Feeding hyperprolific sows: a nutrition or a management issue?

Alimentação de femeas hiperprolíficas: o problema e nutrição ou o manejo?

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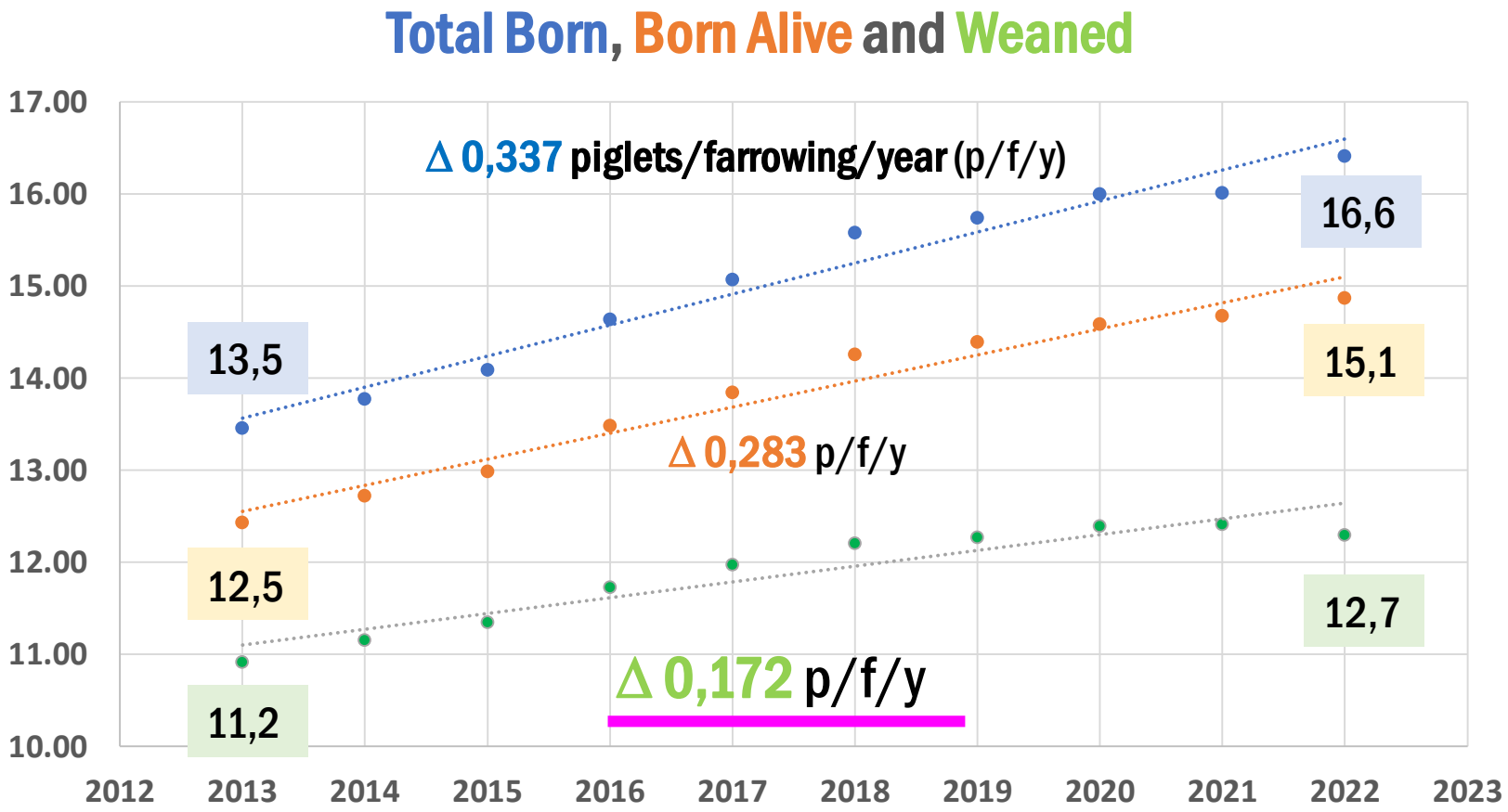
- Gestation
- Lactation

Effect of increasing the hiperprolific show's inventory in Spanish pig production



"Bdporc" data base with more than 800.000 sows.

BRASIL

2013	2022
12,2	13,9
Δ 0,174 p/f/y	
11,0	12,6
Δ 0,154 p/f/y	

Data base with 1.600.000 sows.

Comparing sow's performance 2013/2022

(Spanish "bdporc" data base)

	2013		2022		*Change (%)*
Number of sows (thousands)	654		805		
Number of controlled farms	622		525		
Weaned/Productive Sow and year	**27,02**		**29,77**		*2,75 (+ 10,2)*
Farrows/Productive Sow and year	2,48		2,42		*-2,4%*
Lactation length (ds)	23,7		25,3		
Total Born/Farrow	**13,46**		**16,41**		***+21,9***
Born Alive/Farrow	12,48	2,26	14,87	4,12	*+19,6*
Weaned /Farrow	**11,20**		**12,29**		***+12,5***
Stillborn losses (%)	7,2	16,8%	9,4	**25,1%**	*+13,3*
Lactation losses (%)	10,3		17,4		*+32,8*

At weaning, some farms lost more than 30% of the TB piglets

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Lactation length (ds)	23,7	25,3	
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Born Alive/Farrow	12,48	14,87	*+19,6*
Weaned /Farrow	11,20	12,29	*+12,5*
Stillborn losses (%)	7,2	9,4	*+13,3*
Lactation losses (%)	10,3	17,4	*+32,8*
Age at firs farrowing (months)	12,9	12,9	*0,0*
Age at culling (months)	32,0	29,6	*-7,5*
Culling (%)	**43,2**	**49,8**	*+15,3*

Performance of three specific farms

(own data)

	Farm A	Farm B	Farm C
	Trad. (2005)	**HP (2017)**	**HP (2018)**
Nº controlled sows	128	76	95
Total Born/Farrow	12,9 ± 1,80	17,6 ± 1,52	18,0 ± 0,84
Piglets after cross fostering (ACF)	12,0 ± 1,60	14,5 ± 1,42	14,8 ± 0,72
Weaned/Farrow	**10,8** ± 1,58	**13,9** ± 1,18	**14,3** ± 0,87
Litter body weight ACF (kg).	19,9 ± 4,17	19,4 ± 3,98	20,3 ± 3,22
Litter body weight at weaning (kg)	**61,3** ± 14,4	**67,0** ± 14,9	**76,6** ± 11,9
Litter growth (kg/d)	1,98	1,99 ± 2,61	2,38 ± 0,54
		+3,1%	+23,3%
Piglet body weight at weaning (kg)	**5,68**	**4,82 / *4,33****	**5,36 / *4,89****
		-15,1% / ***-23,8%***	-5,6% / ***-13,9%***
Lactation length (ds)	**21** ± 1,09	**24,5** ± 2,21	**23,8** ± 2,54

* Assuming 21 ds of lactation

Main consequences of introducing the hiperprolific shows

- Reproduction efficiency (fertility, farrowing rate,…) do not seems a crucial issue, since no substantial change was perceived.
- Gilts rearing and replacement decisions become an important issue, although this subject is not included in this “palestra”.
- The main concern of this “palestra” will focus on the nutrition and management of gestating and lactating sows.
- **Compared with traditional sows:**
  - **Hiperprolific sows** farrow more piglets, with less mean and more variable body weight at birth. (Gestation)
  - Lactating **hiperprolific sows** must feed more piglets that available teat and piglets are lighter and more variable in body weight.

Nutrition and management should be a key issues

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Gestation characteristics

1- It is the longest period of the sow's production cycle (≈80%), and feed consumption represents 65-70% of the whole sow cycle.

2- A reliable productive response is not obtained until the end of the period.

3- Along gestation it is necessary to nourish two different “organisms”, the sow and the litter.

Gestation commercial objectives

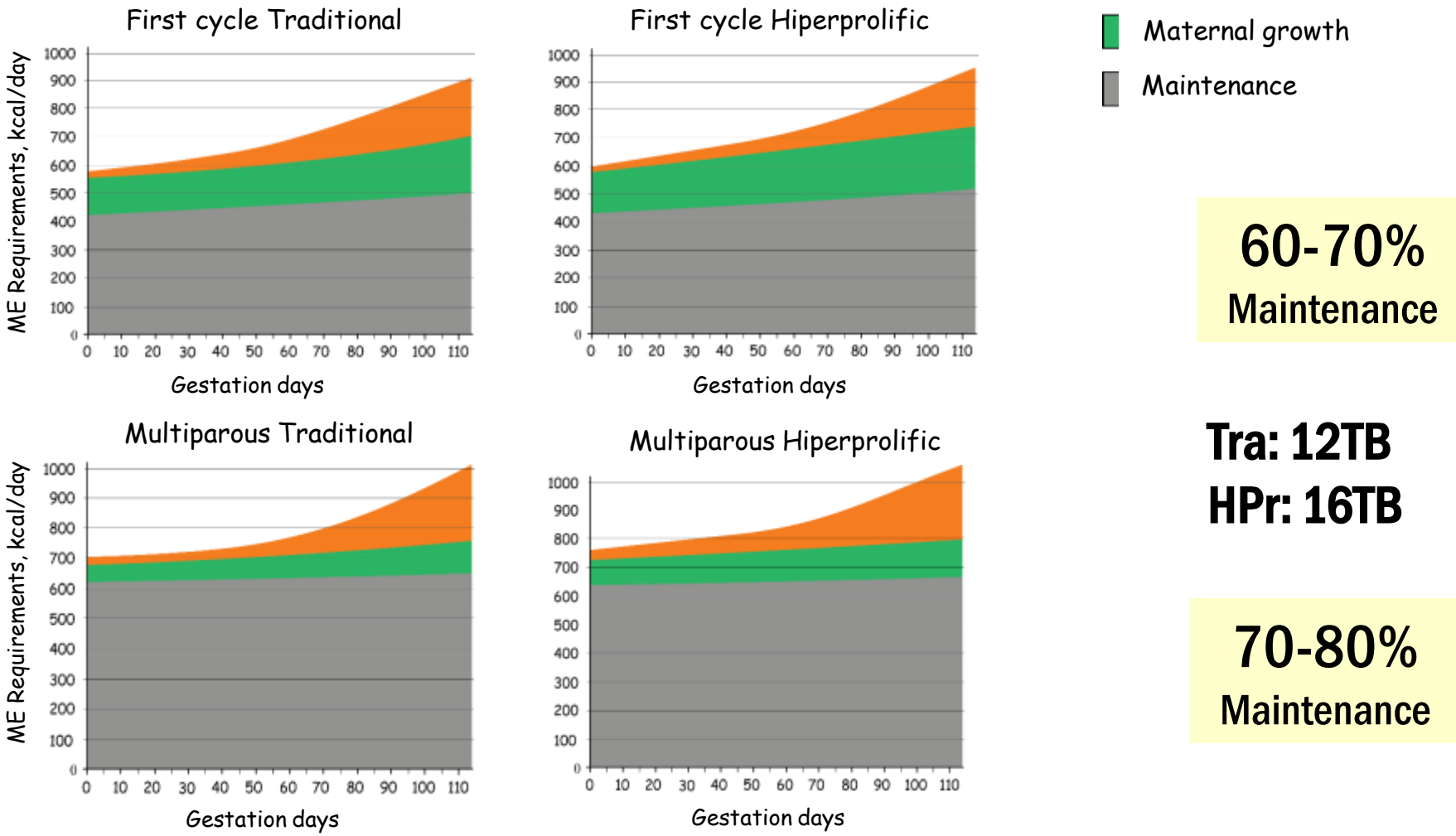
1- To produce as many “quality” piglets as possible,..... *compatible with the production potential of the sows?*.

2- Piglets should have a sufficient body weight (>1,2 kg), and, if possible, with a low litter standard deviation.

3- Sows should arrive at farrowing with an adequate body condition or nutritional reserves and finish lactation not too nutritionally exhausted.

Energy requirements (Kcal ME/d)

NRC model (2012)



60-70%
Maintenance

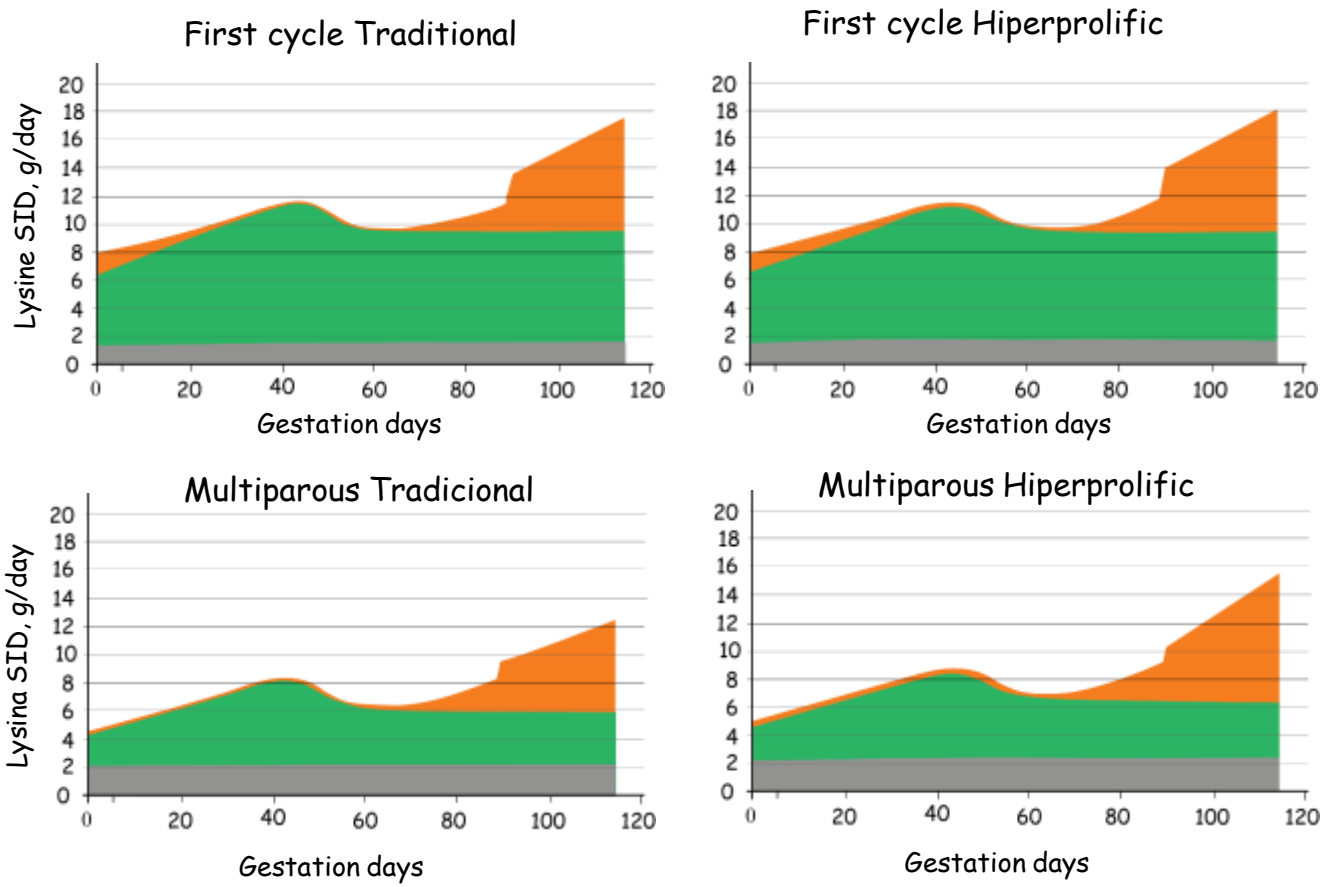
Tra: 12TB
HPr: 16TB

70-80%
Maintenance

Solà-Oriol y Gasa (2016)

SID Lys requirements (g/d)

NRC model (2012)



>60% Mother

<10% Maintenance

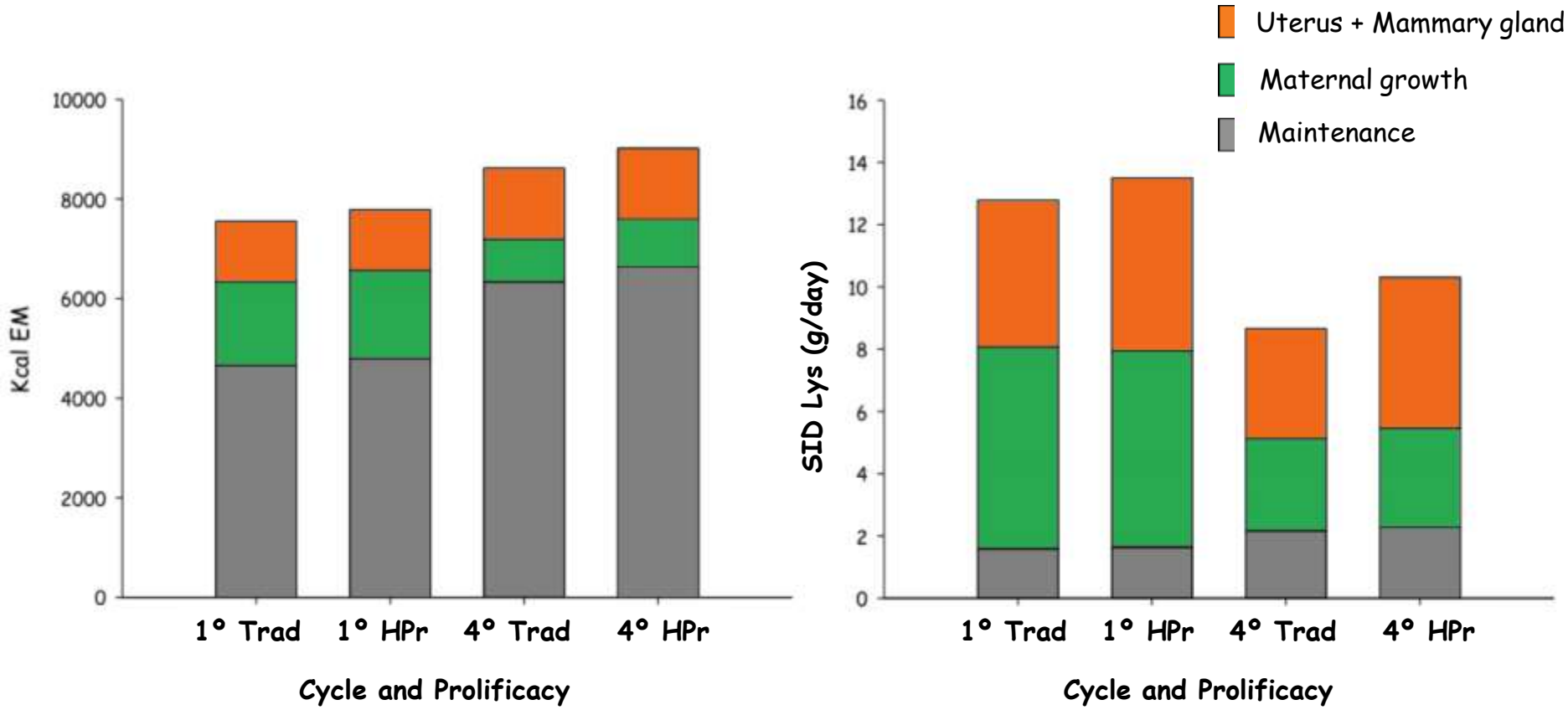
> 50 Mother

~10% Maintenance

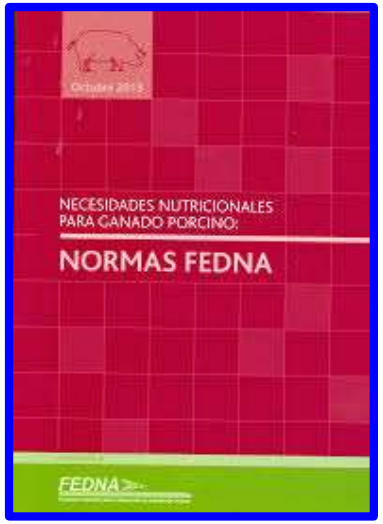
Tra: 12NT; HPr: 16NT

Solà-Oriol y Gasa (2016)

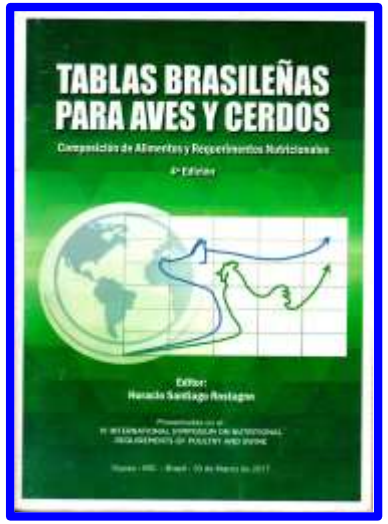
Relationship SID Lys:ME (g/Mcal)



	1º Trad.	1º HPr.	4º Trad.	4º HPr.
SID Lys/EM (g/Mcal) *(% over 4º Trad.)*	1,63 *(168)*	1,71 *(176)*	**0,97** (100)	1,10 *(113)*



FEDNA recommendations for gestating sows (2024)



	1	2		
		A	B	C
ME swine (kcal/kg)	**2.900**	**2.850**	**2.900**	**2.920**
NE swine (kcal/kg)	**2.130**	**2.110**	**2.160**	**2.175**
Ether Extract (%, min.)	**3,1**	**3,1**	**3,5**	**3,8**
NDF (%, min.)	**18,0**	**18,0**	**17,5**	**17,0**
Crude Protein (%, min.)	**13,7**	**13,1**	**13,5**	**14,0**
(%, max.)	**15,8**	**15,5**	**16,0**	**16,4**
Total Lysine (%)	**0,60**	**0,51**	**0,61**	**0,63**
SID Lysine (%)	**0,50***	**0,43**	**0,50**	**0,53**

1- **"Without the possibility"** of individual control of the feed intake.
2- **"With the possibility"** of individual control of the feed intake.

(A) Adult sows until the last month of gestation (<85 days).
(B) Young sows (1st and 2nd cycles) and adults last month of gestation (>85 days).
(C) Hyperprolific sows (>16 total born) last month of gestation (>85 days).

** 0,50 SID Lys (%) is equivalent to 1,73 g SID Lys/Mcal EM*

Partial conclusions

- **To satisfy the requirements** of all sows throughout gestation **with a single feed** waste a high quantity of nutrients.
- **Gilts along the whole period and sows during the last weeks of gestation** requires a higher SID Lys/ME ratio.
- **High hyperprolific sows** (*>16 TB*) would need more energy and nutrients.

However, *some of those differences can be partially alleviated by modifying feed intake.*

The curve and the feeding "system" can help to mitigate or to exacerbate the differences.

Commercial approach: the feeding curve.

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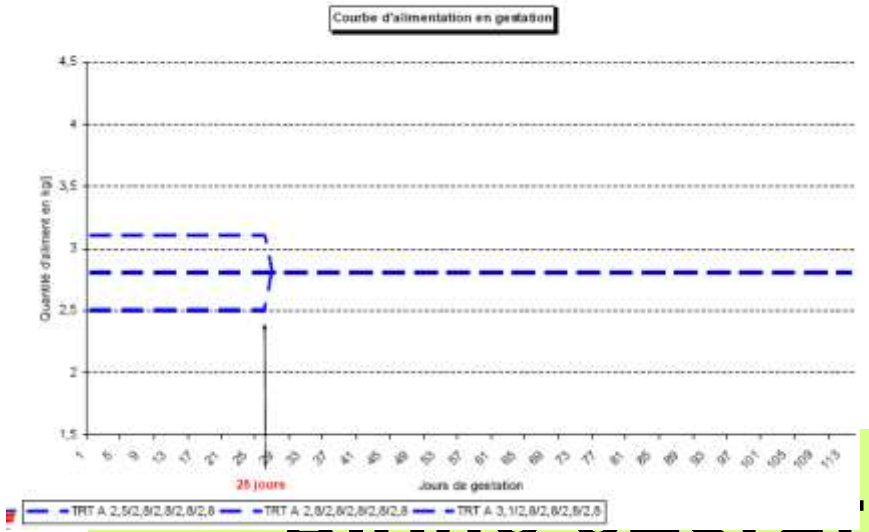
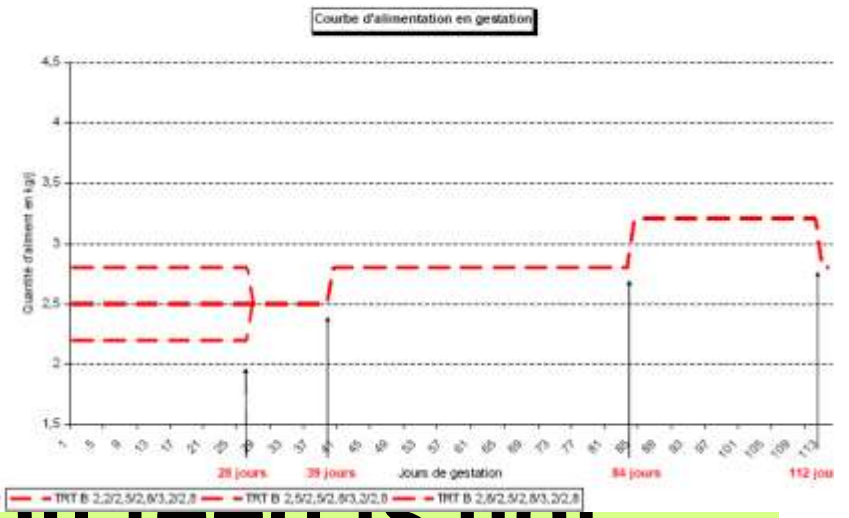
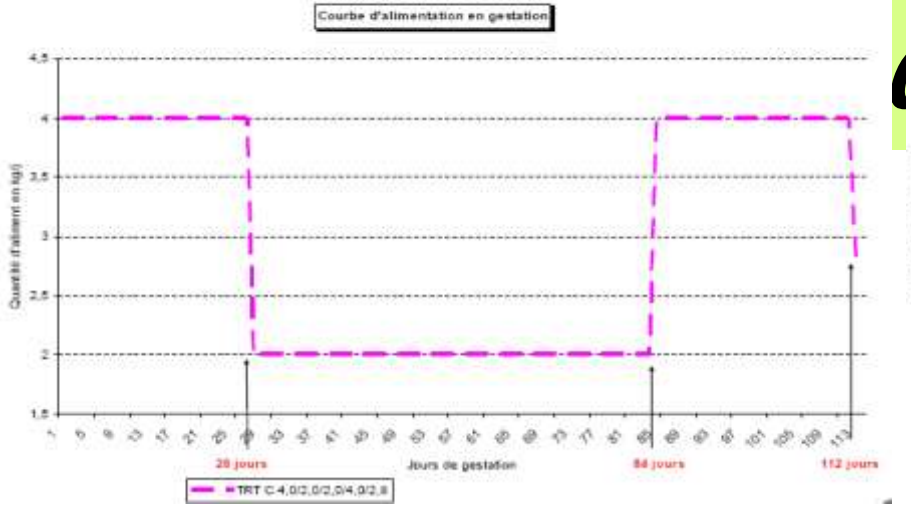


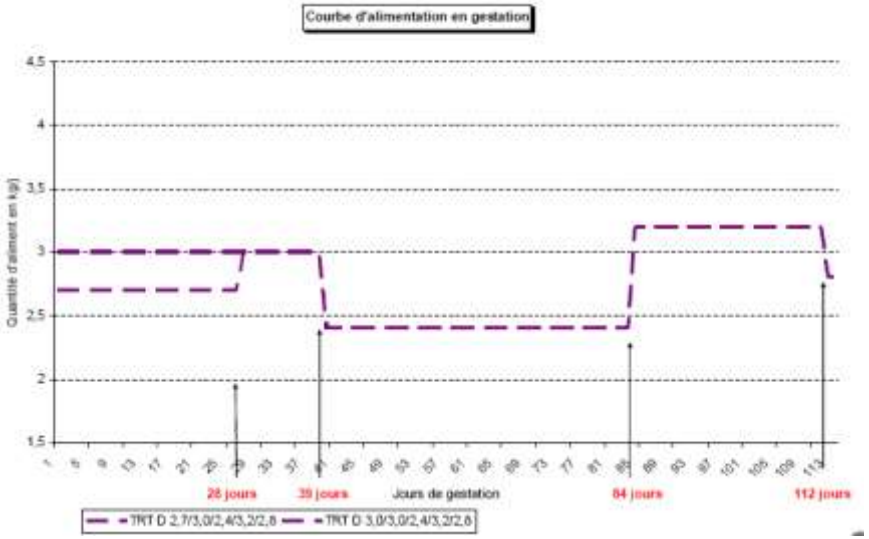
PLAN HOLLANDAIS



PLAN DANOIS 4-2-4

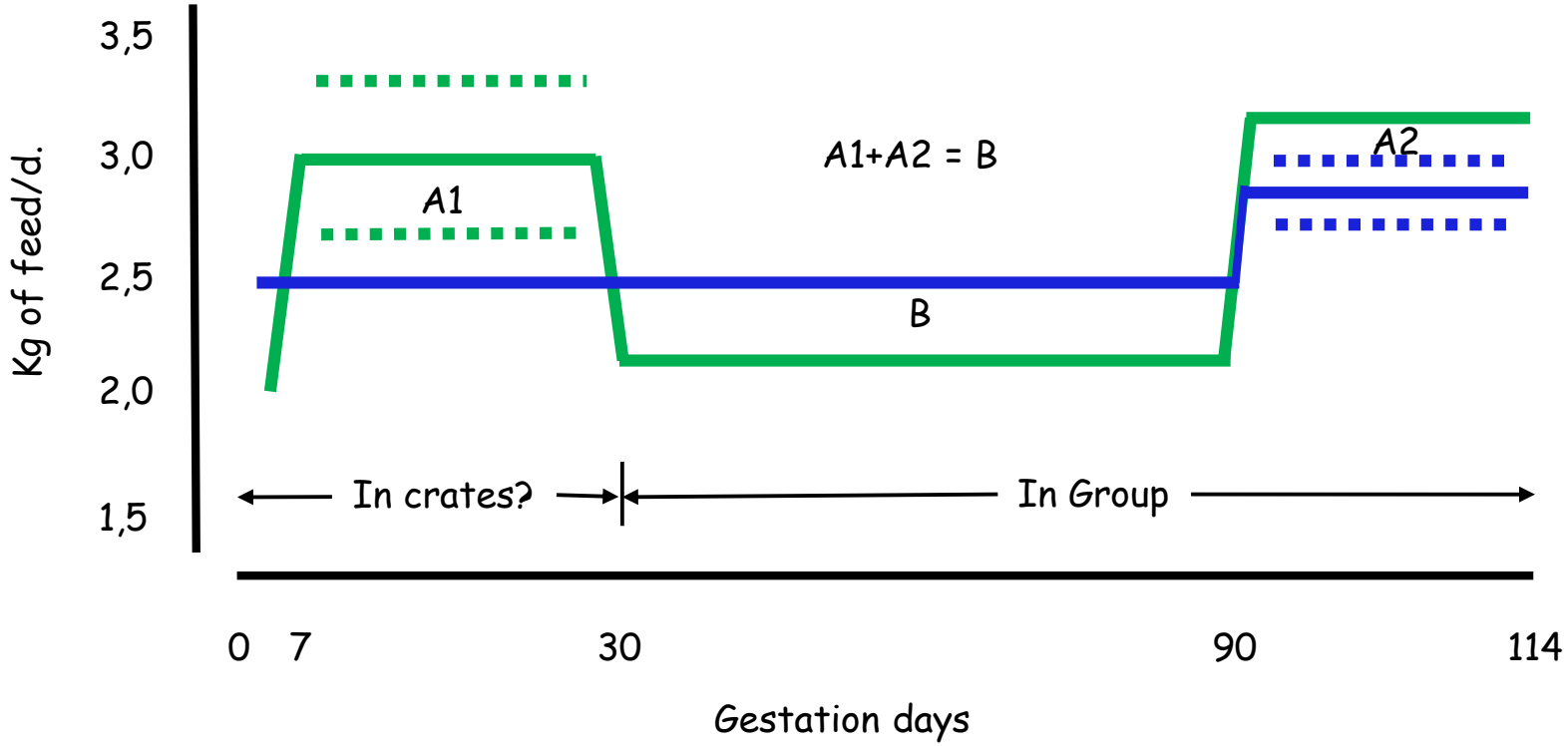


PLAN FRANCAIS



Feed intake curves along pregnancy

Two main approaches



"Tradicional curve" y "Plane/Flat curve"

In which circumstances may use more than a feed during the gestation period?

Logistical conditions

In feed factory: Feed preparation and transportation

- Manufacture 3 or 4 Feeds instead of one.

In farm:

- Availability of silos and equipment.
- Feed administration system: Depends on **the possibility to control feed intake individually.**

NO

NO

YES

Gestation conclusions

1- The correct feed for multiparous sows is insufficient for **first cycle gilts.** Assuming the same energy content, Lysine, AAs and other nutrients should be increased.

2- The content of AAs and other nutrients should be also increased during the **last month of gestation and for hiperprolific sows.**

3- To properly **adjust the gestation feed intake curve** may help to mitigate some maladjustments of the feed composition.

4- To have the **appropriate logistics to supply the feed** and to be able **to individually control sow's feed intake on farm** will allow to optimize feeding during gestation.

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Main lactation characteristics

1- It is the period of maximum nutritional demand in the productive cycle of the sow, and five days or a week after weaning the sow is in heat and starts a new production cycle.

Nutritional effort during lactation: comparison of some mammal species

	Gest. (ds)	Lact. (ds)	Lac/total x 100	PL* end Ges.	PL* Lac. max.
Sow	114	20-28	**15**-19	1,2	3,5
Dairy Cow	270	305	>80	1,2	5,0
Beef Cow	270	>90	>25	1,2	1,7
Sheep	147	>30	17->50	1,3	Up 2,7
Goat	150	>30	17->50	1,3	Up 3,0
Dog	60-65	>40	>40	1,1	2,1?
Rabbit	31	>20	>40	1,2	3,0?
Woman	270	Variable	Variable	1,1	2,0

*PL, Production Level or Level of Production: **Total NE Intake / NE for maintenance**

“Production Level”

- Maintenance:
  - 75 kcal NE/$kg^{0,75}$ x $275^{0,75}$ = 5.000 kcal NE/d
- Gestation (day 113):
  - 70g growth/p x 15 piglets x 0,2 x 5,4 = 1.134 kcal NE/day 113.
- **Max. Production Level gestation**: 6.134/5.000 = **1,23**

- Lactation (day 10):
  - 9 kg milk x 1.400 kcal/kg milk=12.600 kcal EN/day10
- **Max. Production Level lactation**: 17.600/5.000 = **3,52**

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Dog	60-65	>40	>40	1,1	2,1?	1,0
Rabbit	31	>20	>40	1,2	3,0?	1,8
Woman	270	Variable	Variable	1,1	2,0	0,9

*PL, Production Level or Level of Production: **Total NE Intake / NE for maintenance**

Main lactation characteristics

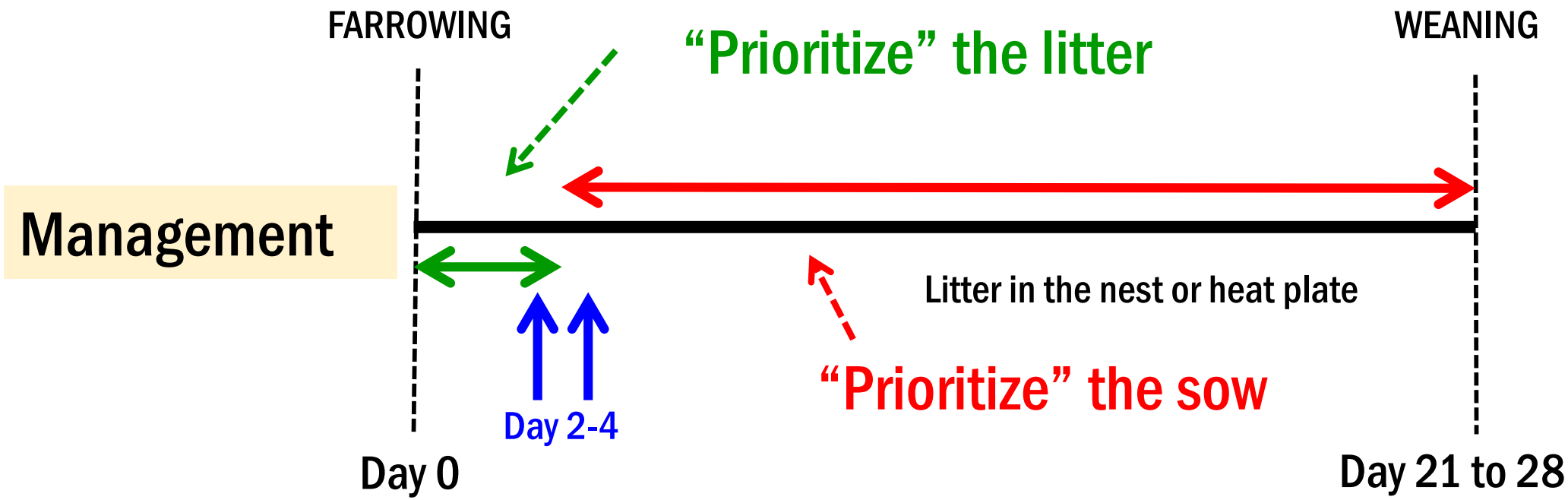
1- It is the period of maximum nutritional demand in the productive cycle of the sow, and Five days or a week after weaning the sow is in heat and starts a new production cycle.

2- The sow and the litter have different nutritional and environmental needs but share the same facility.

3- The most critical subperiod of lactation, for both sow and litter, is the first week or ten days postpartum.

Main events in the maternity room

"Area of coexistence": sow + litter



Litter Feeding

Colostrum (24/36 hs)
"ad libitum" and without any routine

Milk (>36/48 hs)
Strict breastfeeding cycles (15 or 20 / day)

"Creep feeding"

Management and nutrition summary

1- Lactation is a **short period of time** (20 to 30 days, 15-19% of the sow's cycle), which is highly variable from a nutritional point of view.

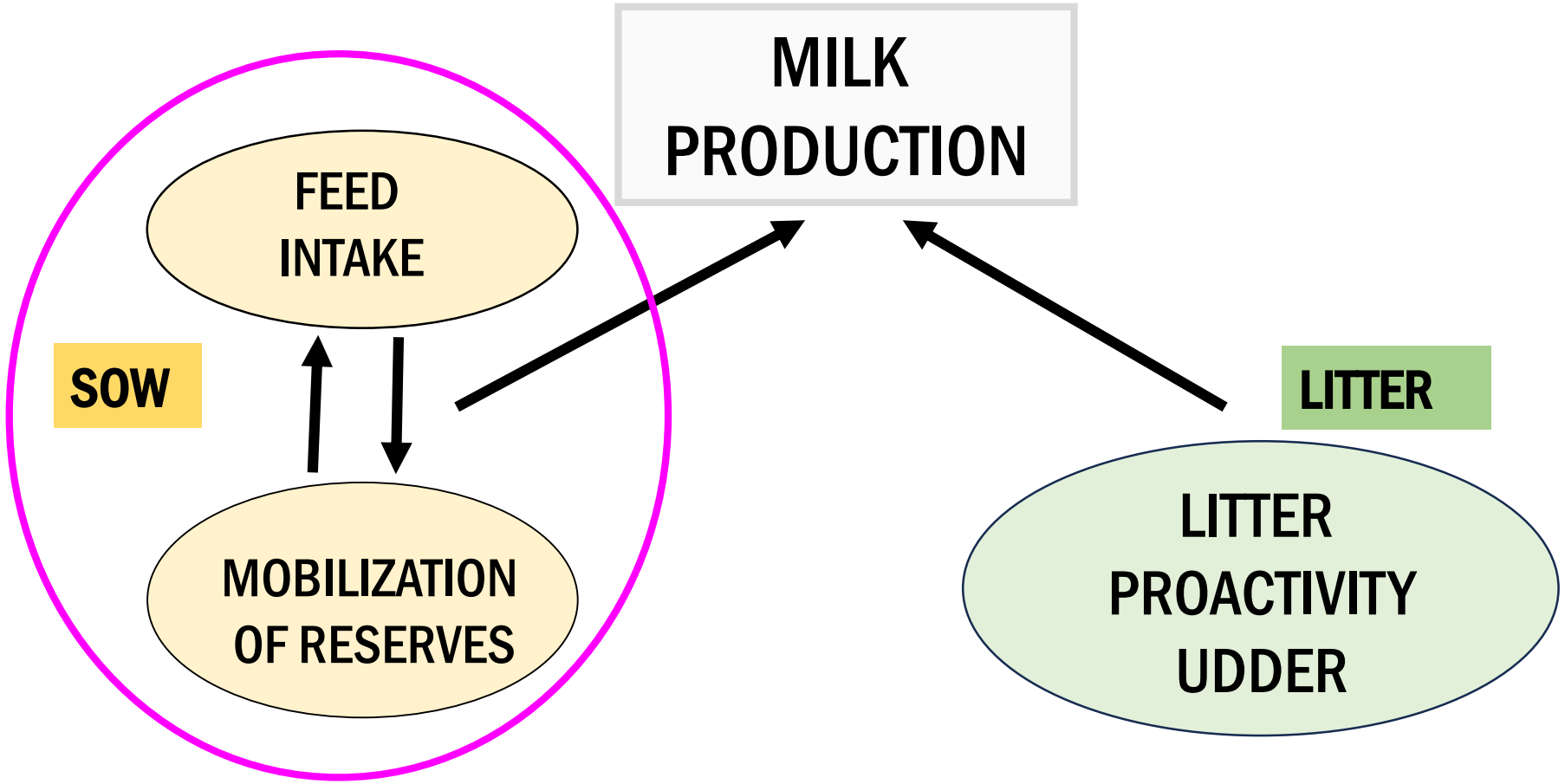
2- Lactation is **the period of greatest digestive and metabolic demand** for the sow. In 10 to 12 days the sow goes from a production level of 1.2 to more than 3.0.

3- Milk is the main piglet's feed during lactation. Piglets take colostrum "*ad libitum*", however take milk following a strict routine. **Success in the "*switch on*" of milk production is paramount for litter's growth.**

4- Along lactation sows must have a **high feed intake** and most animals **mobilize a significant amounts of body reserves.**

Objectives in lactation

- Wean piglets in “quantity” and “quality”.
- Preserve and optimize sow longevity



Comparing sow's performance (own data)

(Traditional Sows 2013 vs Hiperprolific Sows 2023)

	Trad. 2013		HP. 2023	
	Mean	*SD*	Mean	*SD*
Number of Sows (*mean cycle number*) *	55 (*2,53*)		84 (*2,49*)	
Total Born	14,0	*2,64*	22,6	*4,54*
Born Alive	12,3	*2,49*	19,0	*3,97*
Weaned/Farrowing	10,9	*0,92*	13,4	*2,02*
Litter BW at cross fostering (kg)	20,0	*3,80*	22,7	*4,77*
Litter BW at 20/22 lactation days	66,0	*10,31*	67,7	*16,64*
Litter growth (kg/d)	2,30		2,05	
Piglet BW at 20/22 lactation days (kg)	5,95		5,05 (4,59**)	

* All sows come from the 3rd production cycle or more, ** Estimated at 20 days of lactation

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Litter BW at 20/22 lactation days		66,0	*10,31*	67,7	*16,64*
Litter growth (kg/d)		2,30		2,05	
Piglet BW at 20 lactation days (kg)		5,95		5,05 (4,59**)	
Sow BW at farrowing (kg)		276,0	*26,73*	275,5	*23,25*
Sow BW loss in lactation (kg)	Tissue	21,0	*11,41*	9,3	*20,72*
Sow BF at farrowing (mm)	Mobilization	18,1	*3,50*	9,8	*3,04*
Sow BF loss in lactation (mm)		2,0	*1,91*	0,25	*2,14*
Feed Intake in lactation (Kg/Sow and day)		**5,2**	*0,79*	**7,6**	*1,74*

* All sows come from the 3rd production cycle or more, ** Estimated at 20 days of lactation

Effect of feed intake and tissue mobilization over the % of SID Lys in feed

Sow	Traditional			Hiperprolific			
Feed Intake (kg/d)	5	33,0%	8	5	32,8%	8	
Body Weight lost (kg/d)	*0,57*	*1,0* 5,7% *,40*	*-0,15*	*0,78*	*1,* 7,7% *,21*		*0,24*
Lean lost (%)	*20*	*60* *0*	*60*	*20*	*6* *20*		*60*
SID Lys in feed (%)	1,07	0,98	0,69	0,68	1,26	1,13	0,81	0,79

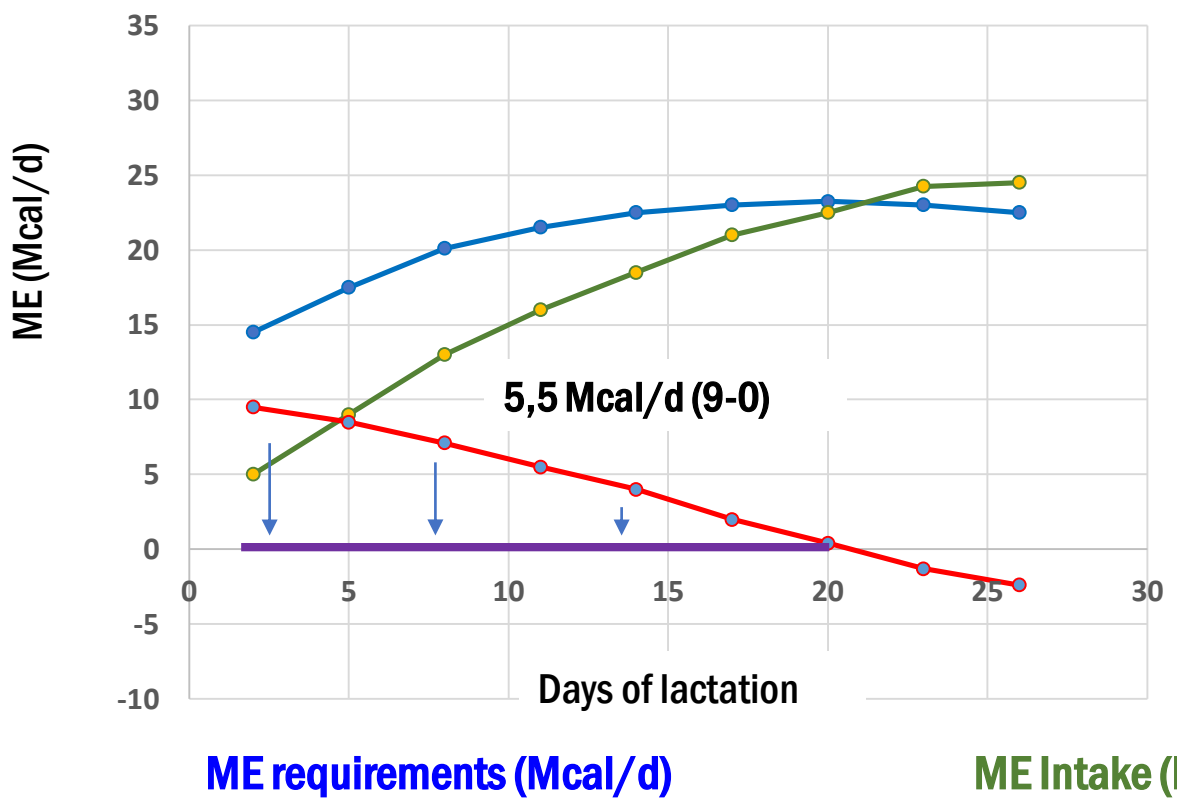
Traditional sow:
260kg body weight
10 weaned
Lactation 21 days
Weaning weight: 6,0 kg/piglet

Hiperprolific Sow:
260kg body weight
13 weaned
Lactation 21 days
Weaning weight: 5,4 kg/piglet

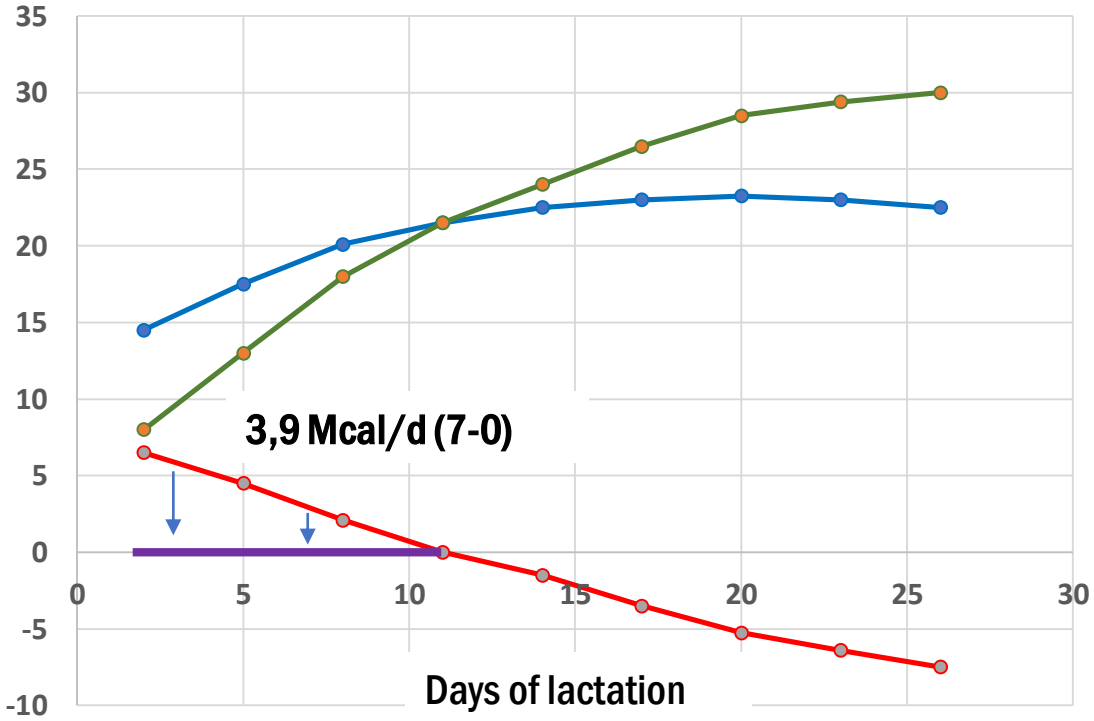
Factorial method; Gasa et al, 2023

Mobilization is still important

Mean feed intake of 6 kg/d



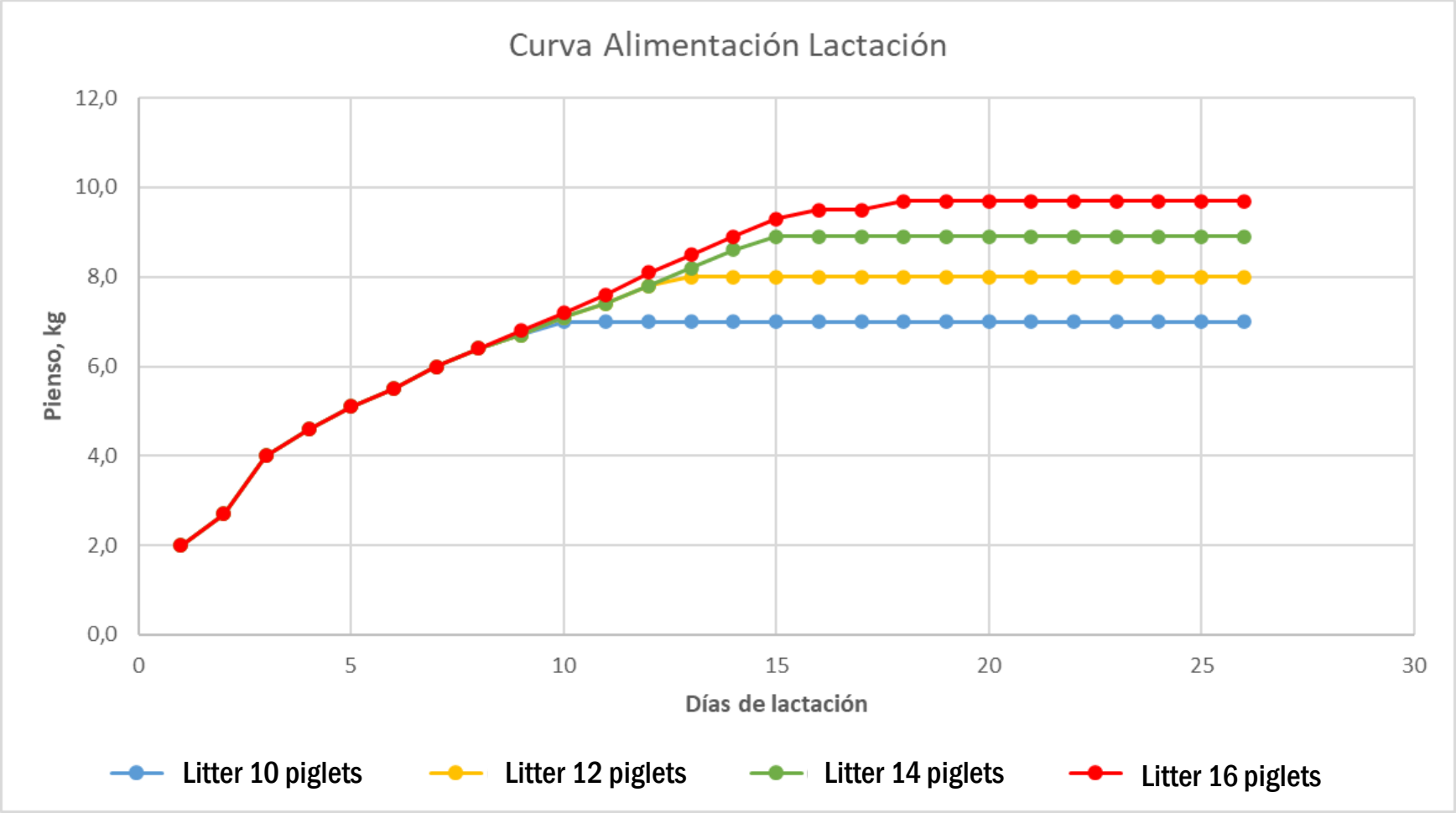
Mean feed intake of 8 kg/d



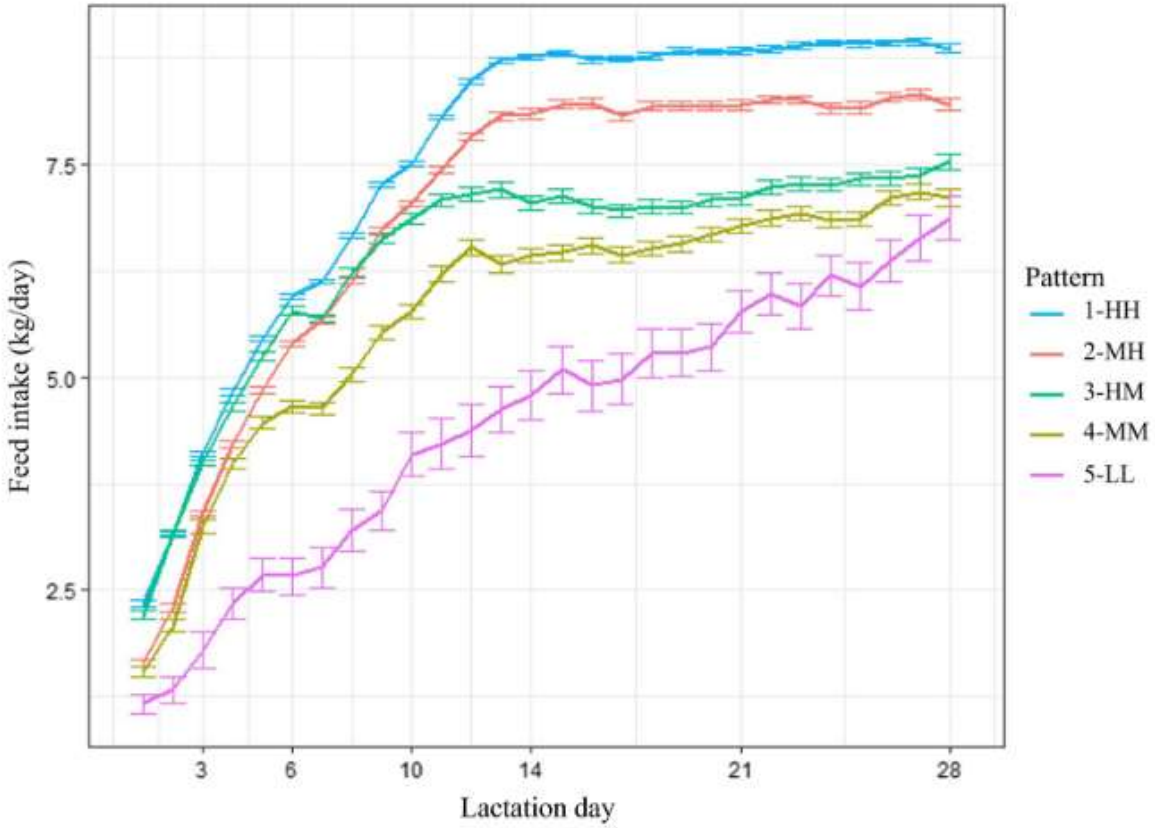
ME requirements (Mcal/d) **ME Intake (Mcal/d)** **ME Equivalents mobilized (Mcal/d)**

Production of a 275 kg BW sow with a mean milk production of 8,0 kg/d (equivalent to wean 12 piglets of 5,25 BW kg each)

Lactation feed intake curve: the theory

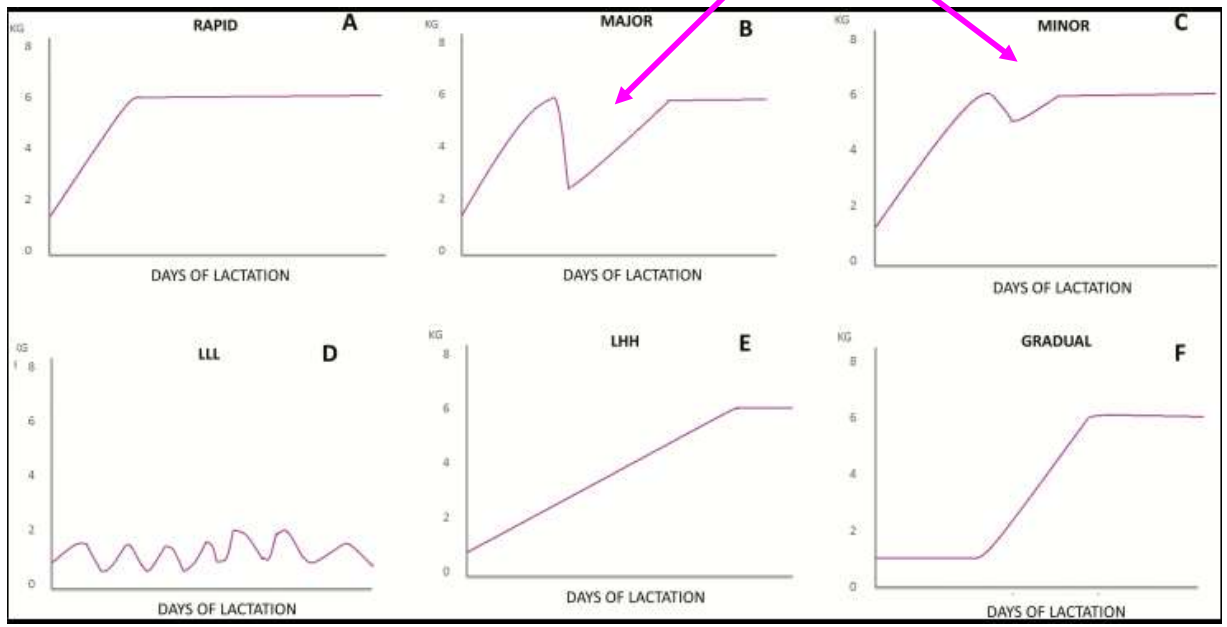


Lactation feed intake curve: the practice



Rodriguez et al, 2023

Indigestion



Piñeiro et al, 2019
(Koketsu, 1996)

Feed management in lactation (1)

Traditional feeding

Dispensers

Feed management in lactation (2)

Hopper

Spherical Plunger
activated with the nose or tongue

“Feeding ball”

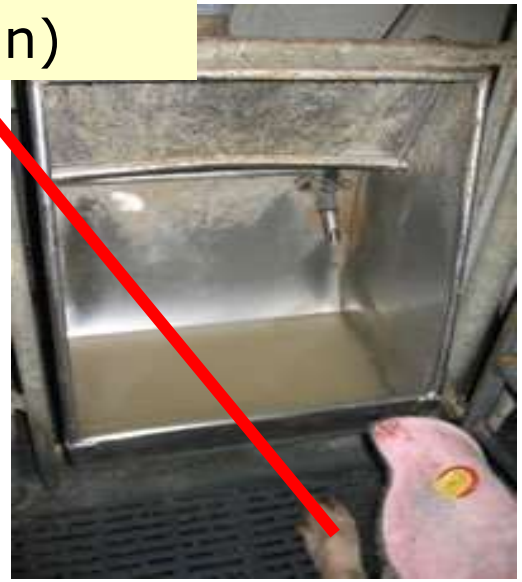
Feed management in lactation (3)

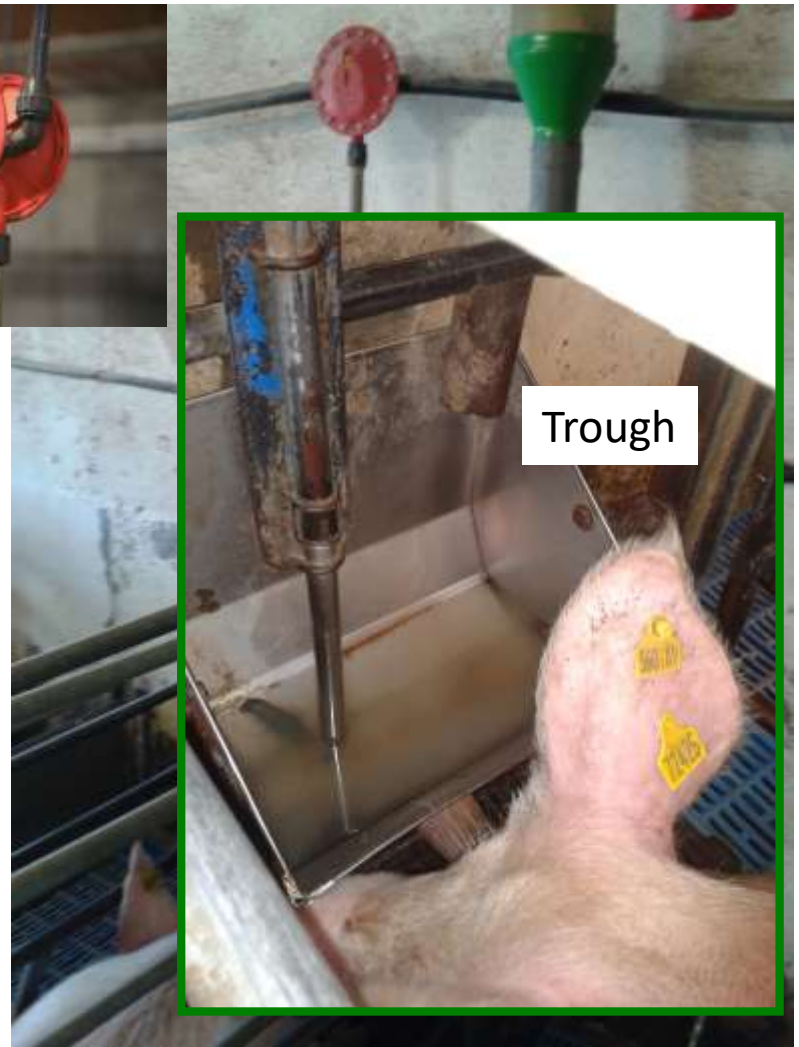
“automatizatión”

Feed management in lactation: water

“Full” water availability: types of drinking trough.

Nipple, high flow!
(>2 l/min)

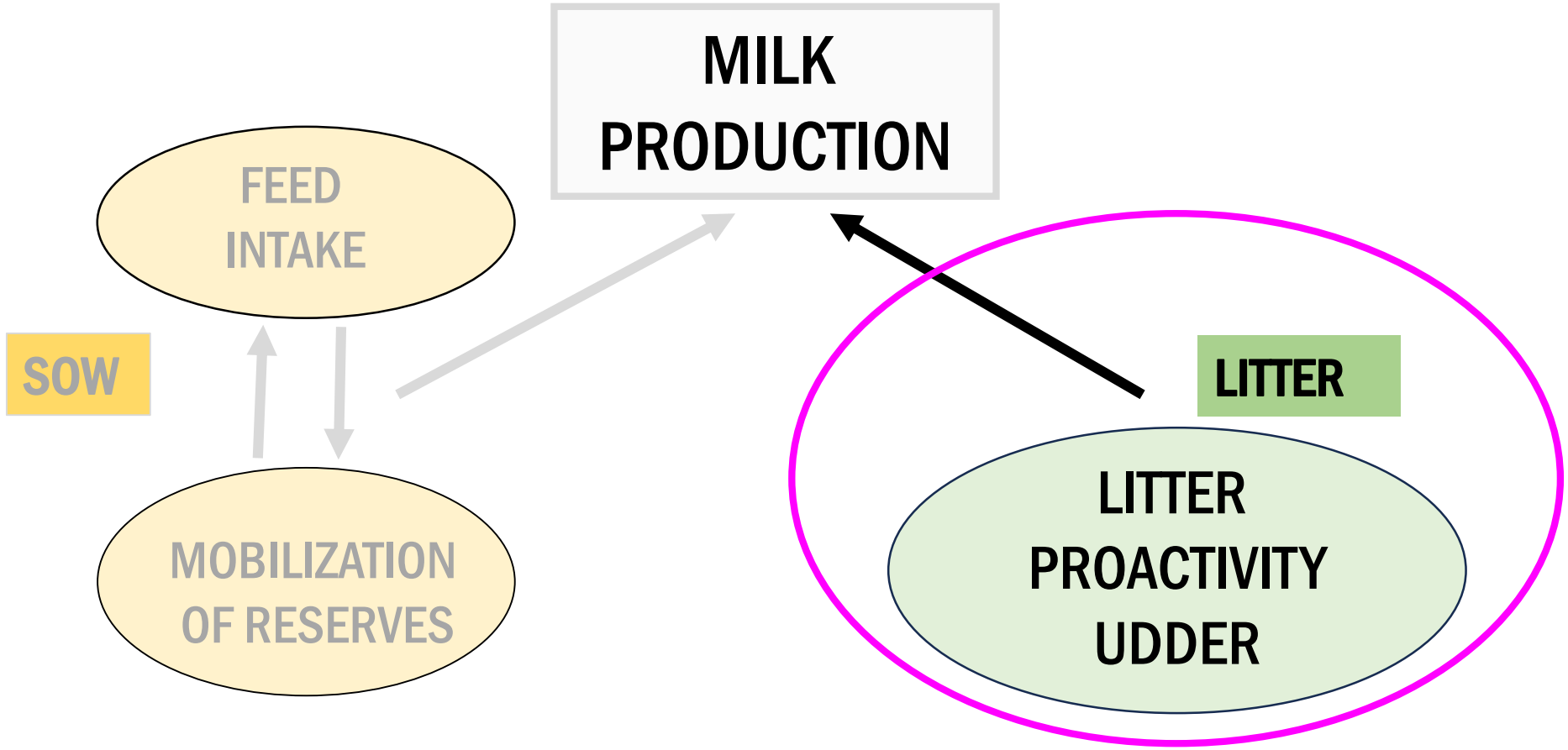




Trough

Objectives in lactation

- Wean piglets in “quantity” and “quality”.
- Preserve and optimize sow longevity



Effect of litter proactivity

Effect of heat stress over the litter productivity of restricted feed intake lactating sows.

Environment temperature	Temperate	Heat Stress	P-value
Nº of sows	22	24	
Feed intake (kg/d)	**4,33 ± 0,36**	**4,34 ± 0,66**	
Litter size at cross fostering	12,2	12,0	0,520
Litter size at weaning (kg)	10,8	10,2	0,142
Litter weight at cross fostering (kg)	19,7	20,1	0,716
Litter weight at 7d (kg)	30,9	23,1	0,001
Litter weight at 21d (kg)	**63,3**	**52,6**	**0,015**
Piglet Body Weight 21d (kg)	**5,87**	**5,16**	**0,009**
Body Weight loss at 21d (kg)	**25,7**	**10,4**	**0,001**
Body fat loss at 21d (kg)*	9,25	5,87	0,004
Body Protein loss 21d (kg)*	3,45	0,87	0,001

* Calculated following Gasa et al (2023)

Gasa et al, 2020

Effect of litter behaviour

Litter behaviour at 3 and 8 days after farrowing. Percentage of time resting or playing and location of the piglets in the farrowing crates (Plate, Udder or other places) at day 8 post-farrowing.

Environment temperature	**Temperate**		**Heat Stress**	
Mean % ± SD	Resting	Playing	Resting	Playing
3 days post-farrowing	80,3 ± 9,40	**19,2 ± 8,95**	87,3 ± 5,90	**12,6 ± 5,81**
8 days post-farrowing	86,8 ± 9,50	12,8 ± 8,69	90,1 ± 5,89	9,7 ± 5,73

Environment temperature	**Temperate**			**Heat Stress**		
Mean % *	Plate	Udder	Other	Plate	Udder	Other
Daily mean	37,4	19,7	42,9	26,5	13,7	59,8
Morning	*39,4*	*16,3*	*44,3*	*34,2*	*13,0*	*52,8*
Afternoon	*35,4*	*23,1*	*41,6*	*21,7*	*14,2*	*64,0*

* High SD, between 5,0 and 30,0

Ibarra et al (2024)

This is not all with hiperprolific sows

Comparing sow's performance (own data)

(Traditional Sows 2013 vs Hiperprolific Sows 2023)

	Tra. 2013		HP. 2023	
	Mean	*SD*	Mean	*SD*
Number of Sows (*mean cycle number*) *	55 (*2,53*)		84 (*2,49*)	
Total Born	14,0	*2,64*	22,6	*4,54*
Born Alive	**12,3**	*2,49*	**19,0**	*3,97*
Nº Piglets starting lactation (post cross fostering)	**12,2**	*1,20*	**15,9**	*1,01*
Weaned	10,9	*0,92*	13,4	*2,02*
Litter BW at cross fostering (kg)	20,0	*3,80*	22,7	*4,77*
Litter BW at 20/22 lactation days	66,0	*10,31*	67,7	*16,64*
Sow BF loss in lactation (mm)	2,0	*1,91*	0,25	*2,14*

PROBLEM: to manage many more piglets born alive than available nipples/teats in the sows

* All sows come from the 3rd production cycle or more, ** Estimated at 20 days of lactation

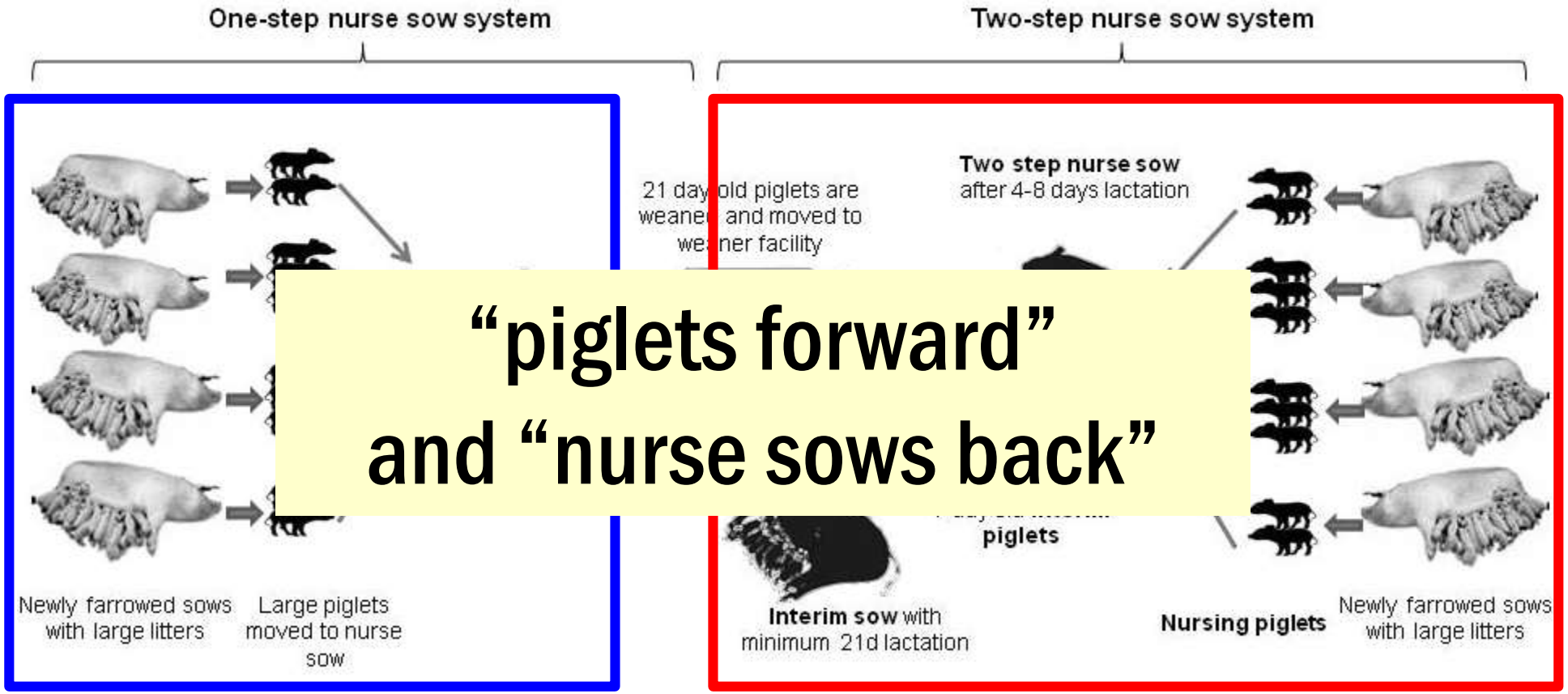
Nursemaid sows

When to perform nursemaids in a farrowing room?

1- When in a farrowing rom there are more piglets than available functional teats.

2-When the mother’s production milk potential is insufficient to feed all the nursed piglets.

Nursemaid sows

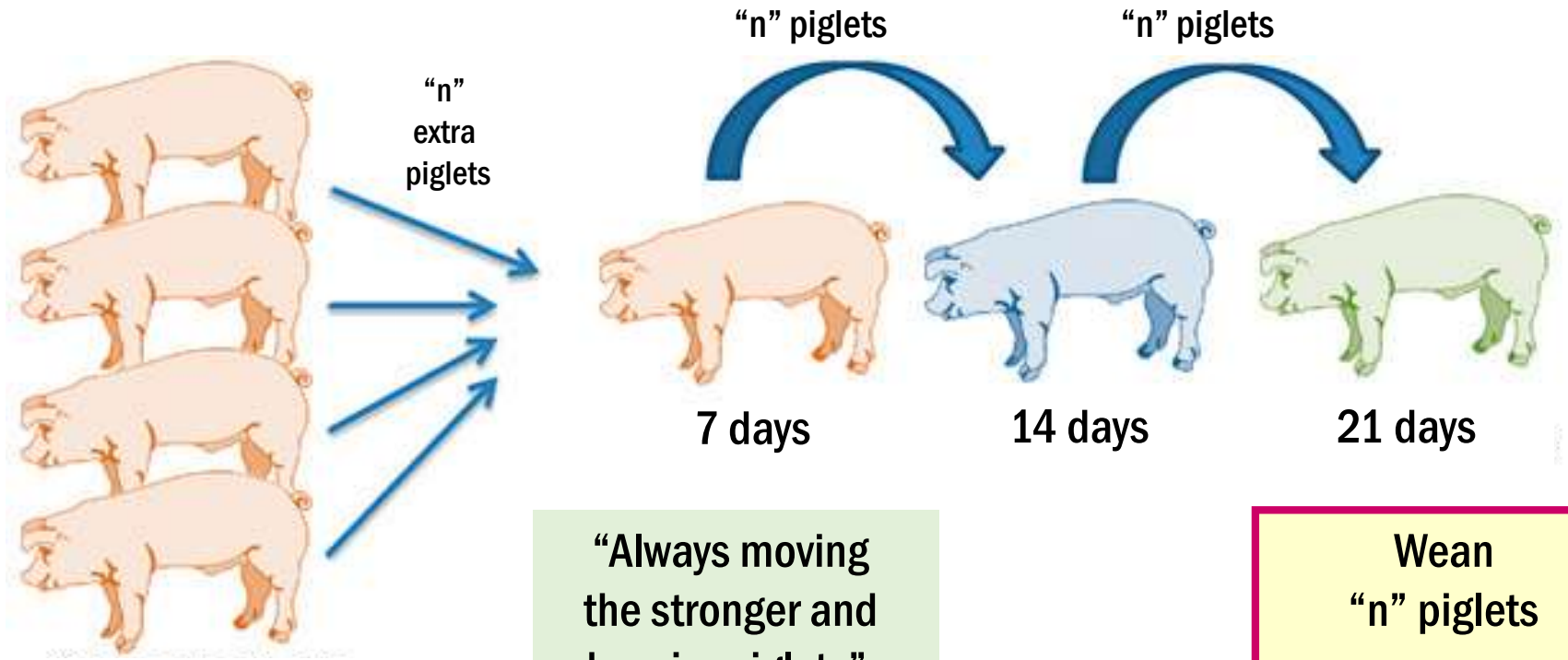


"piglets forward"
and "nurse sows back"

Maternity cages!

Baxter et al, 2013

Nursemaid sows “The cascade approach”



“Always moving the stronger and heavier piglets”

Wean
“n” piglets
or
Extend lactation
of some sows

https://www.3tres3.com/articulos/adopciones-y-nodrizas-ii-%C2%BFcomo-hacemos-los-movimientos_50285/

Supplementation with reconstituted milk

Supplementation with reconstituted milk

Artificial nursing or lactation (1)

Artificial nursing or lactation (3)

NOT ALLOWED IN EU

Lactation conclusions (1)

1- **Lactation is a critical period** for the nowadays sow, from both, nutritional and management point of view.

2- To reach an **appropriate feed intake curve may guarantee a successful lactation**. Recent technical advances in feeders and drinkers help a lot.

3- Nowadays sows eat more and probably mobilize less amount of tissue along lactation. However, this amount is **more variable among sows and include a higher proportion of lean tissue**.

Lactation conclusions (2)

4- The degree of **proactivity of the litter at the udder** is essential to reach a successful “switch on” of milk production.

5- Hiperprolific sows management must cope with **much more live piglets than available teats**, so nursemaid sows o reconstituted milk supplementation have to be performed.

6- In any case, **feed formulation for lactating sows must include a high security range** for most nutrients.

Thank you for your attention

Any questions?

Muito obrigado pela atenção

Dúvidas?

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Servei de Nutrició i Benestar Animal

XVIII Encontro Regional Abraves-PR

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