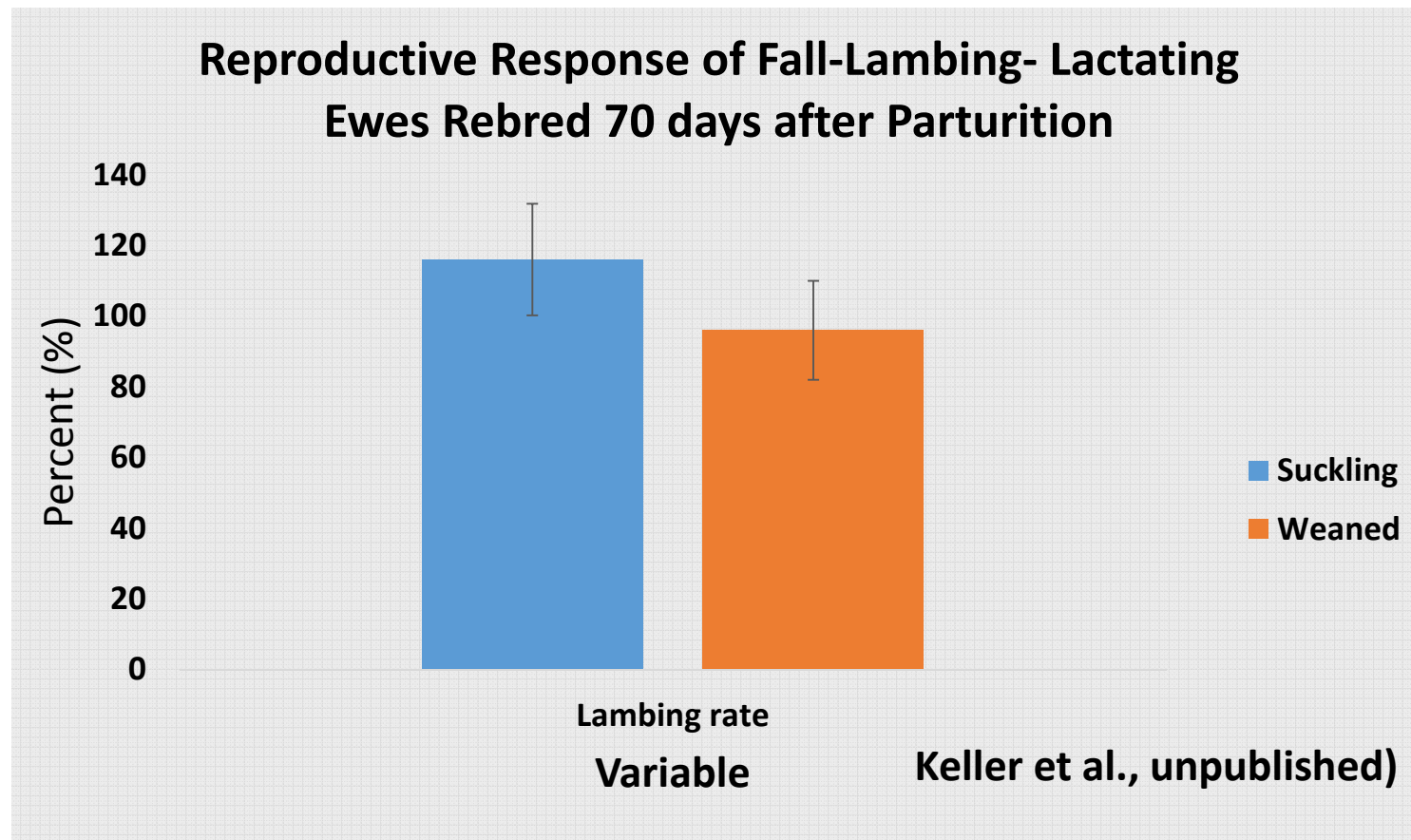
Rebreeding Fall Lambing Females



Dry Fall-lambing Ewes Can be Re-bred with High Fertility in Late Fall/Early Winter



Suckling will not Affect the Ability of Fall-lambing Ewes to Re-breed in Late Fall/Early Winter.



Summary

- Fall Lambing can improve productivity and profitability **if lambing rates are optimal**
- Achieving optimal lambing rates involves properly preparing the ewe and ram for breeding
- The use of CIDRs (progesterone-pretreatment) and other pharmaceuticals can also assist in achieving optimal lambing rates

Our Sheep Group West Virginia University

THANK EWE



Differences Exist for Operations with Fall-Lambing Versus Spring-Lambing

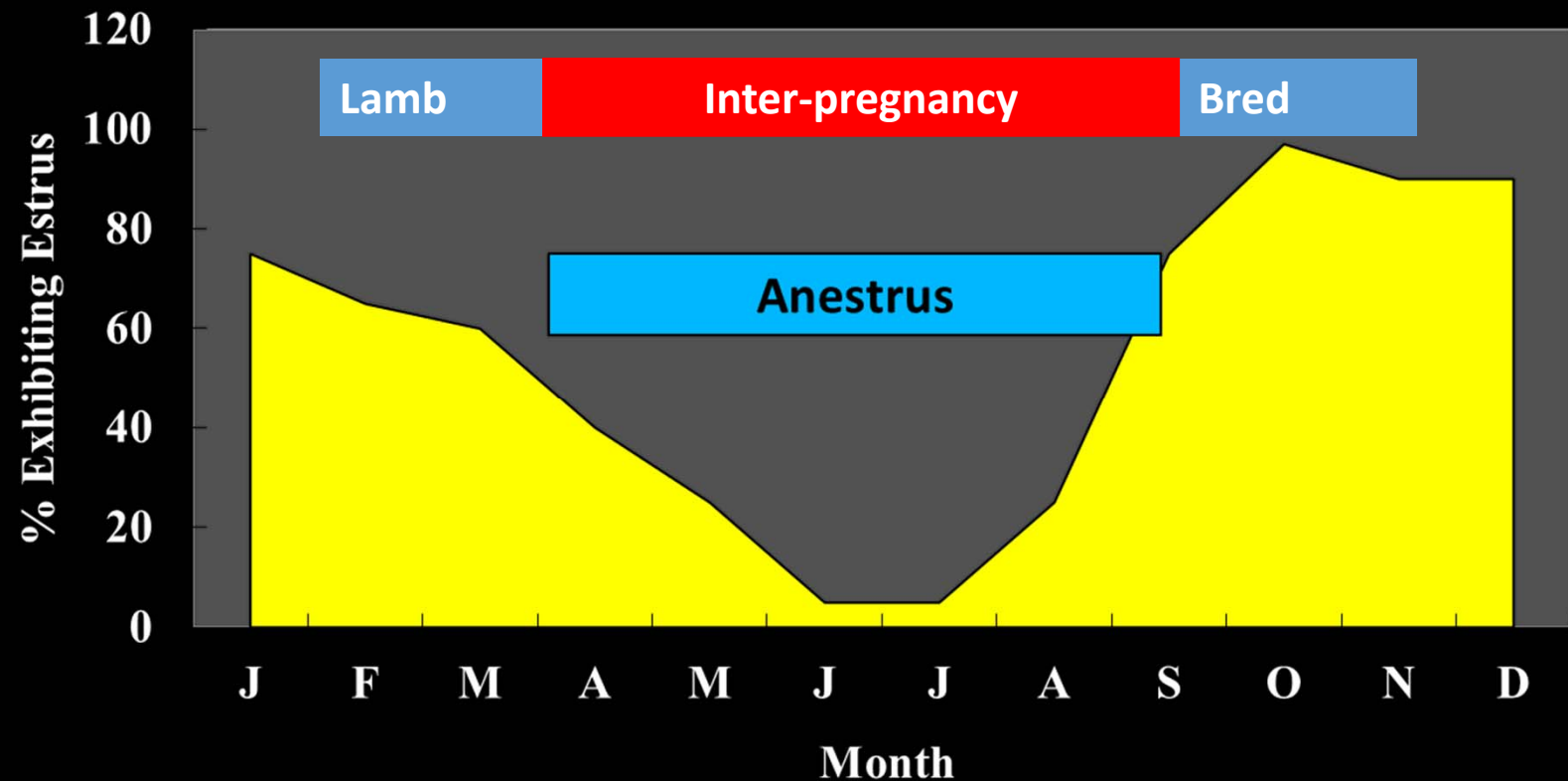
Production Variable	Fall Lambing	Spring Lambing
Pregnancy Rate (ewes lambing/ewes exposed)	75%	89%
Lamb Crop (lambs born/ewe lambing)	159%	170%
Mortality Rate	6%	10%
Average Market Price	\$0.93	\$0.75
Average Cost/lb of Lamb Produced	\$0.58	\$0.51
Profit/lb of Lamb Produced	\$0.33	\$0.28

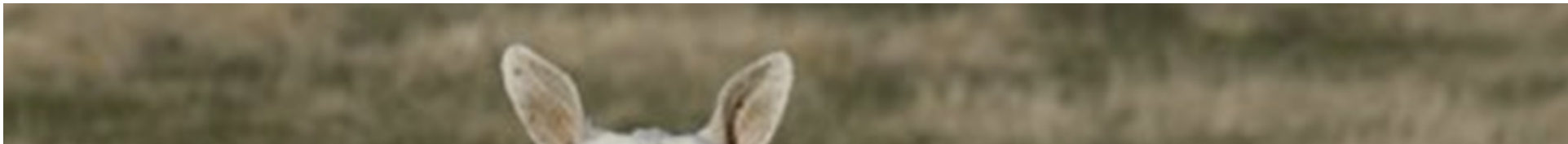


Lambing Rate in some Sheep Producing Countries

Country	Lambing rate, %	
Australia	90-98	Australia Bureau of Statistics, 2013
New Zealand	125-129	Beeflambnz.com, 2013
UK	155-160	Nationalsheep.org.uk, 2011; nadis.org.uk
Canada	132 [193-225]	Sheep Statistics, 2012; Kennedy, OMAFRA
USA	110	NASS

**Increasing frequency of lambing
requires shortening the inter-
pregnancy period re-breeding during
anestrus**





Graph 7. January 1 Breeding Sheep and Lamb Inventory - United States

Thousand head

