ALIMENTACIÓN Y REPRODUCCIÓN
VALORACION DE MASA CORPORAL

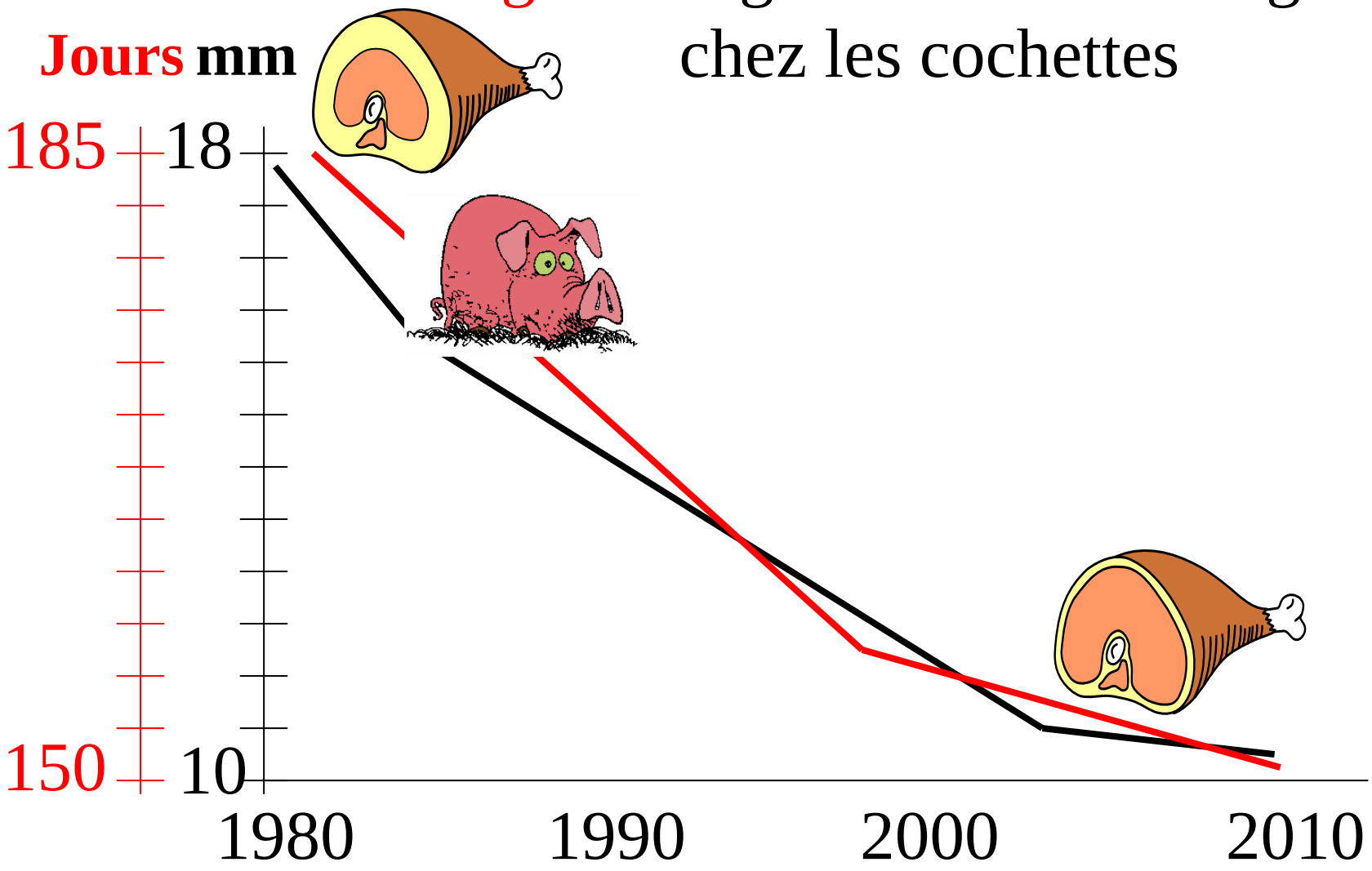
Guy-Pierre MARTINEAU
Ecole Nationale Vétérinaire
Toulouse

Saragosse, jeudi 30 novembre 2006

ALIMENTACIÓN Y REPRODUCCIÓN
VALORACION DE MASA CORPORAL

- Troubles de la reproduction
  - Infectieux vs non-infectieux
- Evolution et Révolution
  - Evolution des truies
  - (R)évolution des concepts
    - Gras et Masse protéique
- Entre théorie et pratique
  - Effet papillon
  - Effet lignée

Evolution de l'âge et du gras dorsal à 100 kg chez les cochettes



Diagnostic approaches to reproductive failure in pigs

Larry Rueff, DVM

- Acute reproductive problems, usually described by the client as a storm of problems associated with abortions, stillborn pigs, premature litters, and/or sows off feed.
- Chronic reproductive failure, usually exhibited by low farrowing rates, low live births, and/or a high number of animals failing to conceive.

Causes of reproductive failure in swine

Infectious diseases

Boar:
- Viral
- Bacterial

Sow or gilt:
- Viral
- Bacterial

Noninfectious

Boar:
- Age
- Body temperature
- Usage

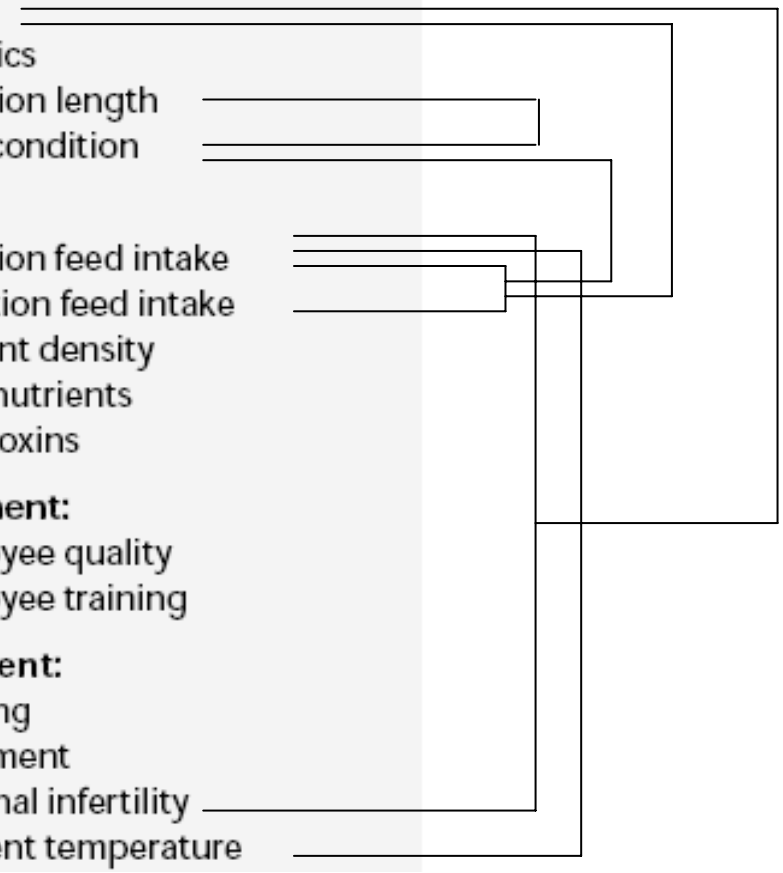
Sow or gilt:
- Parity
- Genetics
- Lactation length
- Body condition

Feed:
- Lactation feed intake
- Gestation feed intake
- Nutrient density
- Micronutrients
- Mycotoxins

Management:
- Employee quality
- Employee training

Environment:
- Housing
- Movement
- Seasonal infertility
- Ambient temperature

Même si apparemment il y a de très nombreux facteurs, la réalité met en évidence de très nombreuses interactions



Effet parité et reproduction

Importance des problèmes de reproduction chez les cochettes et les parités 1

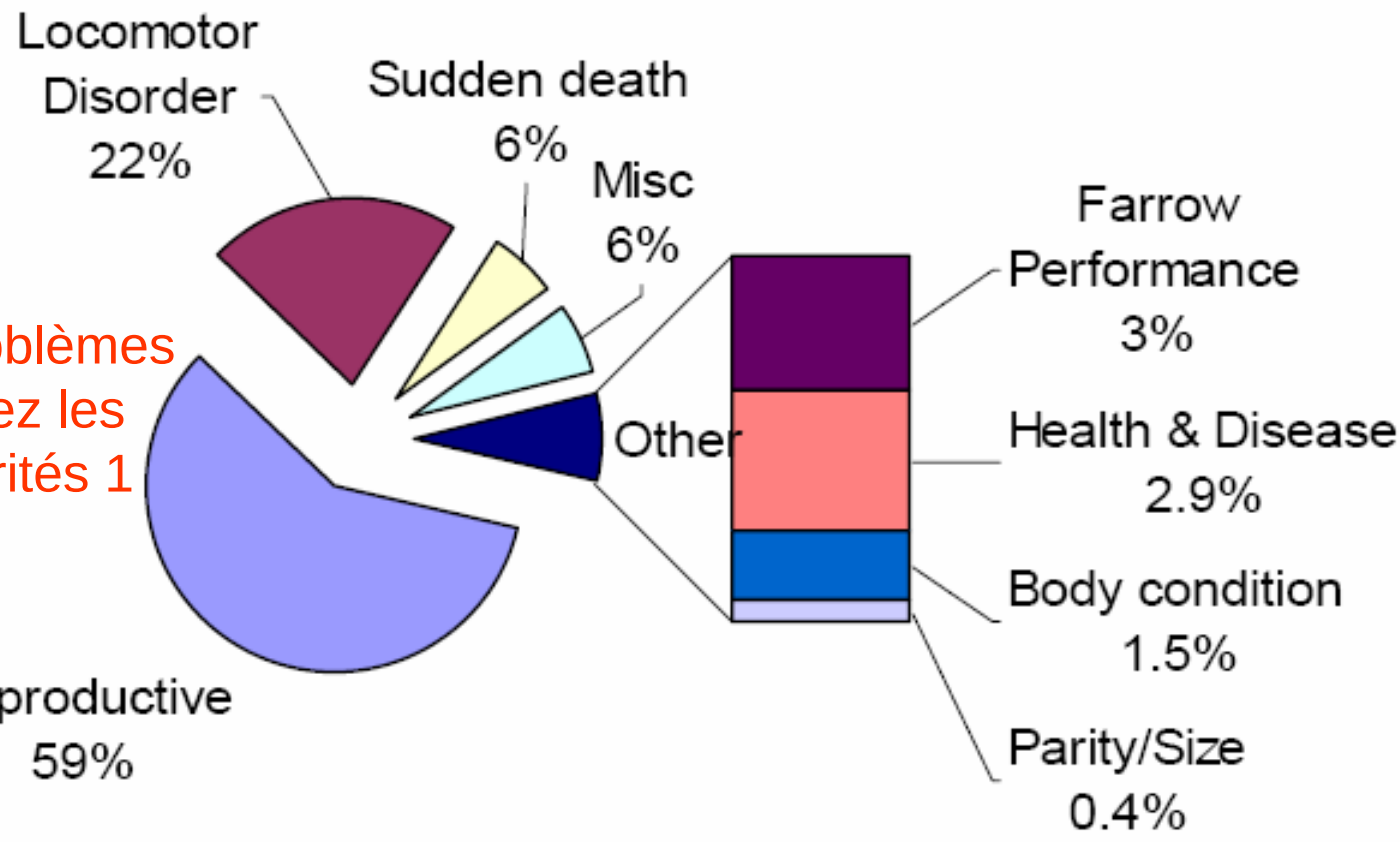


Figure 1. Example of removal reasons for gilts and first-litter sows

Source: Clowes (unpublished data) – 13,873 removals (1999-2004)

Diagnostic approaches to reproductive failure in pigs

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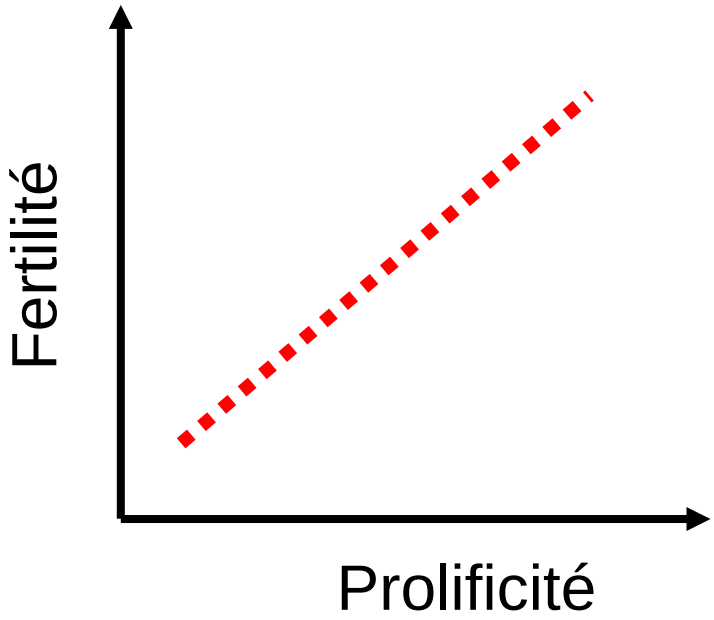
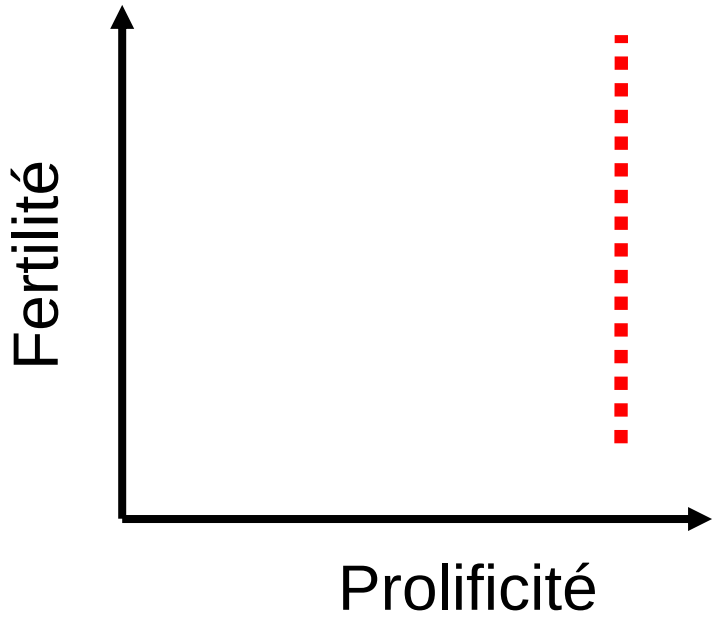
Cas classique

Les nouveaux problèmes de reproduction

Cas classique



Les nouveaux cas



International
Piglatter
Swine Management Ideas
Published by Pig World Inc. • Box 662
Volume 1, No. 3

1981

Cold, Underfed Sows Sometimes Abort Litters

By Dr. Al Leman

Winter Abortions Result from—

Années 70-80
le syndrome de la truie maigre

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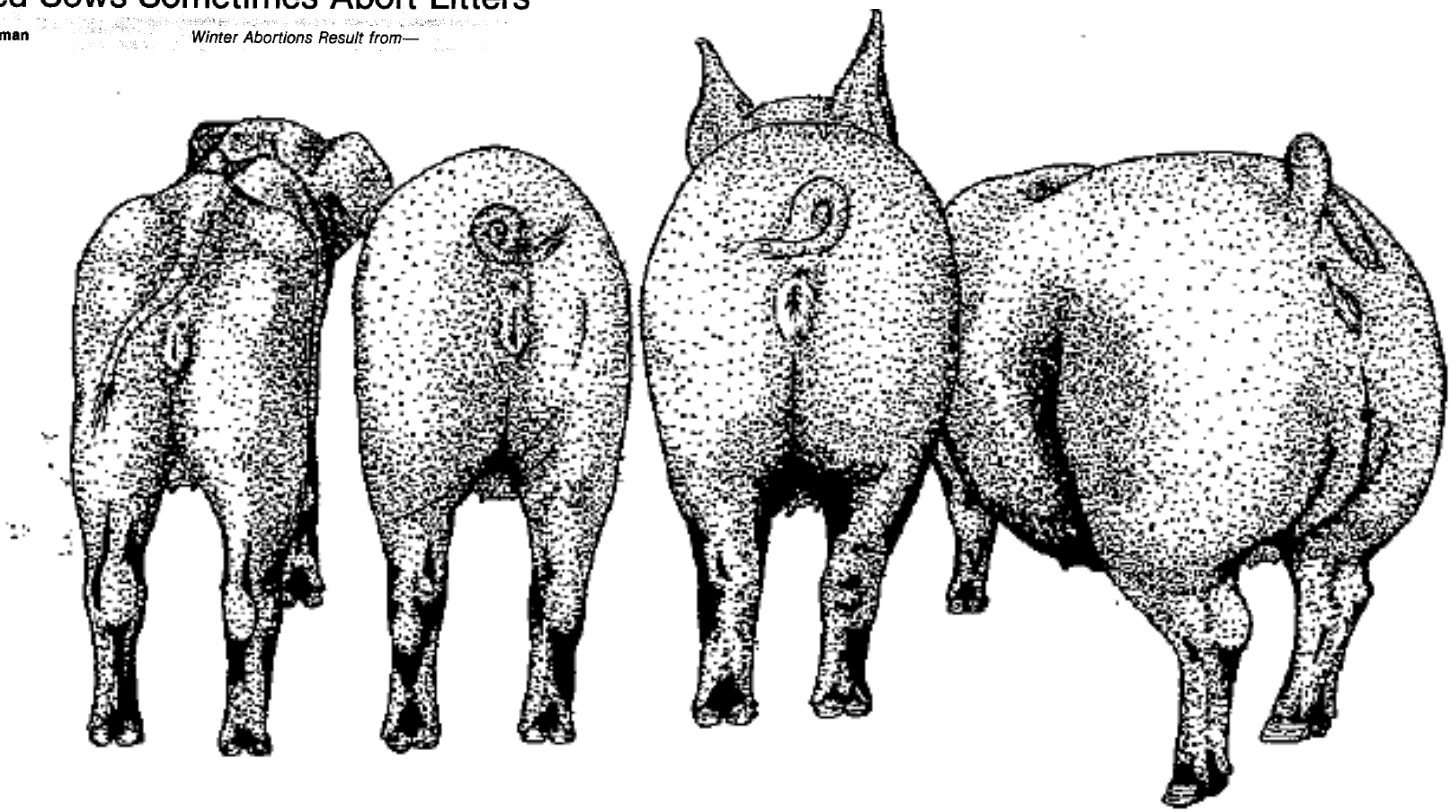
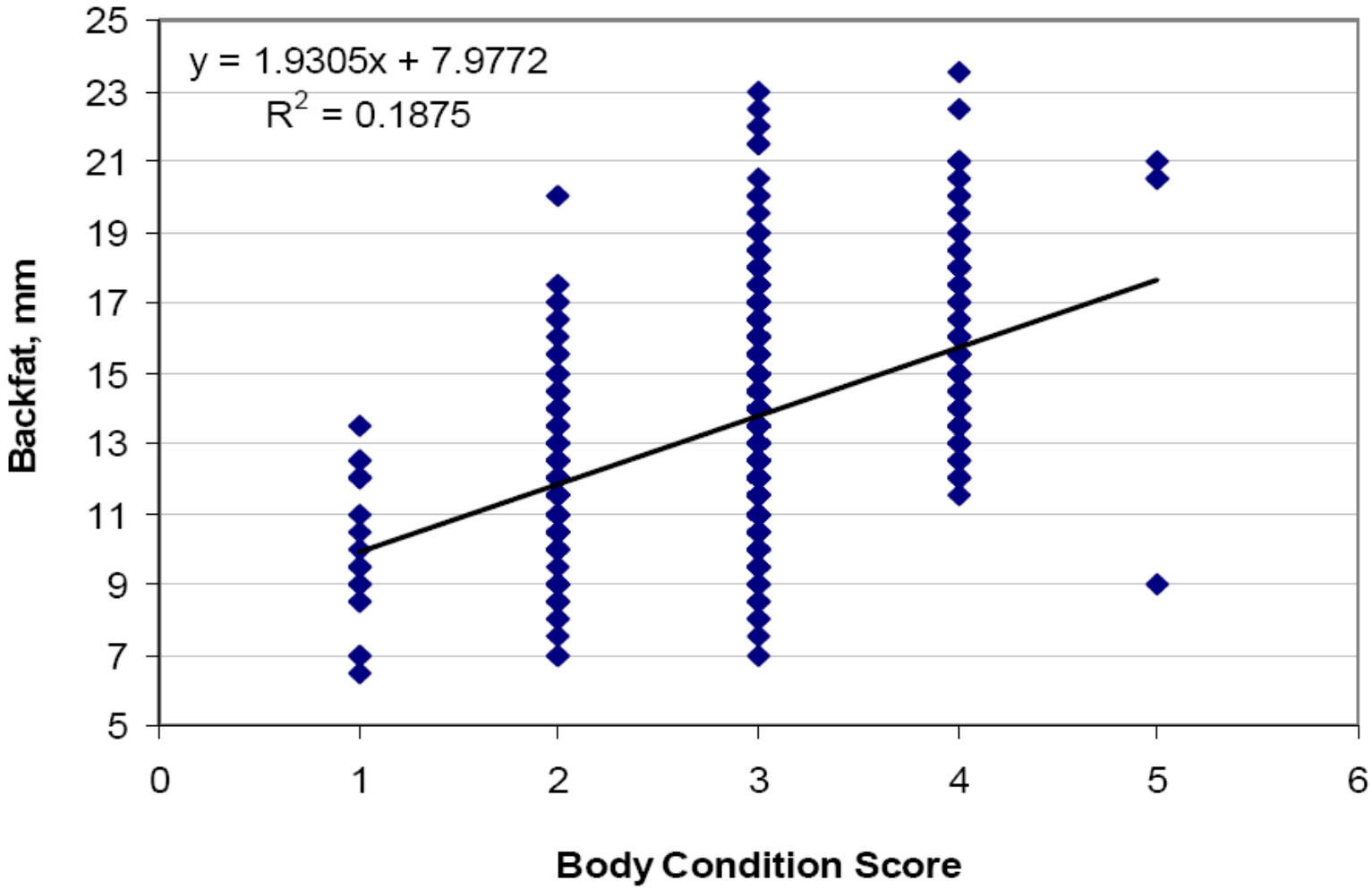


Années 70-80
le syndrome de la truie maigre
Evaluation visuelle généralisée

Années ’90: mise en évidence du problème de l’évaluation visuelle

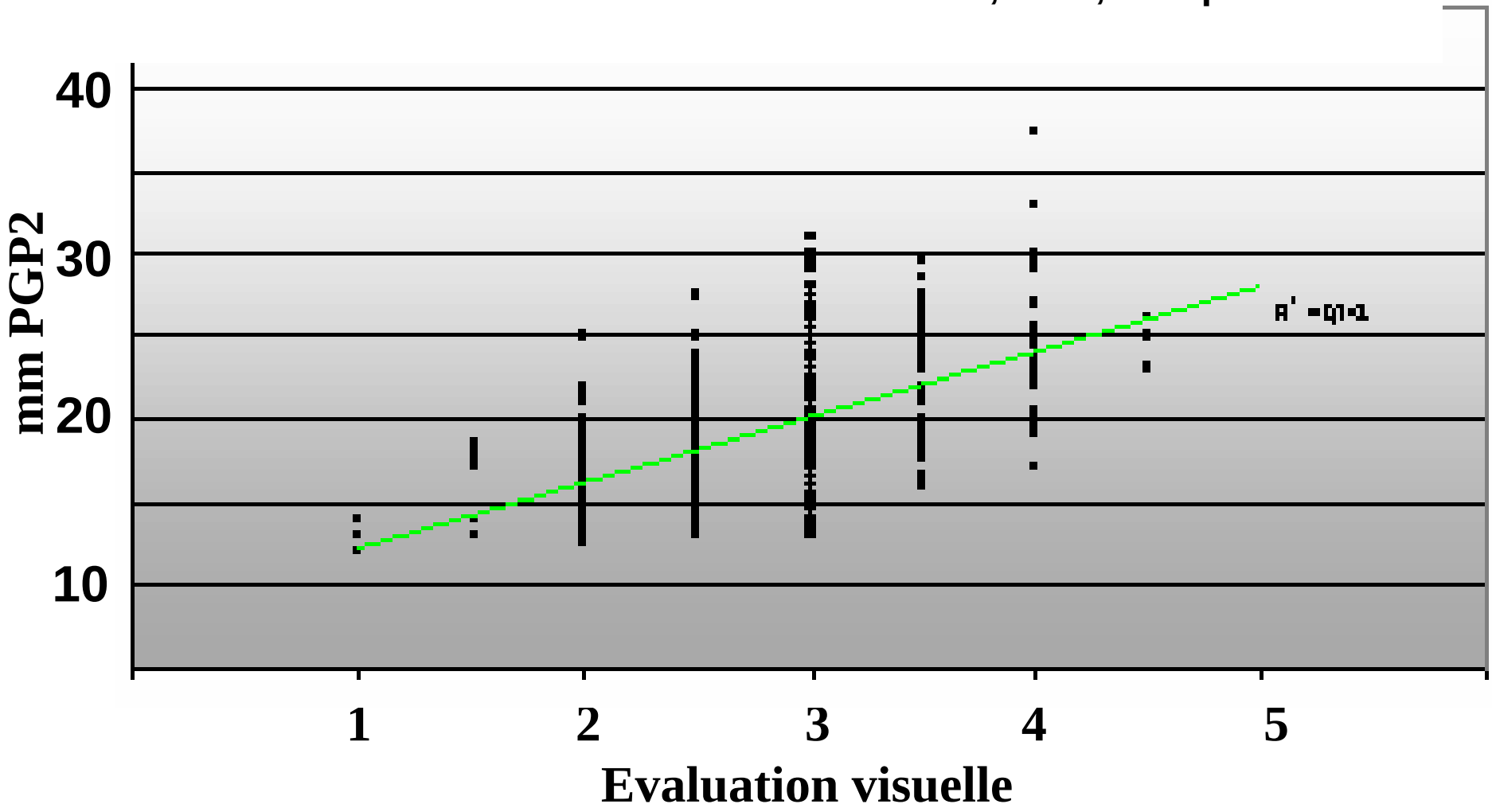
Figure 2. Relationship between body condition score and backfat thickness for gestating sows. A total of 731 sows were ultrasonically scanned at the last rib and correlated with a body condition score (1 = thin; 5 = fat) that was assigned by the farm manager.



Années 1999: mise en évidence du problème en France

Figure 2. Relationship between body condition score and backfat thickness for gestating sows.

Pottier and Martineau, 1999, Non published results

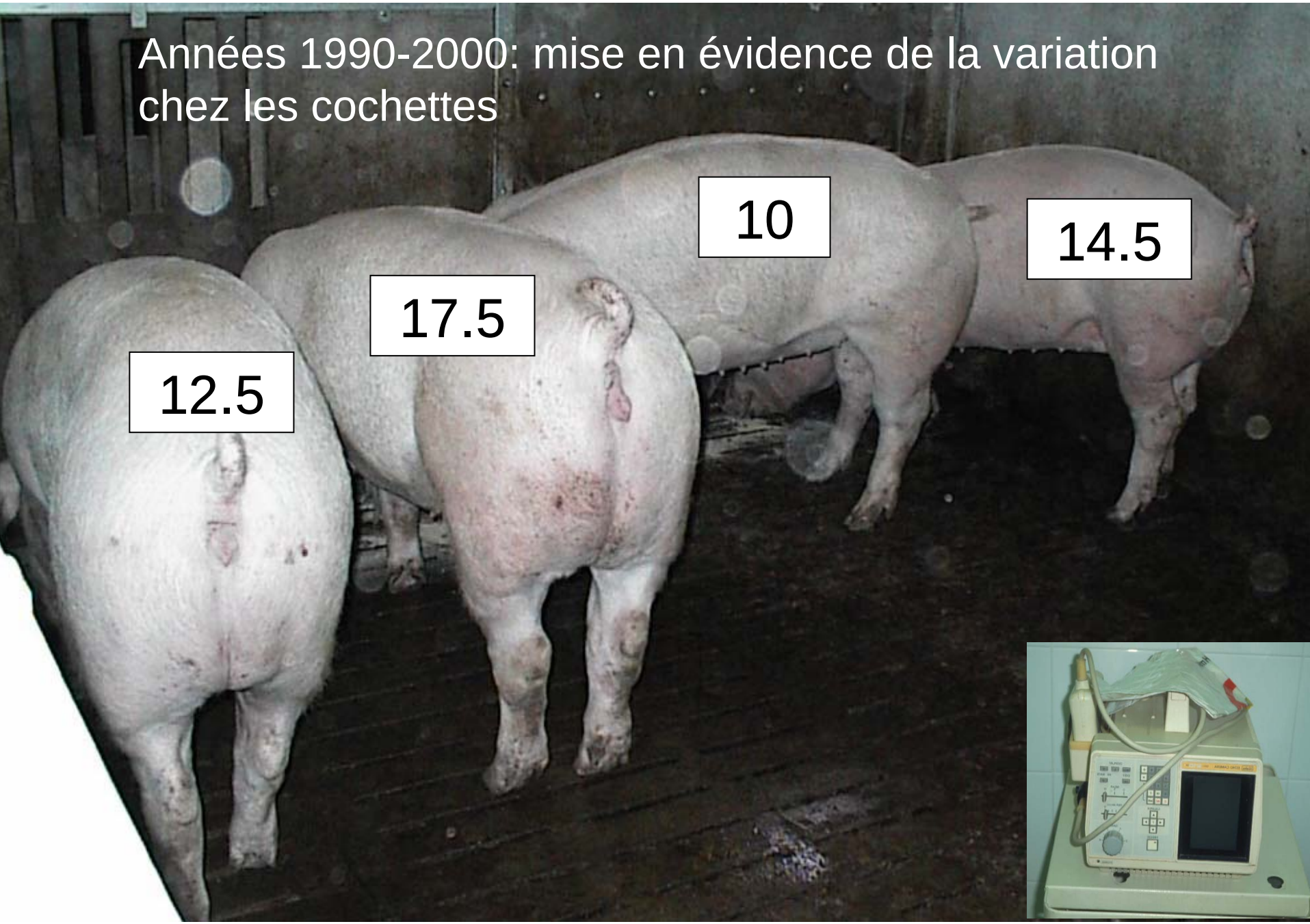


Amplitude du GD (P2) selon la note au sevrage (grille de 1 à 5)

Note	Moyenne	Variation	
1	12,9	11,7	15,0
2	13,6	8,0	20,0
3	15,8	10,3	25,3
4	16,4	11,7	20,7
5			

Dupas, 1997

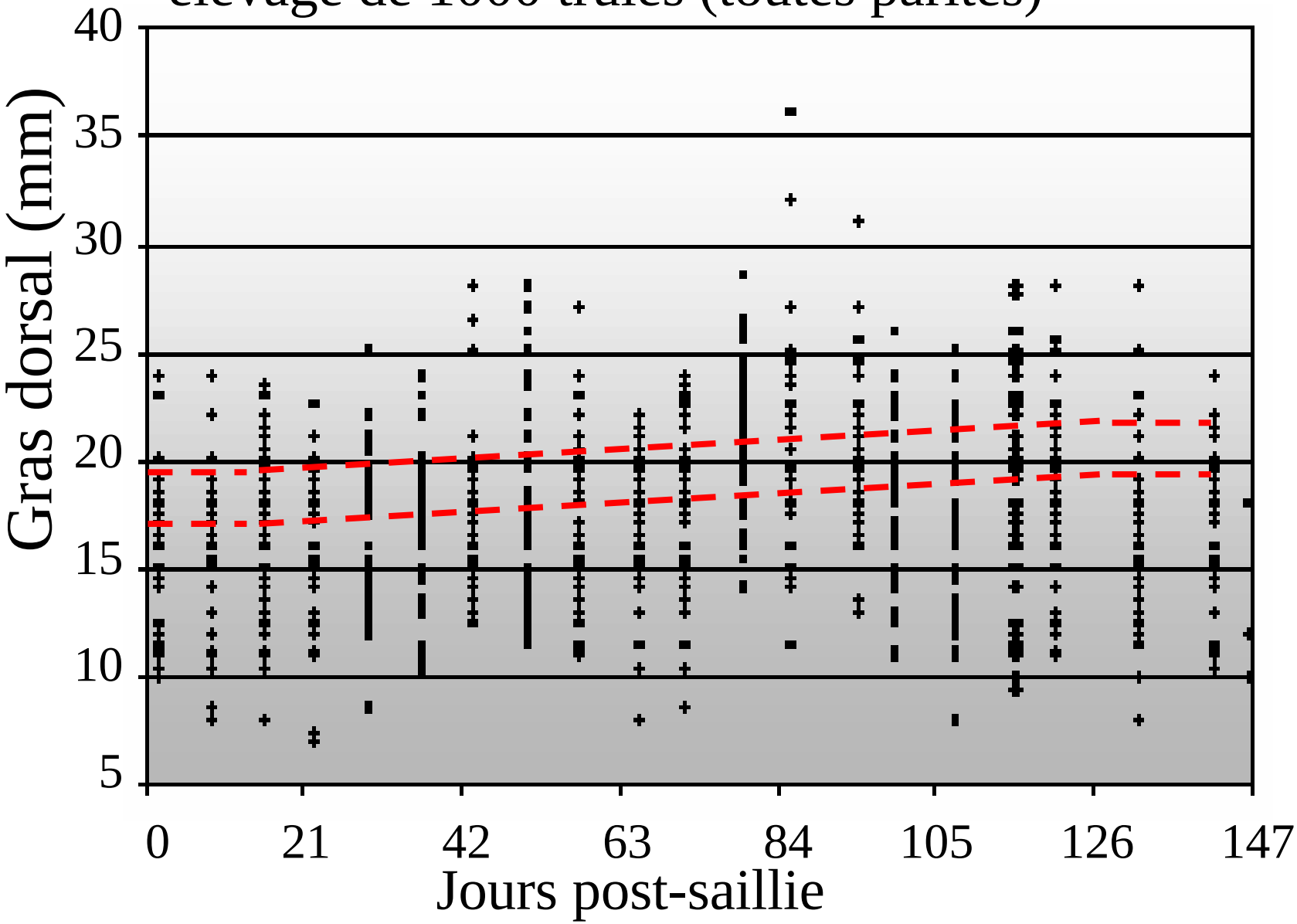
Années 1990-2000: mise en évidence de la variation chez les cochettes

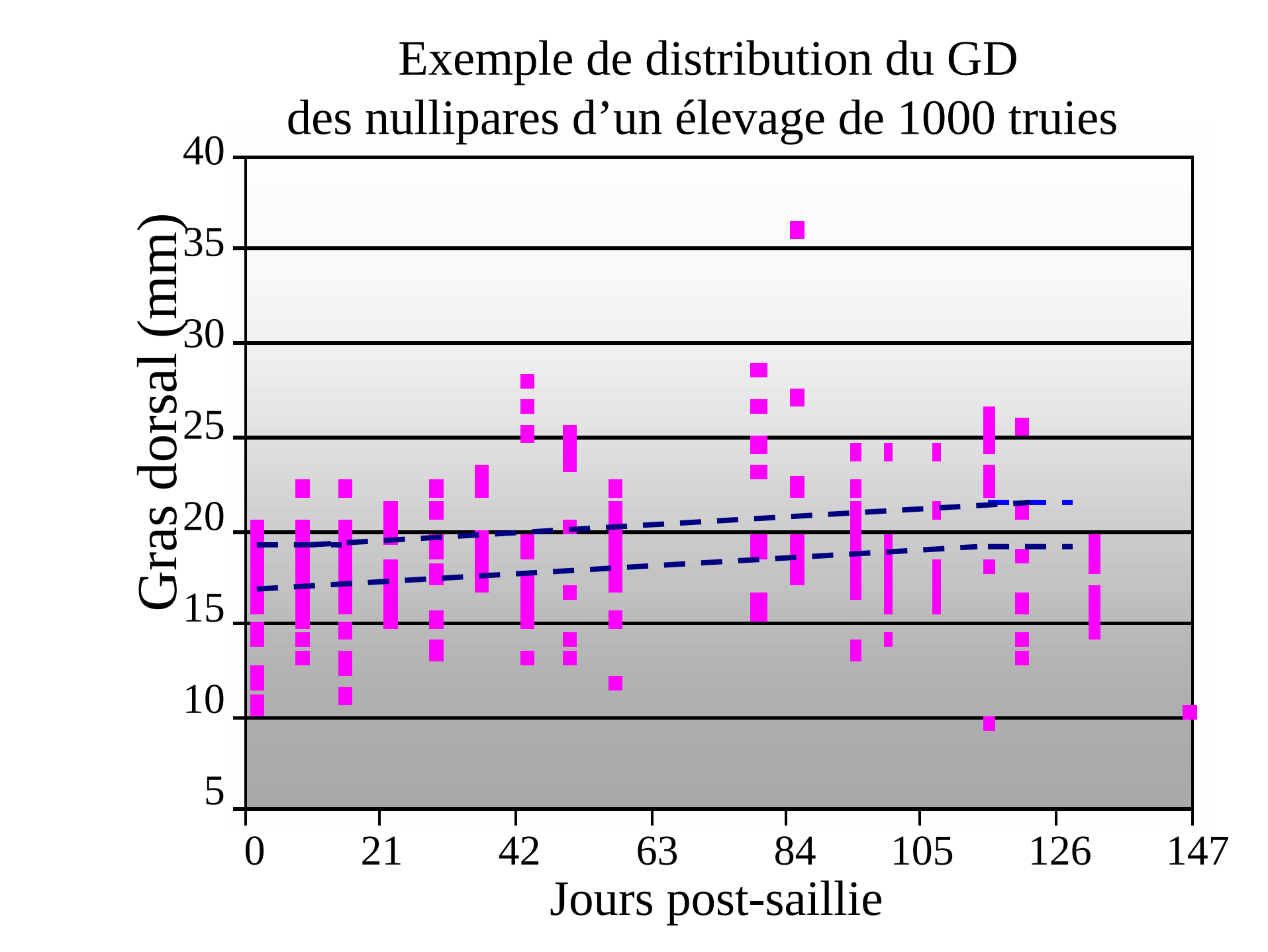


Années 1990-2000: mise en évidence de la variation chez les truies

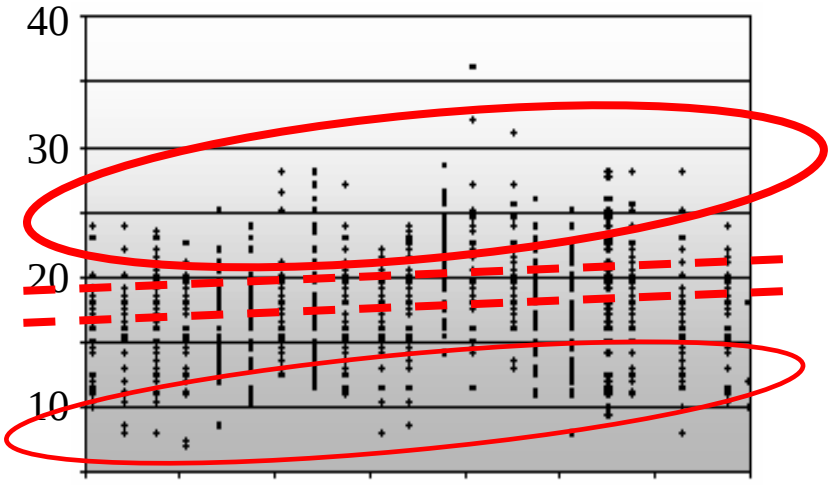
17

25


Exemple de distribution du GD
élevage de 1000 truies (toutes parités)
Gras dorsal (mm)
40
35
30
25
20
15
10
5
0
21
42
63
84
105
126
147
Jours post-saillie


Exemple de distribution du GD
des nullipares d'un élevage de 1000 truies
Gras dorsal (mm)
40
35
30
25
20
15
10
5
0
21
42
63
84
105
126
147
Jours post-saillie

Toutes truies

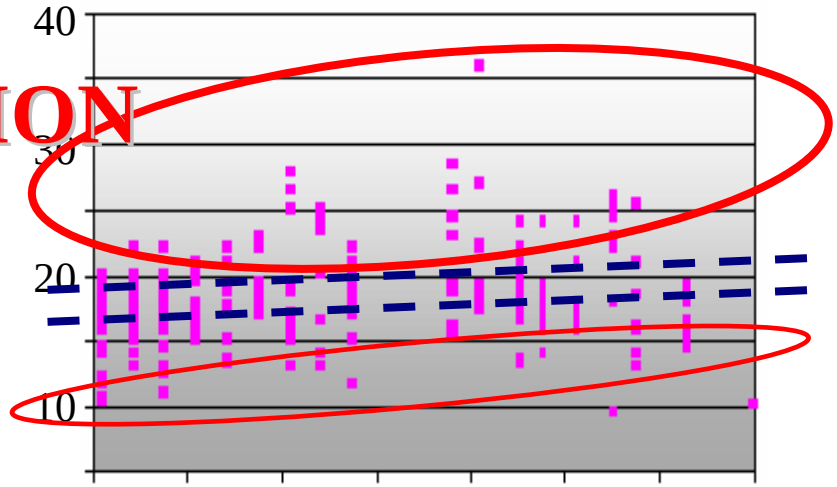


SOUS-POPULATION

SOUS-POPULATION

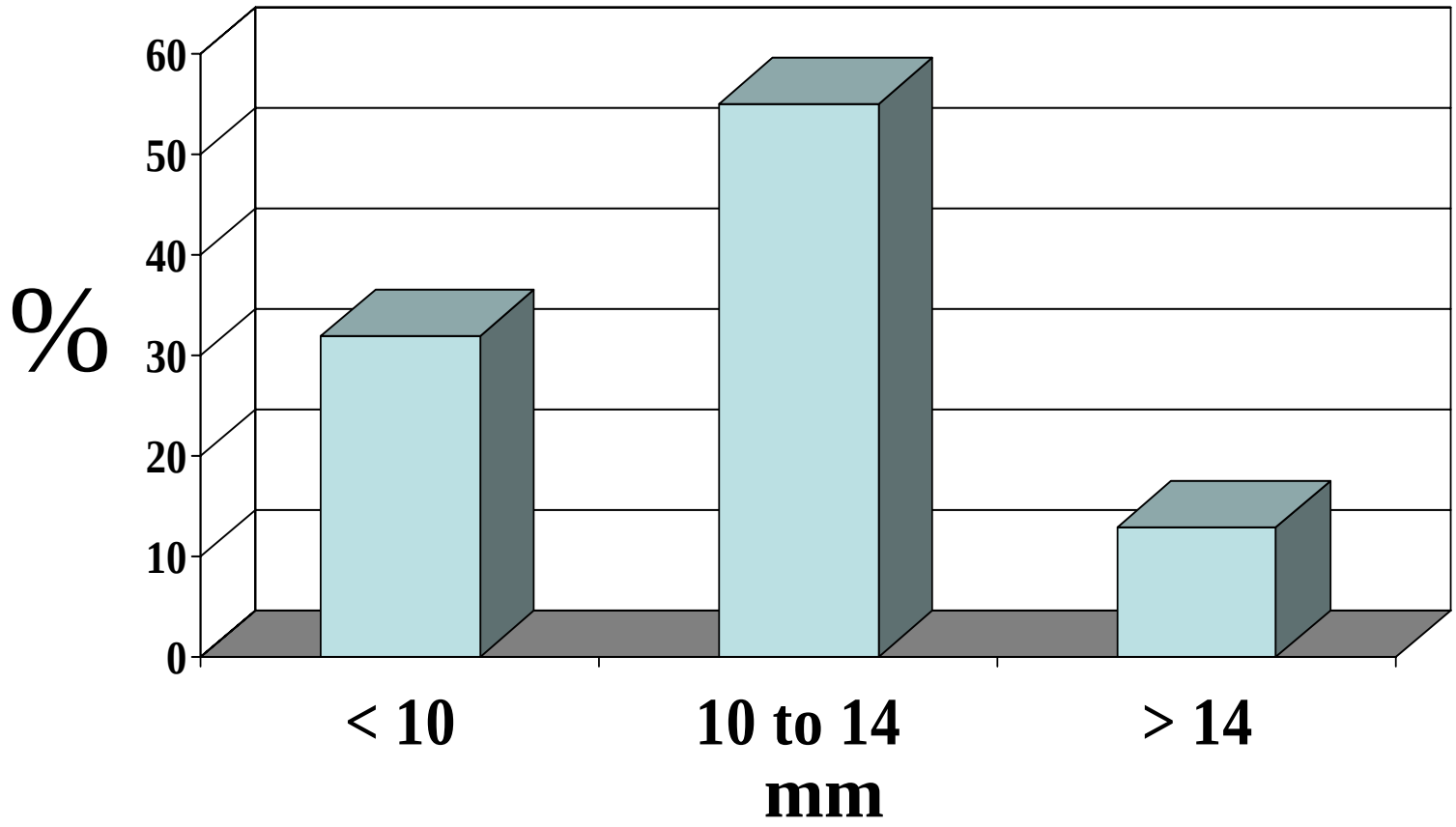
Nullipares

SOUS-POPULATION



SOUS-POPULATION

Distribution of the P2 back fat (mm) of gilts (n = 1046) at delivery
$\bar{x}$ = 11.6 mm, SD = 3.4 mm



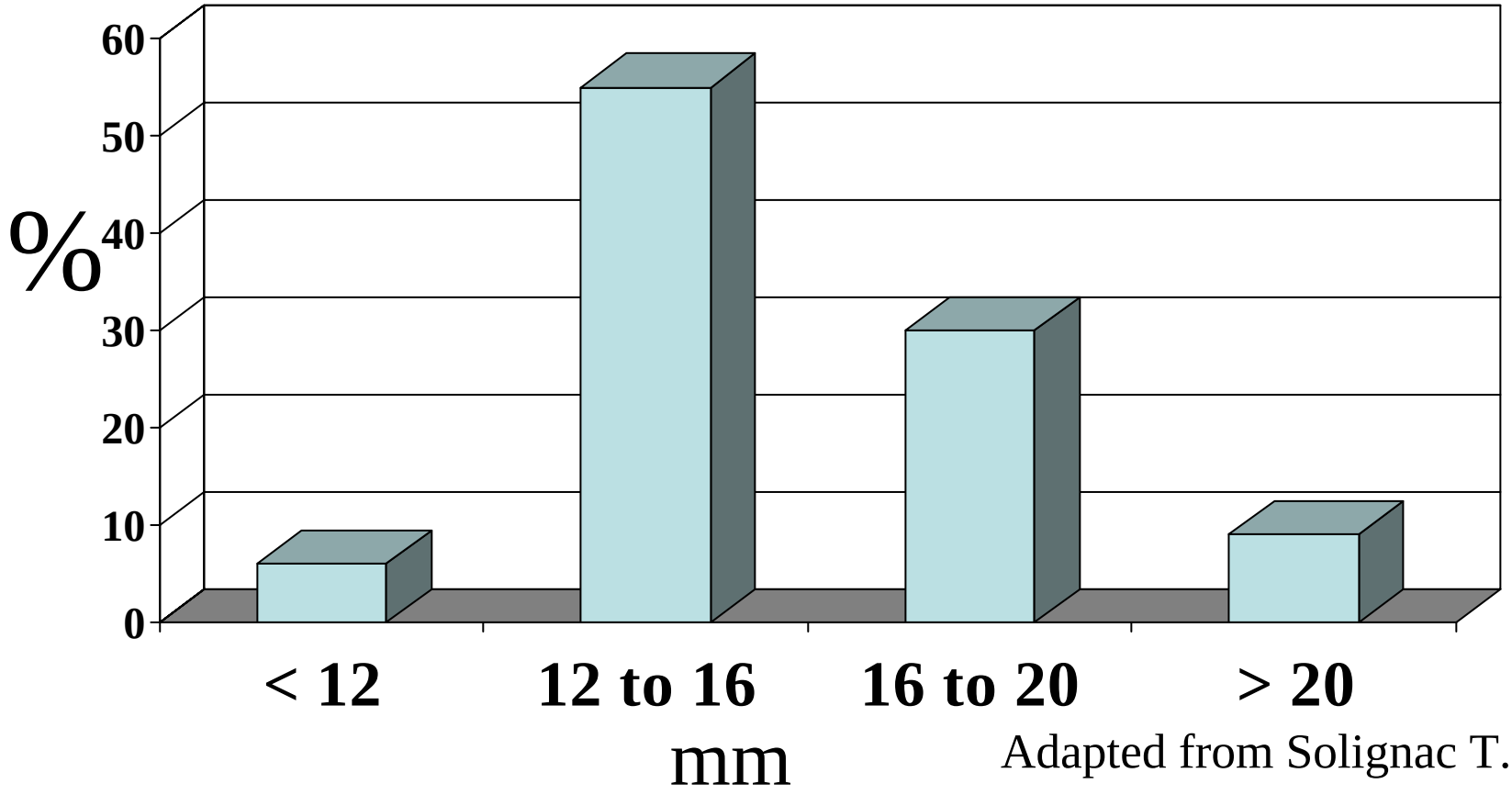
EDE Britany Study, 1998

Exemple de distribution des EDL (mm) chez des cochettes (n = 121) à la livraison dans une grande unité porcine bretonne

Delivery weight = 117 kg (SD = 9)

Mean age = 186 days (SD = 16)

P2 = 15 mm (SD = 3)



Adapted from Solignac T., 1999

Les contraintes:

-la quarantaine et le logement des cochettes

-le logement des truies gestantes

-le système d’alimentation

-la conduite de l’élevage

-l’élevage

Numéro de bande 15

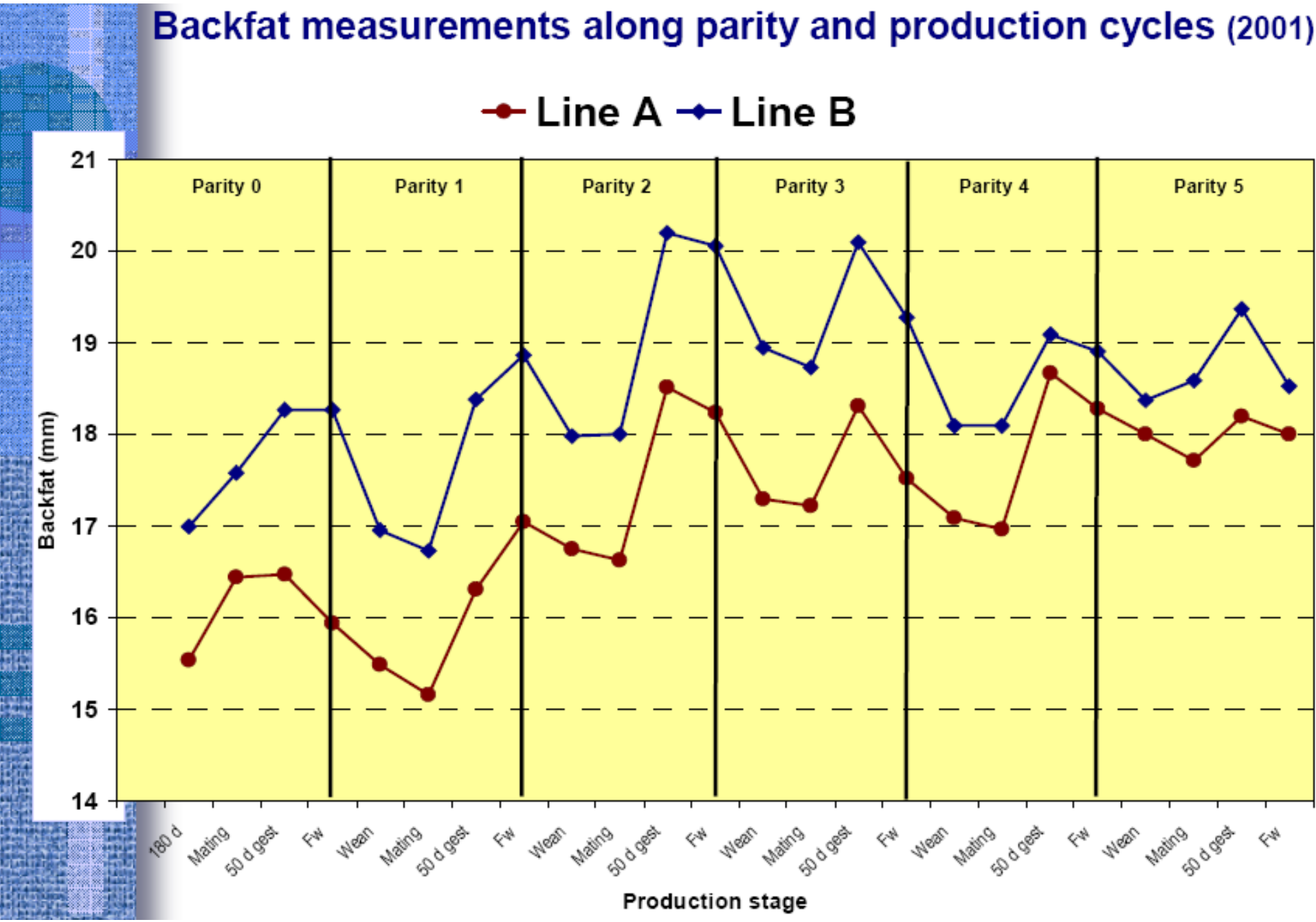
50745

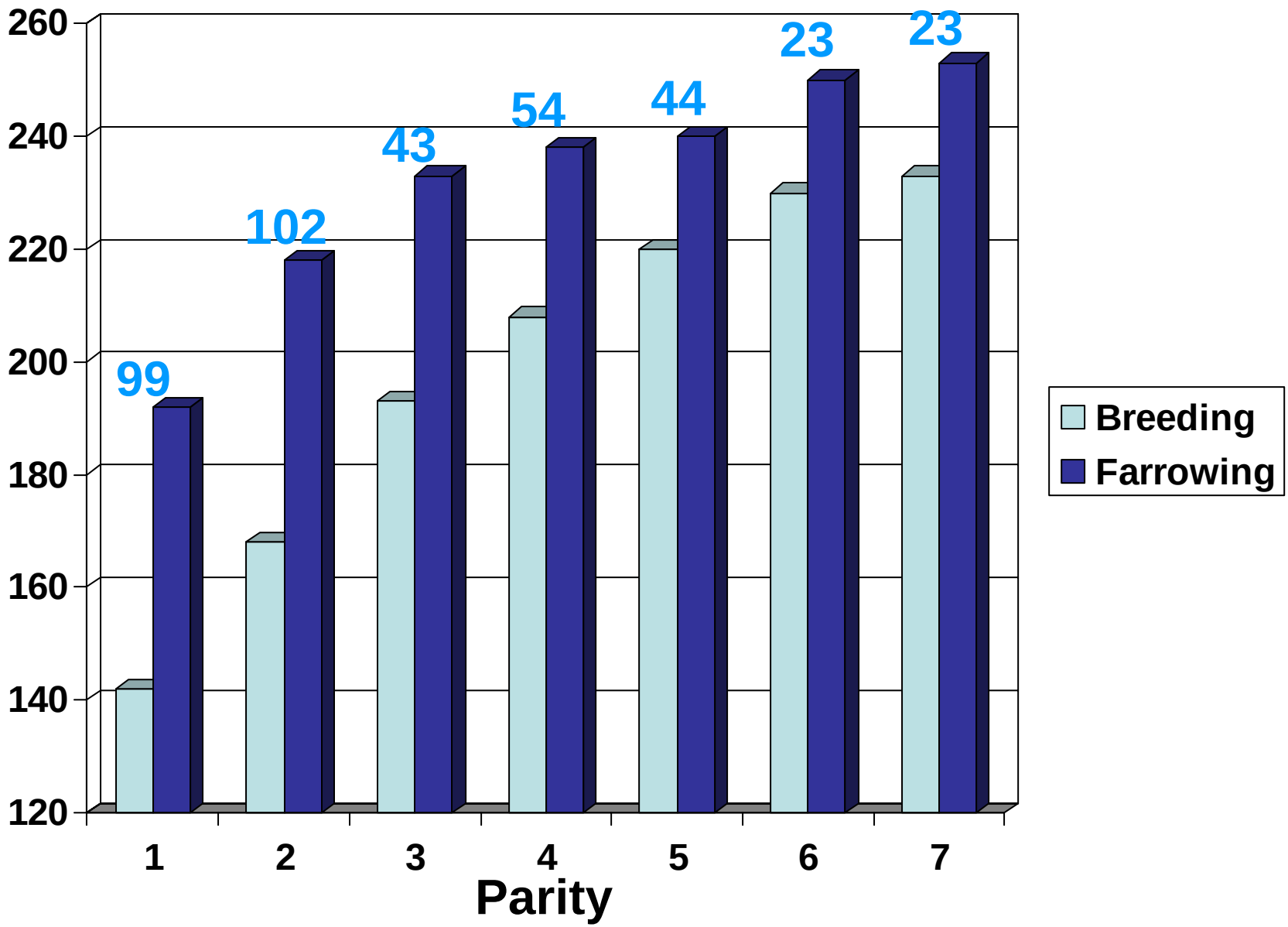
50753 16

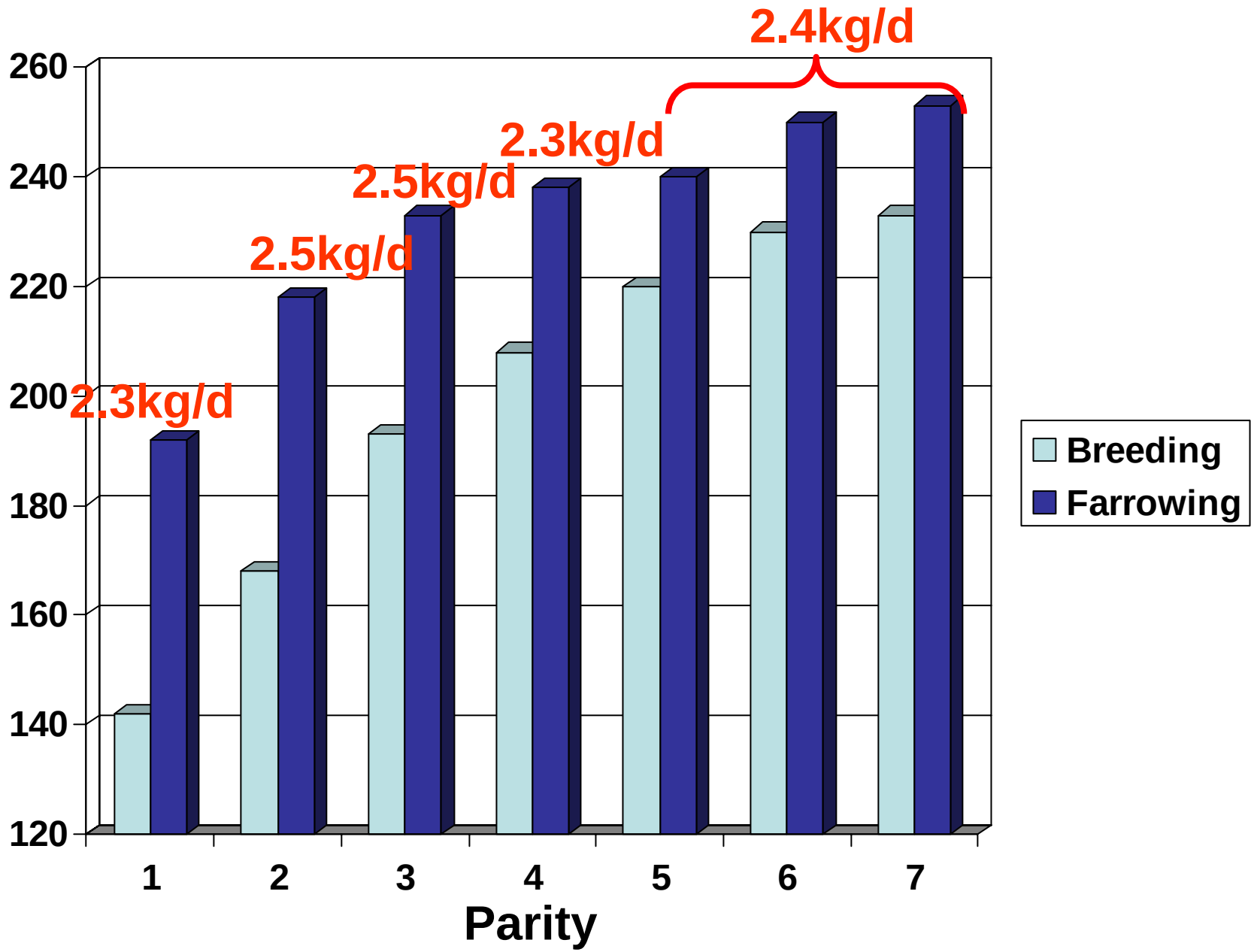
N° truie	Sevrage	MB -5 sem	MB -1 se
50631	11		
50742	17		
50513	19		
50744	17		
50526			
50241	26		
50243	17		
50245	22		
41226	14		
40941	19		
40943	22		
40946	18		
40944	21		
40945	16		
40942	18		
40444	17		
30443	15		
31146	13		
40321	17		
30632	17		
31022	14		
30742	15		
30744	15		

2000

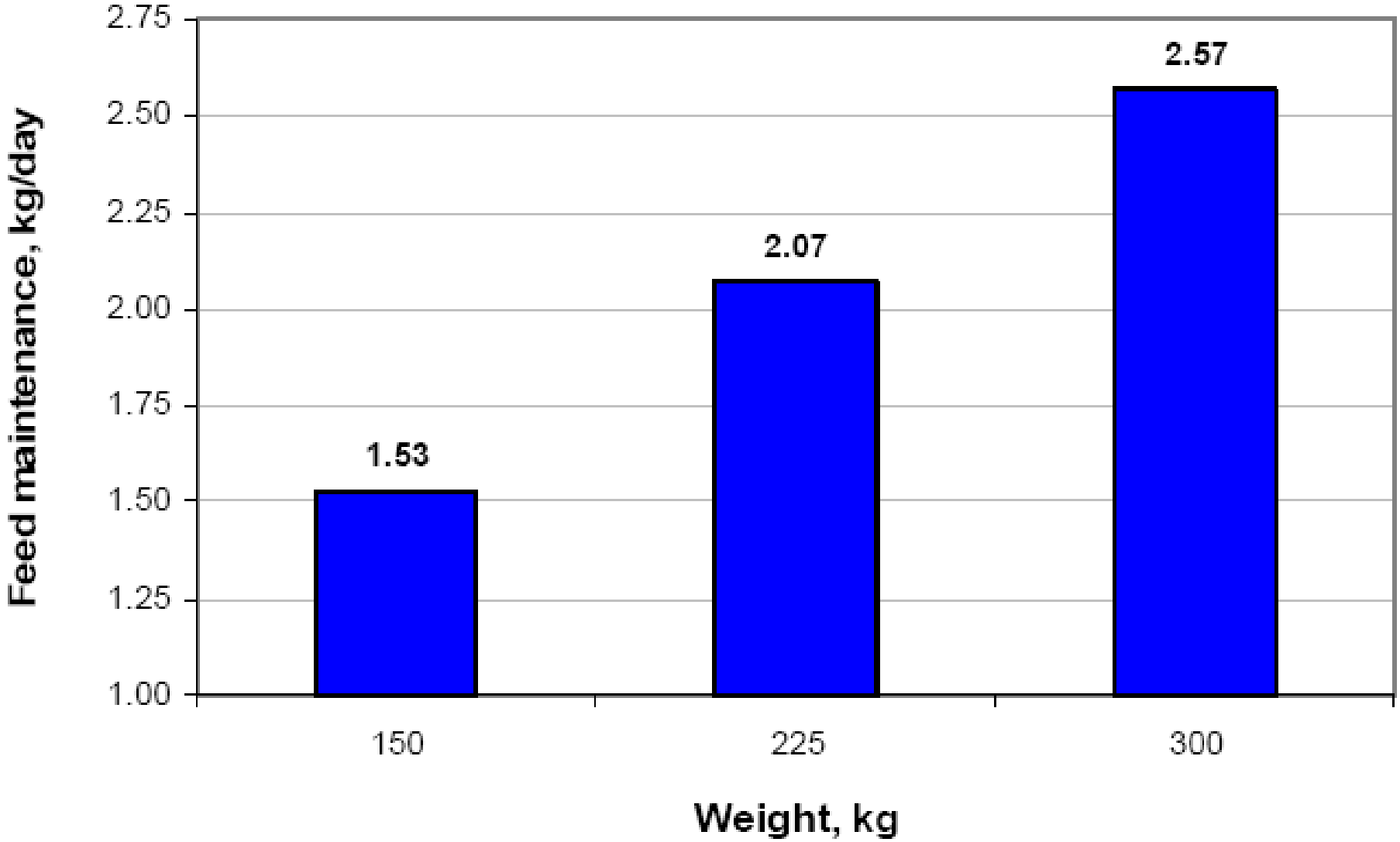
Backfat measurements along parity and production cycles (2001)

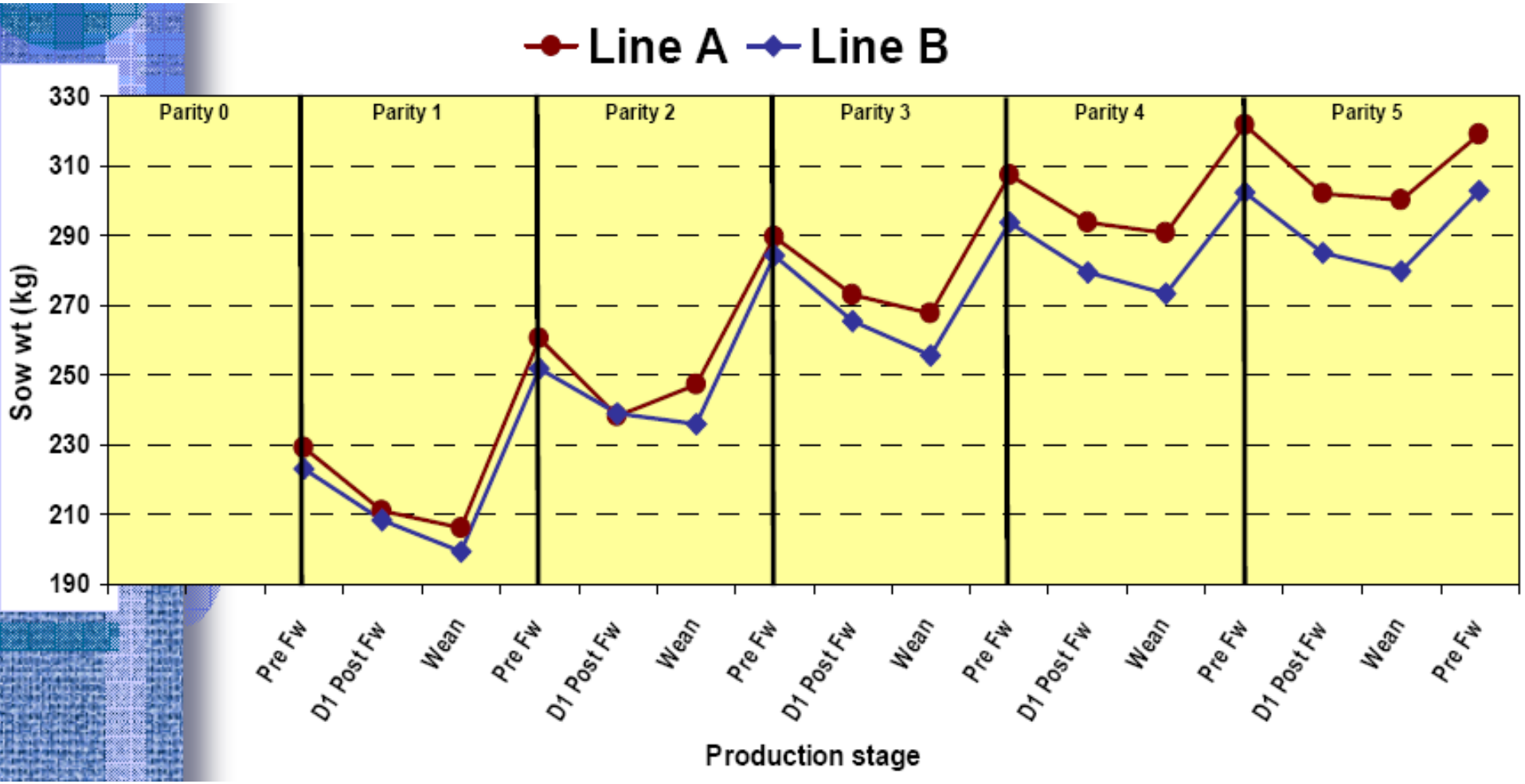



260
240
220
200
180
160
140
120
99
102
43
54
44
23
23
1
2
3
4
5
6
7
Parity
Breeding
Farrowing



Cooper et al., 2000, Prairie Swine Center


Feed maintenance, kg/day
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
1.53
2.07
2.57
150
225
300
Weight, kg

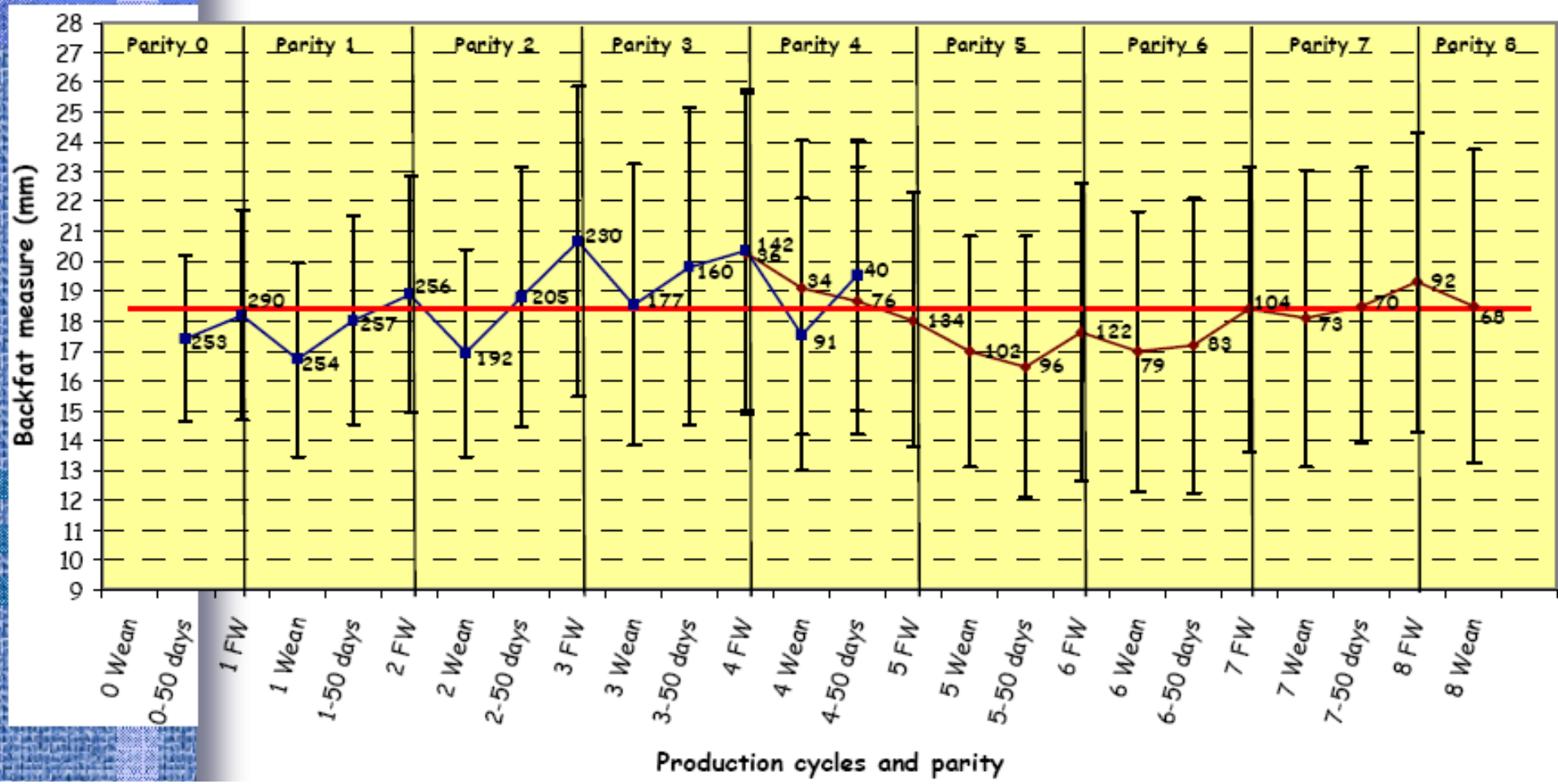

Line A
Line B
Parity 0
Parity 1
Parity 2
Parity 3
Parity 4
Parity 5
330
310
290
270
250
230
210
190
Sow wt (kg)
Pre Fw
D1 Post Fw
Wean
Production stage

Conséquences pratiques

- Variation obligatoire
  - il faut relativiser
    - Le relativisme n'est pas la variation de la vérité mais bien la vérité de la variation (Deleuze): nous devons accepter cette variation et ne pas vouloir uniformiser à tout prix
  - Il faut donc gérer cette variation
- Effet Papillon
  - Il faut anticiper
  - Il faut naviguer avec des instruments imprécis, incertains et incomplets …

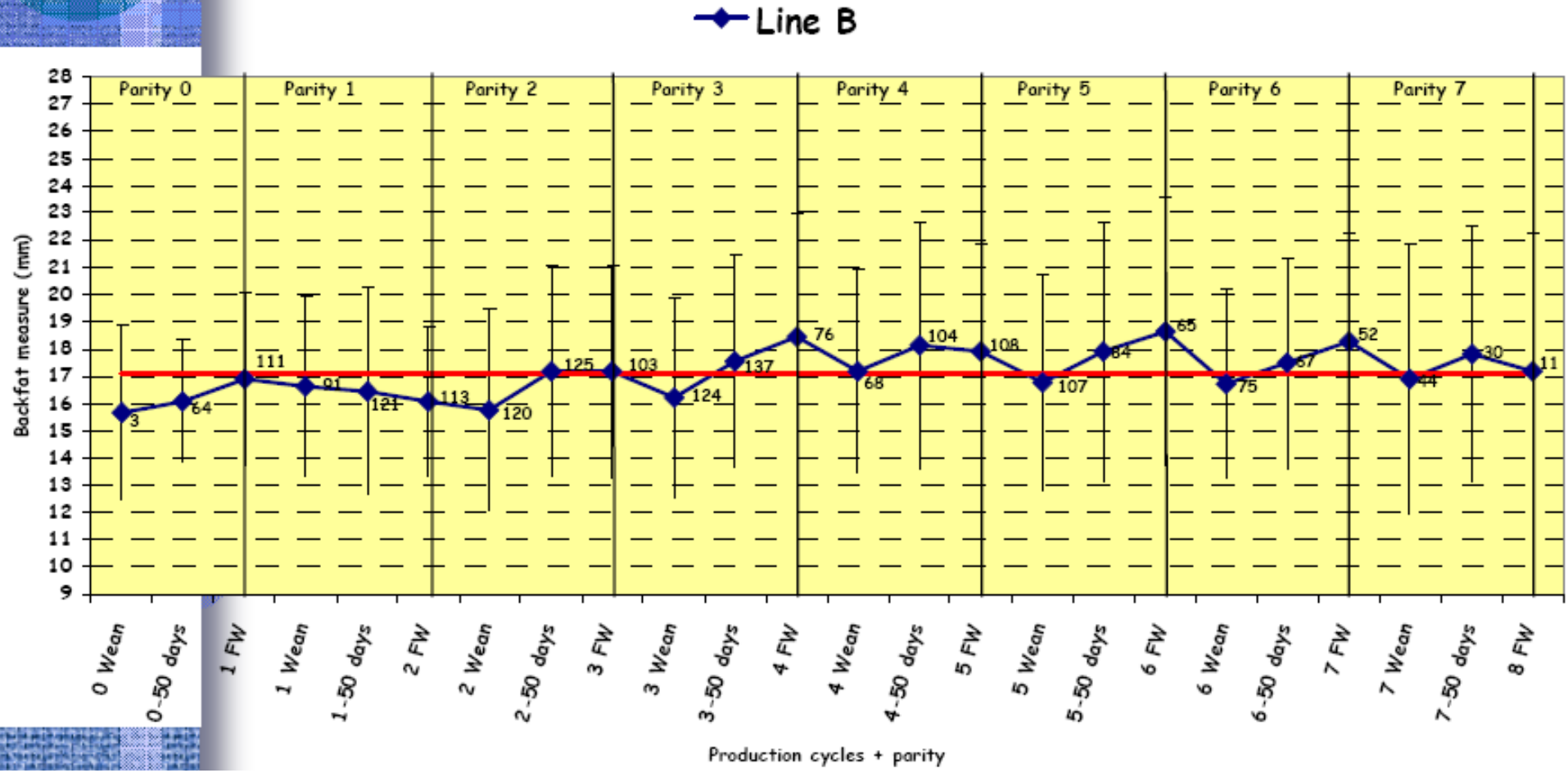
Farm #1

Jul 04 - Dec 04



Farm #1

Jan 06 - Mar 06



Recognizing the characteristics of our new dam lines

George Foxcroft[1,2], Eduardo Beltranena[2], Jenny Patterson[2], Noel Williams[3]

George Foxcroft, Eduardo Beltranena, Jenny Patterson, et al.

Management strategies for the breeding sow herd must increasingly recognize the changes in lean growth per-

Accepting the risk of being considered some what heretical, most of our recent experiments with the lactating and weaned sow lead to the conclusion "that from a fertility and prolificacy perspective, fatness is simply not the key risk factor"

ment of the gilt, and the lactating and weaned sow, and the experimental evidence to support this contention has been clearly established (Clowes, 2003a,b; Quesnel et al, 2003).

Conclusions

Foxcroft, G.R. 2002. Fine Tuning the Breeding Program. *Saskatchewan Pork Industry Symposium 2002*. Saskatoon,

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Foxcroft, G., Patterson, J., Beltranena, E. and Pettitt, M. 2004. Identifying the true value of effective replacement gilt management. In: *Proceedings of the Manitoba Swine Seminar*, Volume 18, 35-51.

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Management strategies for the breeding sow herd must

In contrast, lean tissue mass is a key consideration for correct management of the gilt, and the lactating and weaned sow, and the experimental evidence to support this contention has been clearly established

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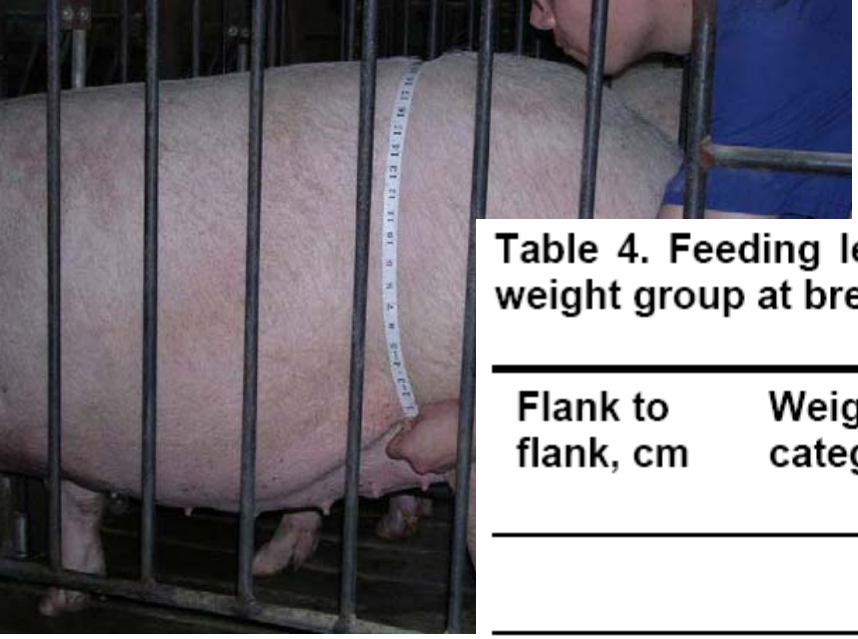

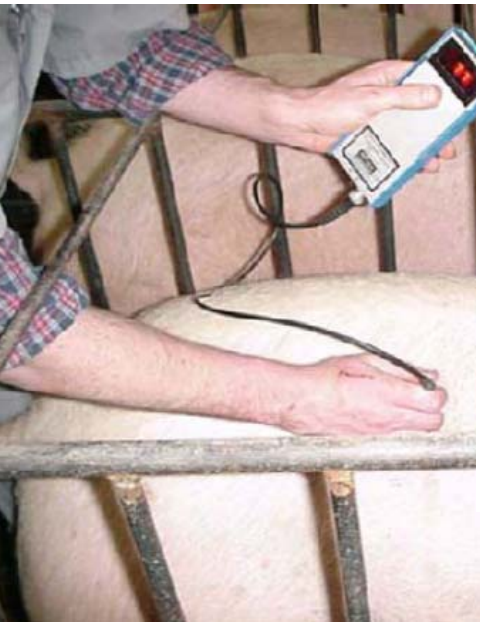

Table 4. Feeding levels (kg/d) for gestating sows based on backfat and weight group at breeding[1,2]

Flank to flank, cm	Weight category	Estimated Weight, kg	Backfat at breeding, mm			
			< 12	12 to 14.9	15 to 18	> 18
			Estimated feed level, kg/d			
83 to 90	Very light	115 to 150	2.4	2.1	1.9	1.7
91 to 97	Light	150 to 180	2.7	2.4	2.1	1.9
98 to 104	Medium	180 to 215	2.9	2.6	2.4	2.1
105 to 112	Heavy	215 to 250	3.1	2.9	2.6	2.4
113 to 127	Very heavy	250 to 300	3.3	3.1	2.9	2.6

[1] Diet energy content 3.0 Mcal ME/kg. Feeding level to be increased 1 kg/d on day 101 of gestation.

[2] Assumes barn temperatures is maintained at or above 20°C.

Table 2: Sow and litter production data for a recent experiment to study the mechanisms mediating effects of tissue catabolism in first parity sows subjected to restricted feed intake from day 14 – 21 of lactation (Restrict) or fed close to appetite until weaning (Controls) on subsequent fertility. (Data are Means ± SEM). (Unpublished data of Vinsky et al., Swine Reproduction-Development Program, University of Alberta, 2004)

Item	Control (n=17)	Restrict (n=17)	P value
Sow data			
Farrow weight (kg)	189.8±12.4	189.1±14.3	0.89
Farrow backfat (mm)	19.8±3.0	20.5±3.0	0.49
Weight loss (kg)	9.17±6.66	22.35±7.73	<0.0001
Lactation backfat loss (mm)	1.29±2.51	2.74±2.09	<0.08
Litter data			
Litter size (piglets)	9.41±0.80	9.47±0.72	0.82
Initial weight per pig (kg)	1.46±0.29	1.36±0.20	0.20
Total weight gain per pig (kg)	5.05±0.53	4.63±0.51	<0.03

Table 3: Embryonic survival and other reproductive characteristics in sows at day 30 of gestation. Data are from the same experiment for which production data are presented in Table 3 and all sows were bred using standard artificial insemination procedures are the same pooled semen after weaning. (Data are Least square means ± SEM).

Item	Control (n=16)	Restrict (n=17)	P value
Wean-to-estrus interval (days)	5.29±1.26	5.41±1.33	0.79
Ovulation rate	18.25±0.65	18.24±0.63	0.99
Live embryos	14.43±0.78	12.29±0.76	<0.06
Embryonic survival to d30 (%)	97.59±6.76A	77.34±6.56*	<0.04
Number of males	7.75±0.59	7.53±0.57	0.79
Number of females	6.50±0.57	4.71±0.56	<0.04
Proportion of male embryos (%)	58.34±4.52*	67.47±4.38*	0.16

[A]Arcsin transformed data are presented

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[A]Arcsin transformed data are presented

Exemple pratique: Problème majeur de fertilité dans un élevage de 5000 truies en Italie

05/10/06 11.27.03

Rapporto messa in parto

Valore obiettivo 270

Nr. sett. copertura	Gravida	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Nidiata	Coperta	+/-	nidiata %
200601		4	1	7	21	9	3	2	1		2	1	1	1	2	1	12	**161**	229	**-41**	**70%**
200602		4		9	20	7	2	3			1	4	1		1	2	8	**180**	242	**-28**	**74%**
200603		1	1	8	26	9	6	2		6	2				1	5	10	**214**	291	**21**	**74%**
200604		2		10	16	11	4	4		2		1	1	1		1	9	**231**	293	**23**	**79%**
200605		1	1	4	14	10	4	1		1	4	1	2	2	1	3	3	**131**	183	**-87**	**72%**
200606		5		12	16	7	1	3	1	1		2	2		2	1	4	**183**	240	**-30**	**76%**
200607		3	2	8	30	7	3	2	1	2		1	1	1	2		2	**176**	241	**-29**	**73%**
200608		2		5	23	11	1	3	1	1		1	4	1		2	5	**204**	264	**-6**	**77%**
200609		4	1	8	24	6	4	3			1	3				1	11	**191**	257	**-13**	**74%**
200610		3	1	10	20	12	2	2	1		3	2	2	1		1	12	**184**	256	**-14**	**72%**
200611		1	1	20	22	7	3	2		2		1		1	1	3	7	**188**	259	**-11**	**73%**
200612	3		3	10	27	10	2	2	1			2	4	1		3	14	**225**	307	**37**	*74%*
200613	2			19	29	3	2	3	2		1	1			1	1	10	**241**	315	**45**	*77%*
200614	7	2		12	25	7	5	1	2	1				1			5	**206**	274	**4**	*78%*
200615	18			6	31	4	7	3			1	1		1	1	2	14	**279**	368	**98**	*81%*
200616	2		1	9	36	8	4	1	3				1	3		3	7	**190**	268	**-2**	*72%*
200617	3	3	1	15	21	1	5	4	2		2	2		1	2		12	**188**	262	**-8**	*73%*
200618	2		2	10	27	2	10	5		2	1	1		1			10	**184**	257	**-13**	*72%*

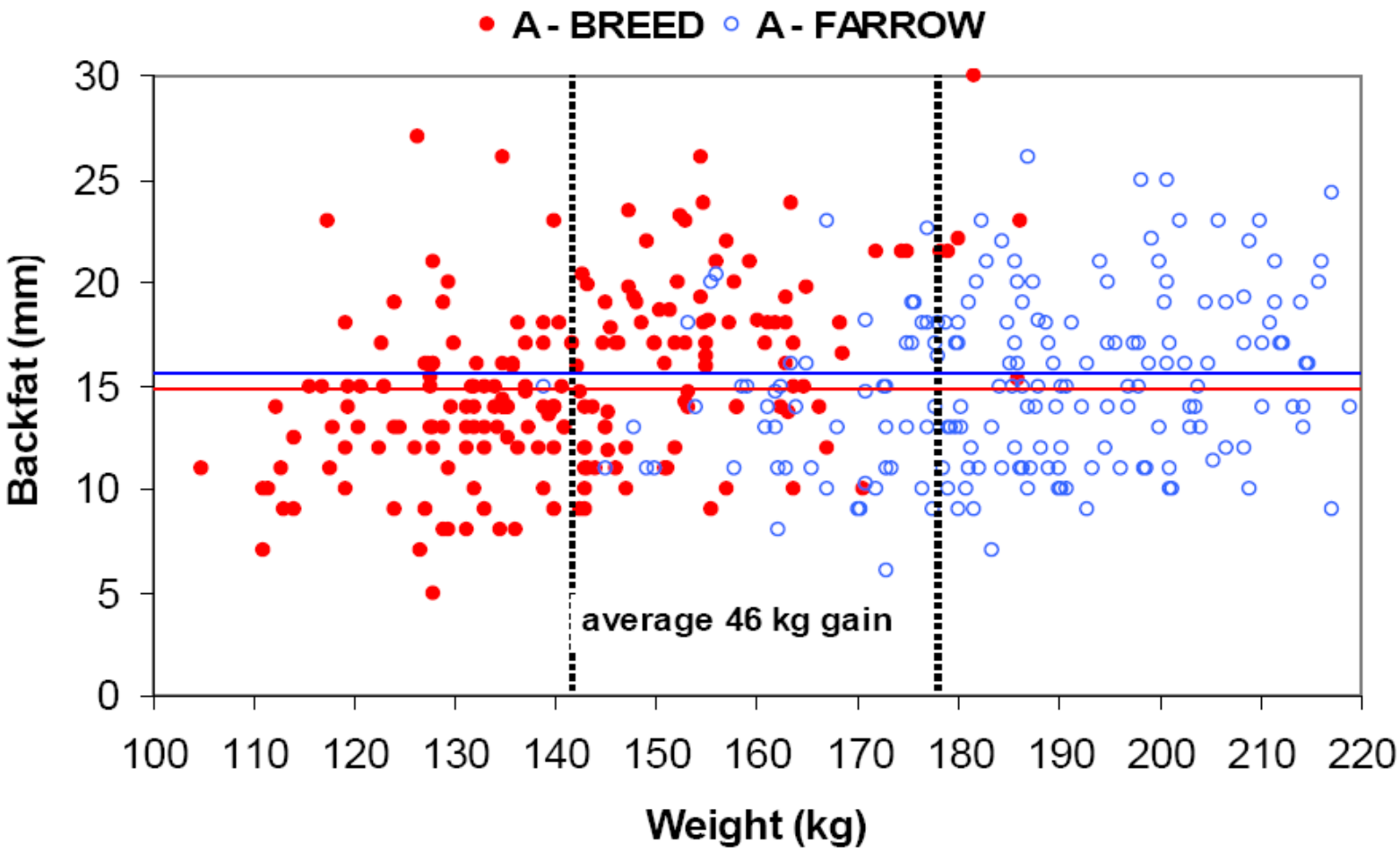
Table 2: Effects of feed intake during lactation on weaning-to-estrus interval (WEI), ovulation rate and embryo survival

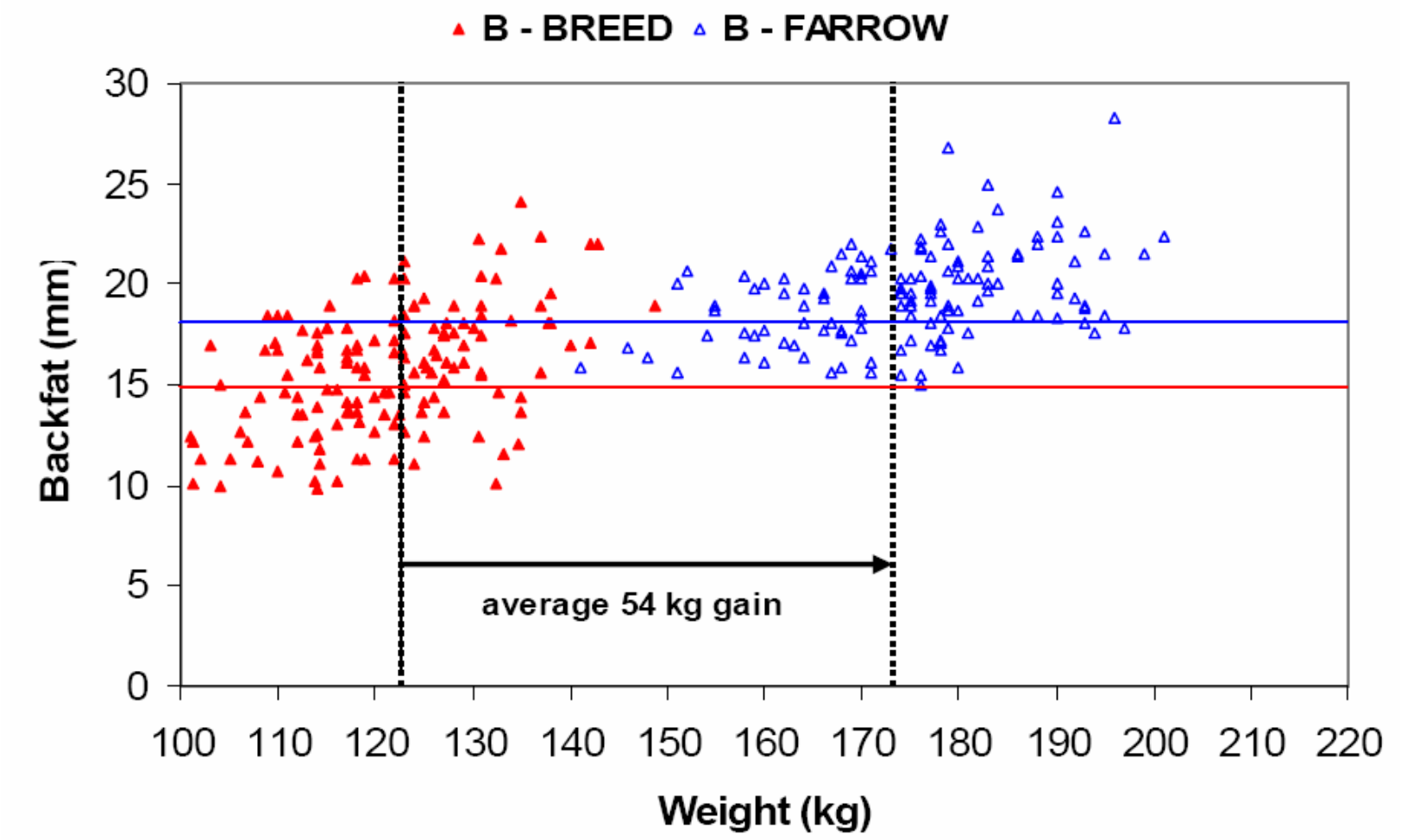
		WEI (days)		Ovulation rate		Embryo Surv (%)	
	Wean	High	Low	High	Low	High	Low
King and Williams, 1984	D32	**7.6**	**19.9**	14.4	13.5	70	72
Kirkwood et al., 1987	D35	**4.3**	**5.8**	18.1	18.6	**83**	**68**
Kirkwood et al., 1990	D28	**6.0**	**8.9**	17.6	17.7	**83**	**72**
Baidoo et al., 1992	D28	5.9	7.5	16.2	16.7	**85**	**64**
Zak et al., 1997 L: wk1-3	D28	3.7	5.6	**19.9**	**15.4**	**88**	87
L:wk4	D28	5.1			**15.4**		**64**
Zak et al., 1998	D28	**4.2**	**6.3**	14.4	15.6	83	72
Quesnel and Prunier, 1998	D24	5.7	5.9	19.2	20.7	-	-
Van den Brand et al., 2000	D22	5.1	5.7	**18.1**	**16.4**	68	68
Terletski et al., 2004 [1]	D21	6.6	6.7	**18.6**	**16.7**	64	69
Vinsky et al., 2006 [2]	D21	5.3	5.4	18.3	18.2	**79**	**68**
Edmonton, unpubl.	D21	5.7	5.5	18.5	17.5	**65**	**78?**

NB High ~ 80-90% of ad libitum; Low ~ 40-60% of ad libitum

[1] High: Control >190kg farrow wt, Restrict: L<170kg farrow wt

[2] # female embryos lower in Restrict sows


A - BREED
A - FARROW
Backfat (mm)
30
25
20
15
10
5
0
100
110
120
130
140
150
160
170
180
190
200
210
220
Weight (kg)
average 46 kg gain


B - BREED
B - FARROW
Backfat (mm)
30
25
20
15
10
5
0
100
110
120
130
140
150
160
170
180
190
200
210
220
Weight (kg)
average 54 kg gain

Relation entre la survie embryonnaire et

A-La balance énergétique

B-La perte en masse graisseuse

C-La perte en masse protéique

Nutritional restriction in lactating primiparous sows selectively affects female embryo survival and overall litter development

M. D. Vinsky[A], *S. Novak*[A], *W. T. Dixon*[A], *M. K. Dyck*[A] *and G. R. Foxcroft*[A,B]

Application pratique

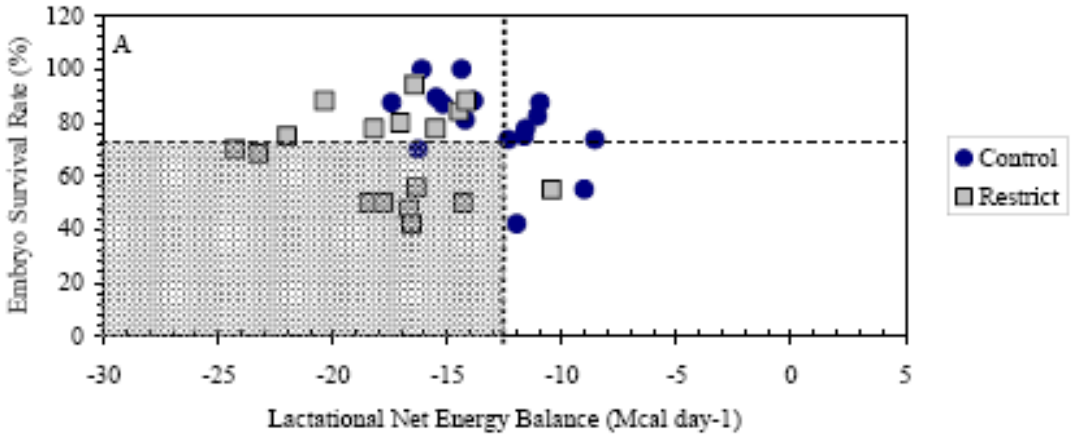
- La restriction alimentaire dans la 3ème semaine en lactation
  - Est une réalité
    - J-1 à J+1 autour du sevrage
    - J+1 à J+5 post-sevrage
  - Est un modèle
    - Lors d’hyperprolificité

Table 2. Least square means ± s.e.m. for sow and litter characteristics during lactation used to estimate net energy balance, and changes in fat and lean tissue mass

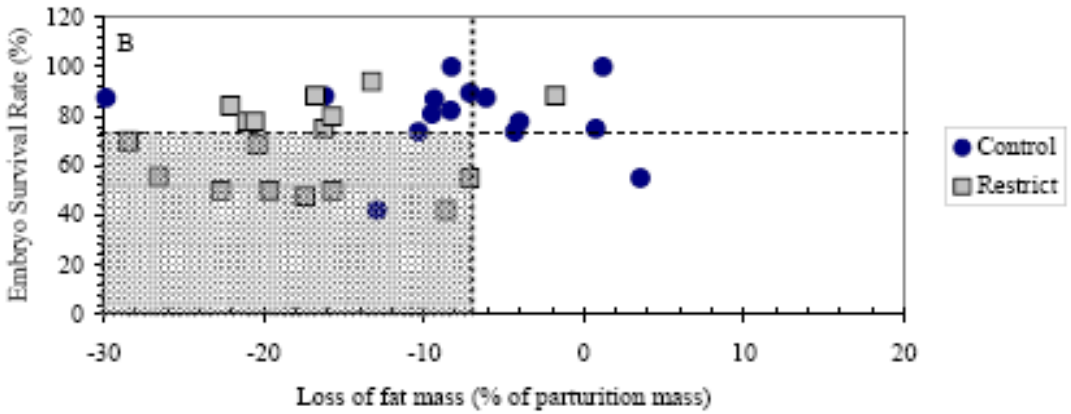
ME, metabolisable energy; NE, net energy

Item	Control ($n = 17$)	Restrict ($n = 17$)
Characteristics for estimation of sow NE balance		
Estimated ME intake		
Day 0–13 (Mcal day^{-1})	15.02 ± 0.19	14.66 ± 0.19
Day 14–21 (Mcal day^{-1})**	15.20 ± 0.00	7.60 ± 0.00
Estimated energy requirements for milk production		
Day 0–13 (Mcal day^{-1})	11.97 ± 0.47	11.32 ± 0.47
Day 14–21 (Mcal day^{-1})**	19.86 ± 0.55	16.54 ± 0.55
Estimated sow net energy balance		
Day 0–13 (Mcal day^{-1})	−3.38 ± 0.42	−3.39 ± 0.42
Day 14–21 (Mcal day^{-1})**	−9.93 ± 0.55	−14.04 ± 0.55
Characteristics for estimation of fat and protein loss		
Day 0 of lactation		
Farrow weight (kg)	189.8 ± 3.24	189.1 ± 3.24
Farrow backfat (mm)	19.8 ± 0.72	20.5 ± 0.72
Body fat at farrow (kg)	49.2 ± 1.41	50.1 ± 1.41
Body protein at farrow (kg)	29.4 ± 0.67	29.1 ± 0.67
Day 0–13 of lactation		
Protein loss as % of parturition mass	2.72 ± 0.69	3.08 ± 0.69
Fat loss as % of parturition mass	3.16 ± 1.41	3.35 ± 1.41
Day 14–21 of lactation		
Protein loss as % of parturition mass**	2.61 ± 0.73	9.52 ± 0.73
Fat loss as % of parturition mass**	4.62 ± 1.28	13.94 ± 1.28

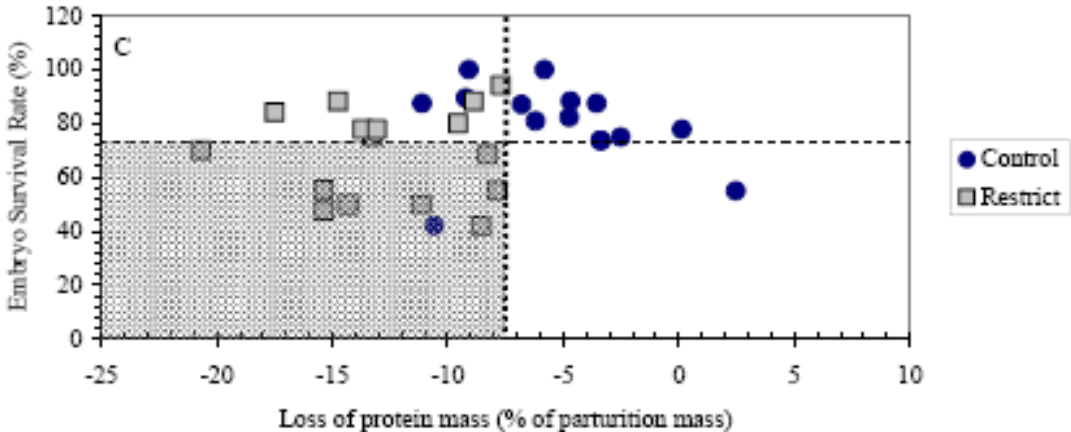
**$P < 0.001$ compared with Control sows.



Balance énergétique



Perte de gras
(% en fonction de la masse à la mise bas)



Perte protéique
(% en fonction de la masse à la mise bas)

RECHERCHE

Fédération des producteurs de porcs du Québec

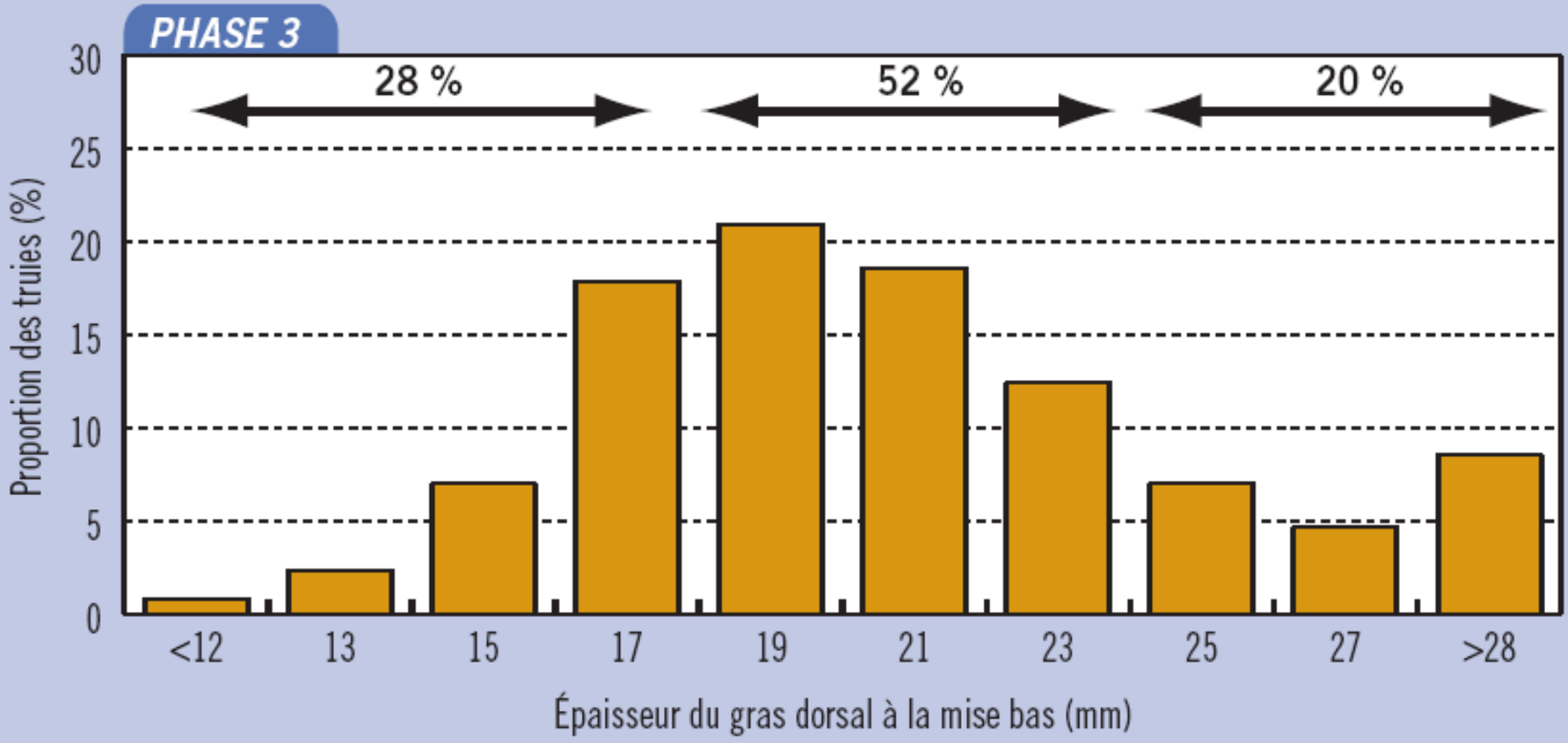
Fonds de recherch

Jean F. Bernier, Ph. D., agronome, professeur, Université Laval

Collaborateurs: Henri Guimont, M. Sc., agronome, chargé de projet, CDPQ; Line Belleau, agronome, étudiante à la maîtrise, et Renée Bergeron, Ph. D., agronome, professeure, Université Laval

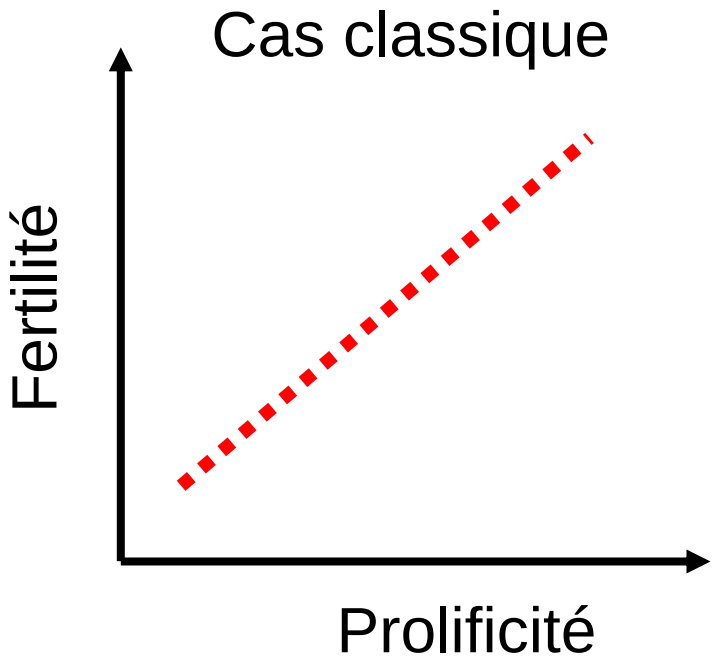
Alimentation individuelle des truies en gestation selon leur gras dorsal : le jeu n'en vaut pas la chandelle!

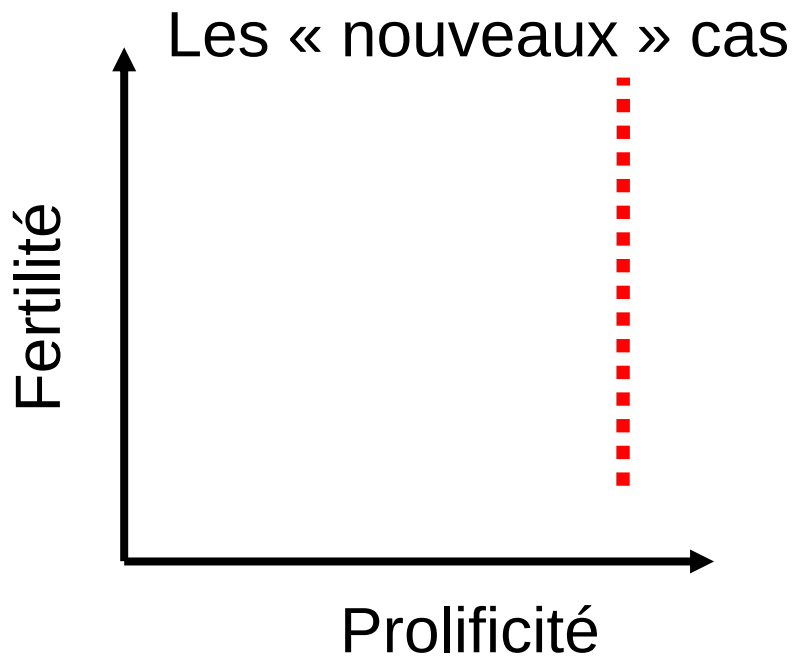
ÉPAISSEUR DU GRAS DORSAL À LA MISE BAS AU SITE P2 CHEZ DES TRUIES ALIMENTÉES SELON LEUR POIDS ET LEUR ÉPAISSEUR DE GRAS DORSAL À LA SAILLIE ET EN COURS DE GESTATION



Conclusions (1/3)

- Confronté à un problème de reproduction enzootique
  - Toujours vérifier la relation entre prolificité et fertilité





Conclusions (2/3)

- Confronté à un problème de reproduction enzootique « normo-prolifique » et parité dépendant, toujours penser à l'alimentation
  - Le perte de gras n'est plus le facteur déterminant
  - La perte de masse protéique est le principal facteur
- Effet papillon
  - Des petites « erreurs » peuvent avoir des effets majeurs
- Effet lignée
  - Chaque génétique à ses caractéristiques

Conclusions (3/3)

- Mais
  - Les contraintes sont très nombreuses: chaque élevage est unique
    - La lignée
    - Le(s) logement(s), le(s) système(s) d'alimentation
    - La conduite d'élevage
      - Quarantaine
      - La conduite en bande
  - Il faut accepter la variation
    - Il faut donc changer de concept
      - La truie moyenne idéale est un concept, pas une réalité
    - Il faut s'adapter