Anestrus in multiparas

This article will generally review the possible causes of anestrus in multiparous sows and will also examine two clinical cases.

Patricia Prieto Martínez, Alberto García Flores, and Pablo Magallón Verde
Veterinary Technical Service, Inga Food SA

Porcine anestrus is defined as the absence of heat, otherwise known as the oestrous cycle, in sows. Anestrus may be:

- Physiological—anestrus that occurs in multiparous sows during pregnancy, lactation, and at the time of weaning before they start a new cycle.
- Pathological or non-physiological—which may have one or several root causes.

Pathological anestrus

This is linked to poor hormonal regulation (*figure 1*) and may appear as the result of several different factors.

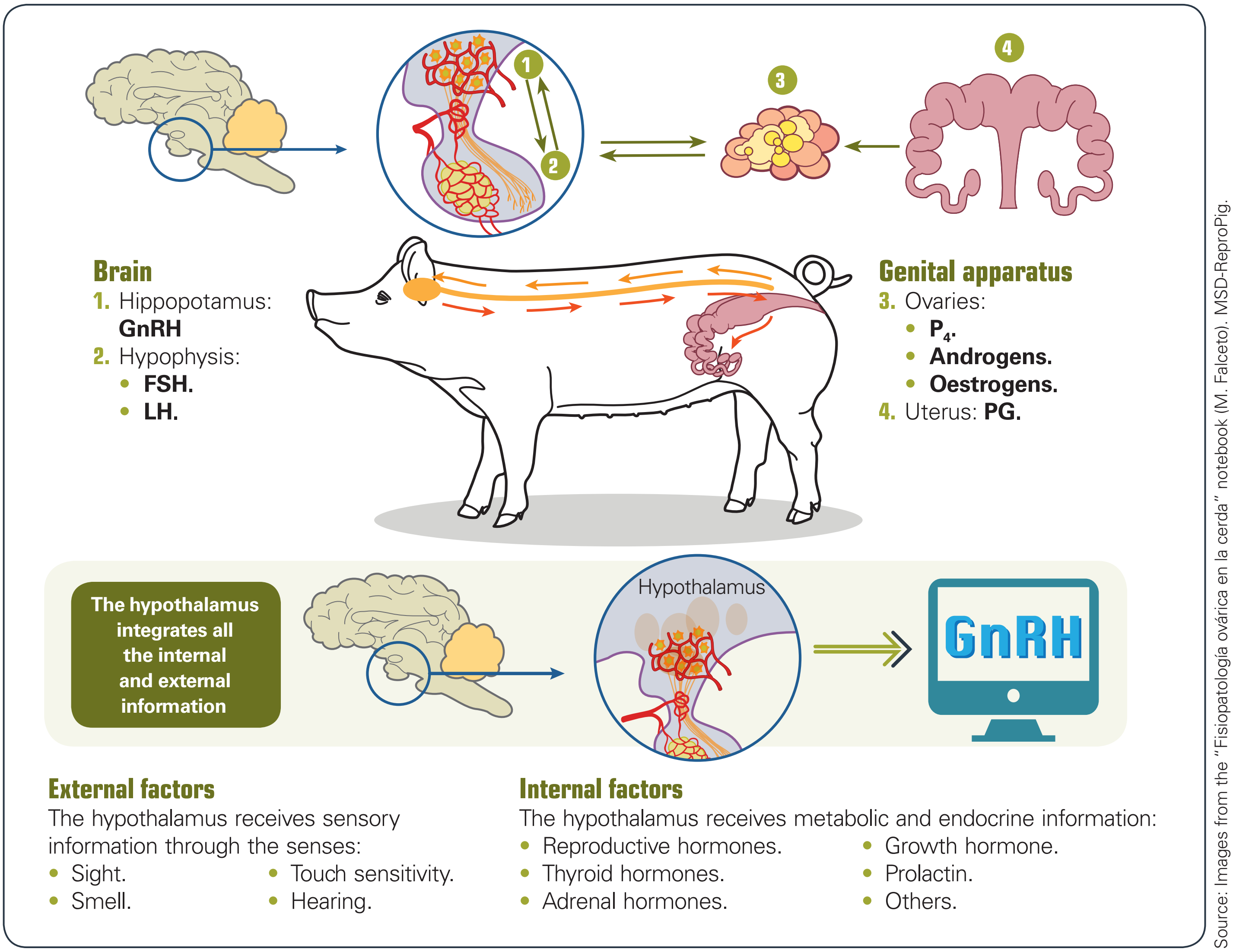


Figure 1. Hypothalamic–pituitary–ovarian axis and reproductive hormones.

Causes of pathological anestrus

- Inadequate feeding of the sow: this leads to significant losses in body condition and of body fat.
- Sow cycle.
- Genetic line.
- Seasonality: this is intricately linked to the increase or decrease in the photoperiod.
- Any cause that can produce a situation that is stressful to the animals including: inadequate facilities, social stress, poor environmental regulation, reproductive pathologies, and locomotive disorders causing pain.

It causes a deficit in the production of hormones linked to reproduction which, in turn, leads to:

- Poor follicular quality.
- Poor ovulation.
- A delayed start to heat or an increase in the weaning-to-oestrus interval (WEI), which leads to an increase in non-productive days (NPDs).

When is there non-physiological anestrus?

A maximum of 10 post-weaning days are usually allowed, after which every corrective measure possible must be taken if the percentage of anoestric sows exceeds 8%

The WEI and NPDs

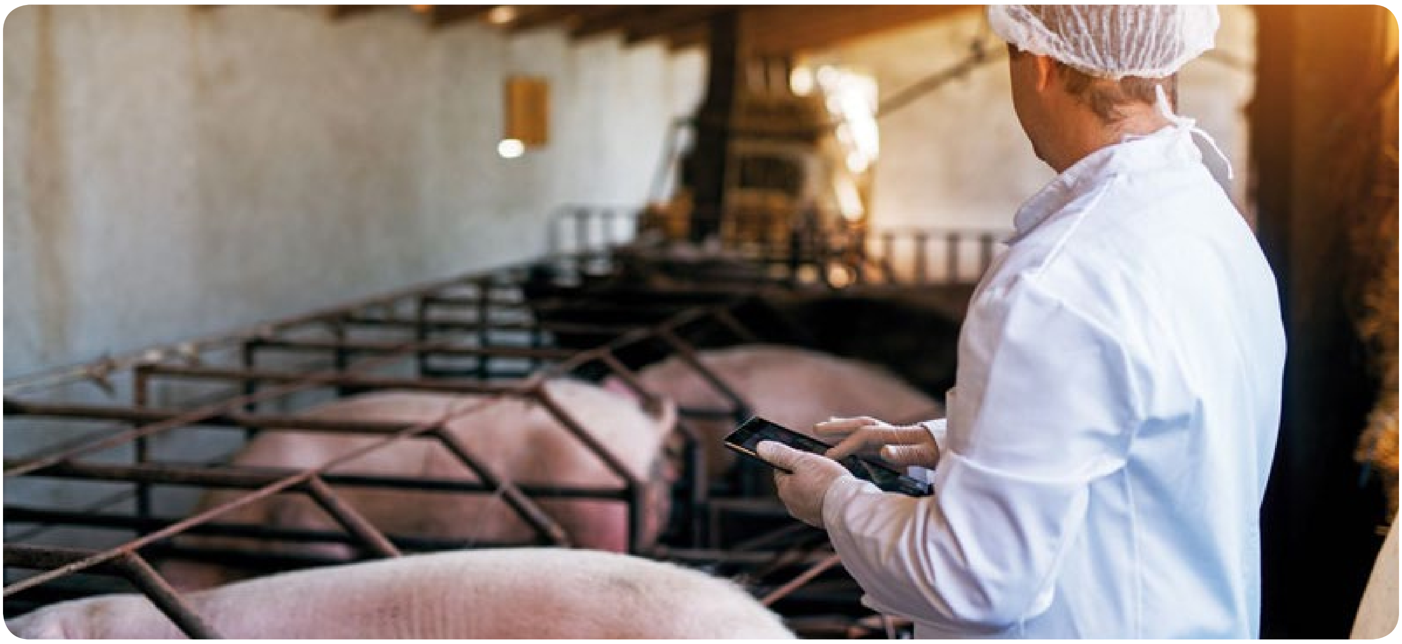
The increase in WEI leads to an increase in NPDs with the following consequences:

- **Economic:** the cost of each NPD is estimated at around €3.0–3.5 per sow per day.
- **Productive:** these parameters affect the proper organisation of groups on the farm and, in addition, *a posteriori*, many of these sows present worse prolificacy and fertility results. It is important to note that anestrus, or delayed heat, is one of the main causes of sow removal due to reproductive failure.

With proper management, most NPDs will come from an increase in WEI. In other words, correctly managing the start of heat and avoiding physiological and/or pathological anestruses is key to maximising the number of farrowings per sow per year (FSY) and, consequently, the number of piglets weaned per sow per year (PWSY).

Of note, each NPD produces an approximate 0.01 FSY decrease in the birth rate (BR).

A common mistake when studying anestrus is the failure to consider the NPDs generated by eliminated sows. This cause of elimination must be indicated so that these days are correctly accounted for.



Dusan Petkovic/shutterstock.com

of the overall post-weaning sow population (*figure 2*). Obviously, the lower this percentage, the fewer the NPDs and lower the inter-birth interval (IBI), and consequently, the more FSYs will be obtained.

If the average WEI exceeds 7 days, we should anticipate a high number of sows will come into heat late (outside of our objective). In this case, we must review all the events that occurred during lactation and in the days before they went into heat (heat-detection, *flushing*, photoperiod, environmental conditions, and any stressful situations).

In other words, to study the possible solutions we must first investigate the data generated on the farm to differentiate a lack of real hormonal activity from pathologies and/or management failures.

A correct WEI should be an average of 5.5–6.0 days. This means that 85% of the sows will be mated between the 4th and 6th day after weaning.

WEI	Cycle N°																			
	0/1	**%**	**2**	**%**	**3**	**%**	**4**	**%**	**5**	**%**	**6**	**%**	**7**	**%**	**8**	**%**	**9**	**%**	**Total**	**%**
< 4 days			16	5	6	2	6	2	6	2	9	4	3	2	1	1			47	3
4 days			88	25	143	53	161	61	144	56	131	60	90	60	55	56	1	50	813	50
5 days			114	32	86	32	69	26	76	30	57	26	44	29	29	30	1	50	476	29
6 days			44	12	20	7	10	4	15	6	9	4	5	3	7	7			110	7
7–9 days			33	9	5	2	6	2	3	1	2	1	4	3	2	2			55	3
10–21 days			26	7	6	2	11	4	10	4	11	5	4	3	4	4			72	4
> 21 days			33	9	6	2	1	0	2	1									42	3
Average N° days			8.4		5.2		5.0		5.0		4.9		4.7		4.9		4.5		5.7	
N° first matings, % total matings			354	22	272	17	264	16	256	16	219	14	150	9	98	6	2	0	1,615	

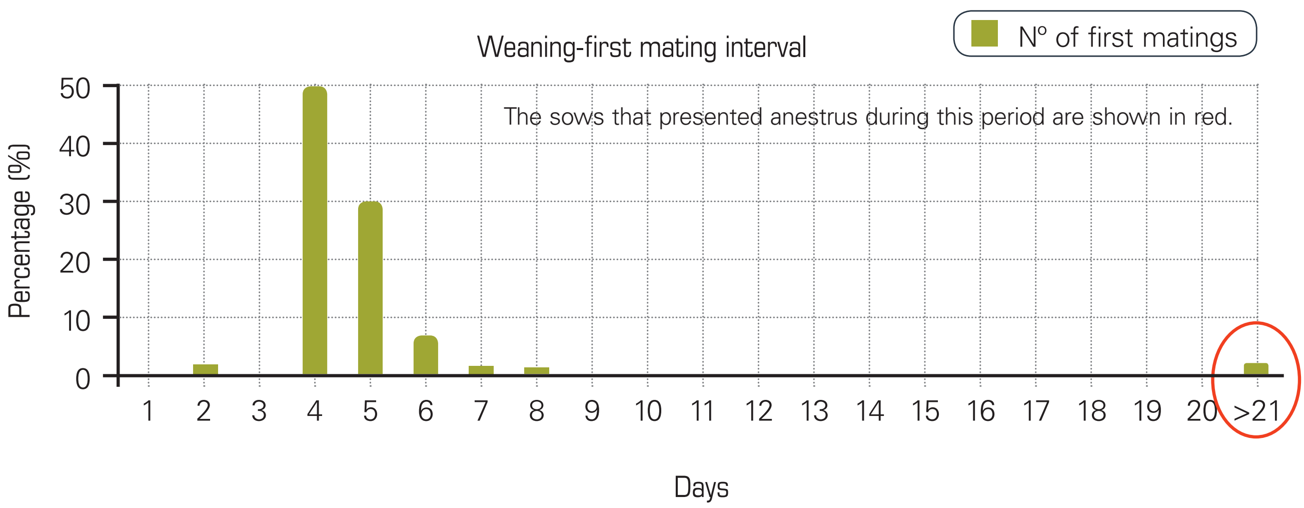


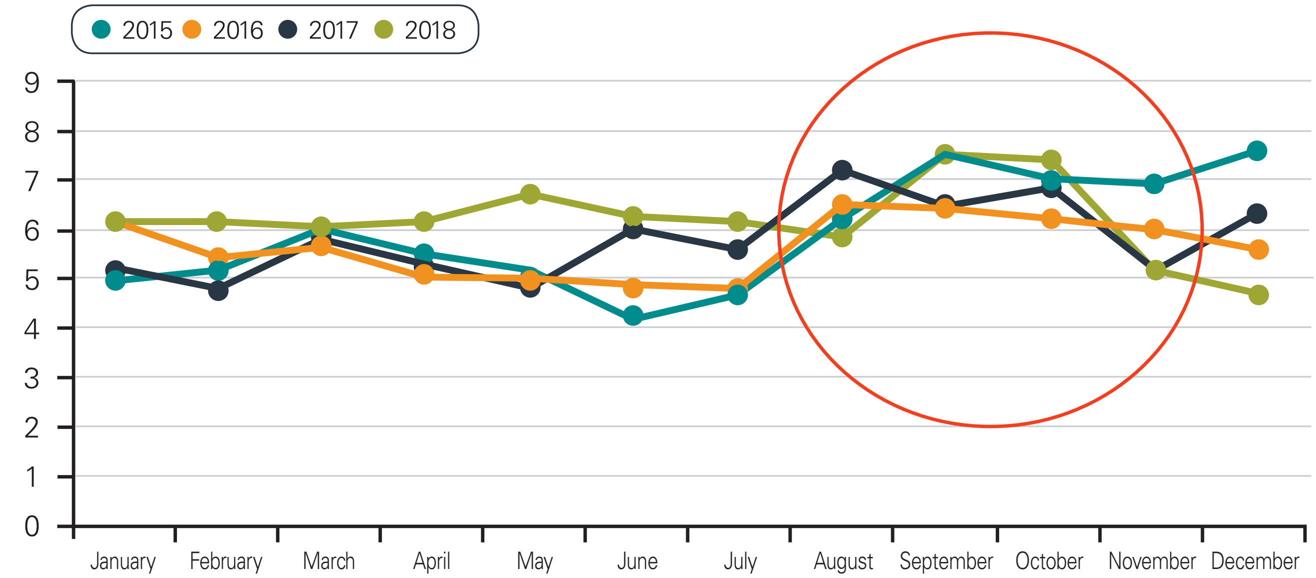
Figure 2. The WEI analysis of all the first post-weaning matings on a farm with 1,000 productive sows from April to November.

Case 1: seasonal anestrus

The incidence and severity of seasonal anestrus may be higher on some farms than others. This is usually because high temperatures and decreased daylight hours negatively affect the production of the hormones that orchestrate the reproductive cycle, thus resulting in so-called seasonal infertility syndrome (SIS). In this case, the main factors related to the facilities and considered important to minimising the seasonal impact of anestrus in sows will be studied.

Description of the problem, with data

Different graphs and tables with the average WEI data from the farm are shown below. The WEI will be discussed in every case because this data metric is collected by the management program.



In the August–October period, there was an increase in the WEI compared to the farm's annual average of 5.7–5.8.
For example: in 2017, the average WEI was 5.8, but in August, September, and October it had increased to 7.3, 6.6, and 6.9, respectively.

Figure 3. Monthly WEI for the past four years on the farm.

As previously indicated, when analysing an anestrus problem, we must also consider sows that are eliminated because they did not go into heat.

Annual WEI analysis

Figure 3 shows the monthly average WEIs for four consecutive years and, as the graph confirms, this anestrus problem repeats itself year after year in a similar way.

Analysis of all the first post-weaning matings

Figure 4 presents the distribution of the WEIs for all the matings performed on the farm in the first five months of the year. The main problem arises in the summer

Description of the farm

- Holding with 1,000 PRRSv and mycoplasma vaccinated sows, located in the municipality of Tauste, Spain.
- Weekly group management system.
- They do not work with a hyperprolific genetic line.
- Every year, starting in August, they detected sows on the farm with a delayed post-weaning return-to-oestrus.
- Their WEI data for the farm was poorer during these months.

WEI	Cycle Nº																					
	0/1	%	2	%	3	%	4	%	5	%	6	%	7	%	8	%	9	%	>9	%	Total	%
< 4 days					6	4	7	5	7	4	3	3	3	4	2	4	1	7			29	3
4 days			76	55	102	60	89	61	107	67	80	68	62	76	30	64	10	67	2	50	558	64
5 days			41	29	49	29	31	21	28	18	22	19	11	13	13	28	1	7	2	50	198	23
6 days			8	6	5	3	4	3			2	2	2	2	1	2	2	13			24	3
7–9 days			7	5			2	1	3	2	2	2	2	2							16	2
10–21 days			5	4	5	3	11	8	13	8	9	8	2	2			1	7			46	5
> 21 days			2	1	2	1	1	1	1	1					1	2					7	1
Average Nº days			5.3		5.1		5.8		5.4		5.1		4.4		4.6		5.2		4.5		5.2	
Nº of first matings, % matings			139	89	169	92	145	92	159	95	118	100	82	93	47	98	15	100	4	80	878	78
Total Nº of matings	190		157		184		158		168		118		88		48		15		5		1,131	
Nº of first matings, % total			139	16	169	19	145	17	159	18	118	13	82	9	47	5	15	2	4	0	878	

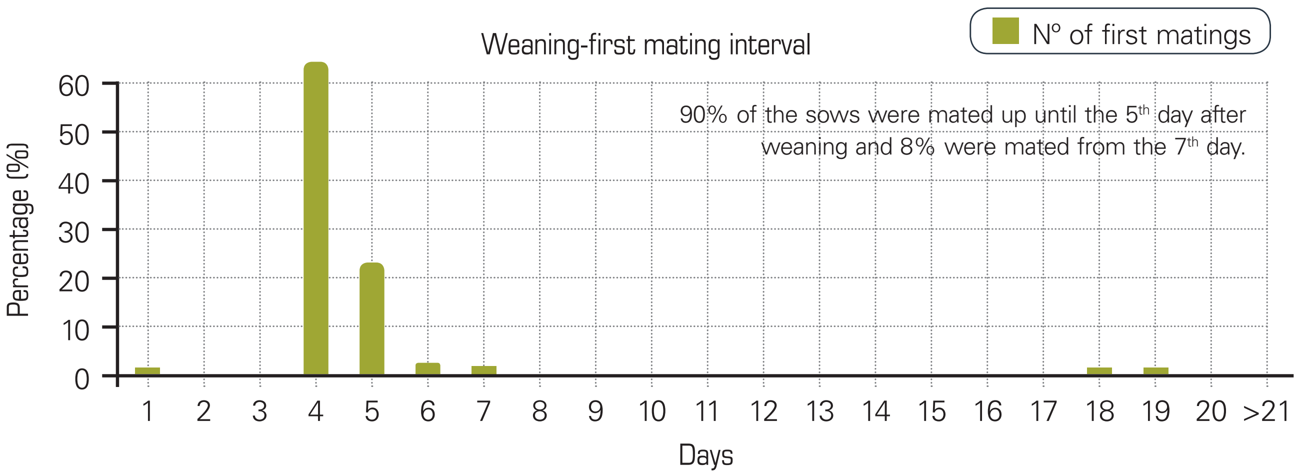


Figure 4. WEI analysis from January to May.

months (*figure 5*), during which the WEI distribution completely changes.

Analysis of the main factors that influence the problem

Figure 6 shows the distribution of the weekly WEI before and during the problem period. It is clear that there was a seasonal anestrus problem associated with two factors:

The influence of temperature and the photoperiod is much more marked in nulliparous sows than it is in multiparous sows.

Temperature

The effect of temperature on the WEI in multiparous sows is more pronounced than that of the photoperiod.

Sows suffer heat stress when temperatures exceed 24–26°C. This problem tends to appear in the July–September period.

This factor produces stress and hormonal changes and directly influences the ingestion of feed during maternity. Thus, the sows do not reach the optimum feed consumption levels and go into a catabolic state, which subsequently affects their reproductive function.

WEI	Cycle N°																					
	0/1	%	2	%	3	%	4	%	5	%	6	%	7	%	8	%	9	%	>9	%	Total	%
< 4 days			3	3	2	2	1	1	2	2	4	5	3	7			1	11			16	3
4 days			21	22	38	47	49	52	45	49	44	54	19	43	17	63	3	33	1	100	237	45
5 days			17	18	12	15	29	31	20	22	22	27	10	23	4	15	4	44			118	23
6 days			7	7	5	6	4	4	12	13	4	5	5	11	2	7	1	11			40	8
7–9 days			19	20	15	19	6	6	8	9	2	2	4	9	3	11					57	11
10–21 days			19	20	6	7	4	4	2	2	1	1	1	2	1	4					34	6
> 21 days			8	9	3	4	2	2	3	3	4	5	2	5							22	4
Average N° days			9.8		6.4		6.4		7.1		6.2		6.0		5.0		4.3		4.0		7.0	
N° of first matings, % matings			94	87	81	83	95	93	92	93	81	92	44	96	27	84	9	100	1	50	524	78
Total N° of matings	89		108		98		102		99		88		46		32		9		2		673	
N° of first matings, % total			94	18	81	15	95	18	92	18	81	15	44	8	27	5	9	2	1	0	524	

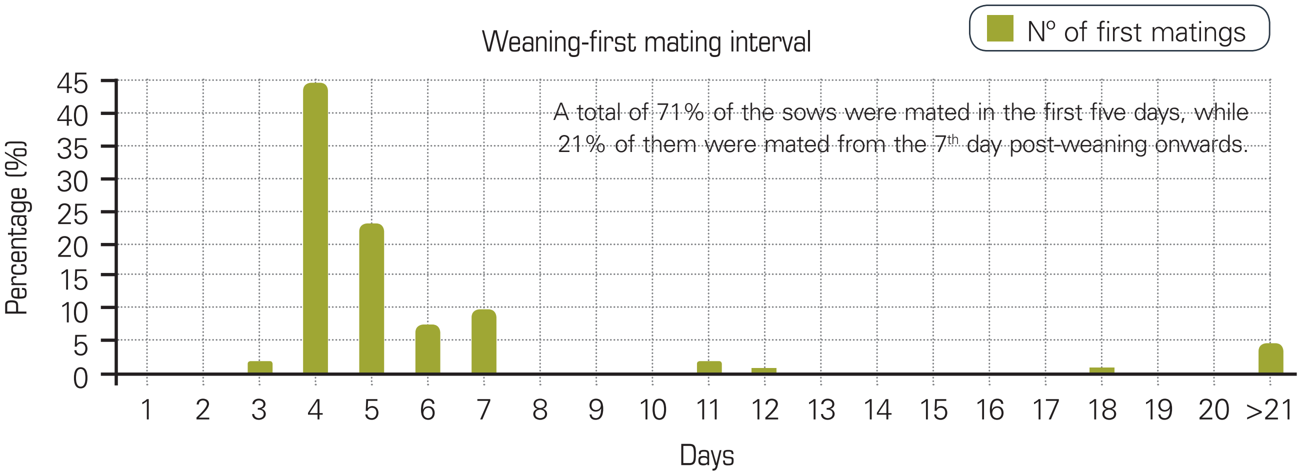
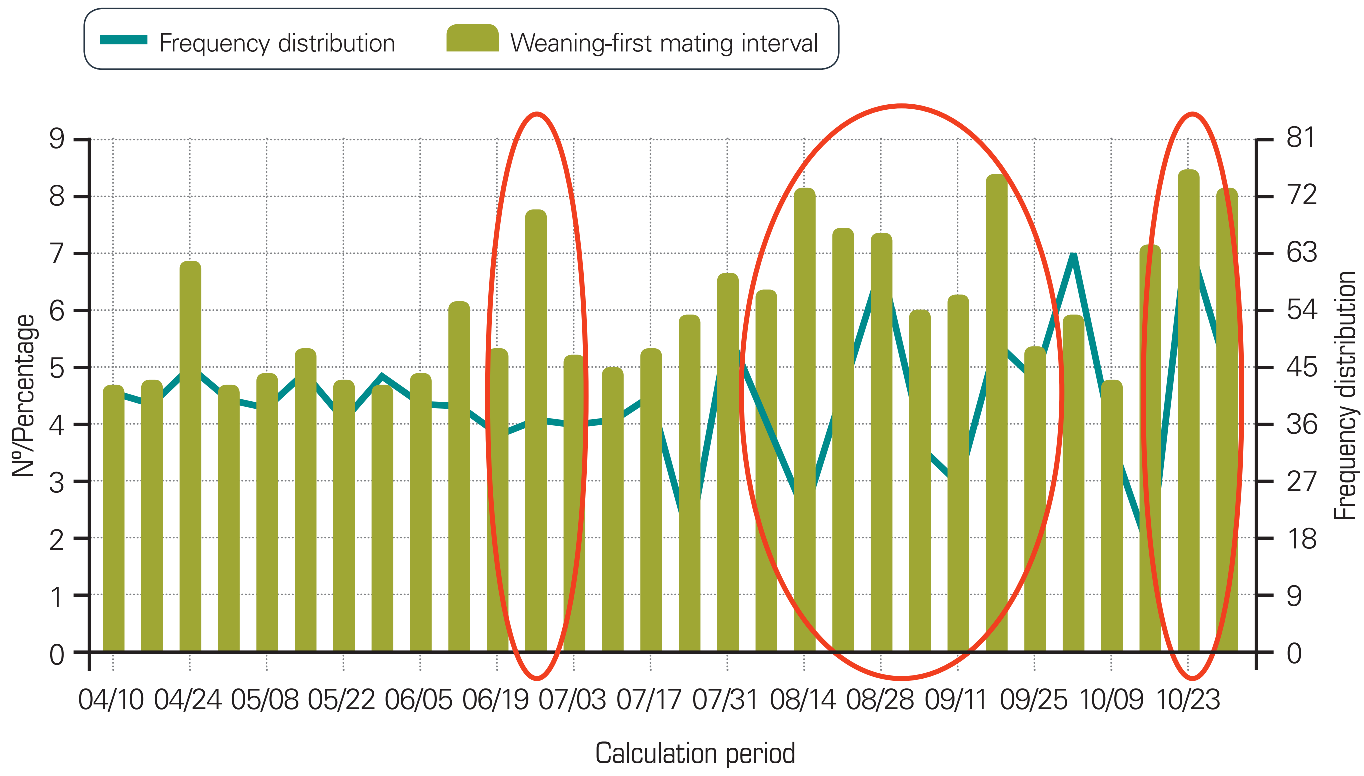


Figure 5. WEI analysis from June to October.



The first peak is usually seen in June, mainly because of the start of the increase in temperatures typical of the summer months.
The increase in WEI is generally noted in August.
There is often another peak in October, which is usually associated with the decrease in daylight hours.

Figure 6. Weekly analysis of the WEI variation from April to October.

Photoperiod

The photoperiod variation throughout the year influences ovarian activity in sows because of the production of melatonin (a hormone that inhibits the secretion of gonadotropins), which directly affects the hypothalamic–pituitary–ovarian axis.

The impact of this variation varies between farms and mainly affects the October–November period. However, 16 hours of daylight are recommended so that the WEI remains unaffected.

Evaluation/Description of the facilities

In this case, the seasonal anestrus problem was mainly associated with an issue with the facilities. Therefore, the prevention of anestrus was focused on proposing improvement measures for the farm installations.

Farm facilities

The farm consisted of:

- Two farrowing barns with a central corridor and rooms on both sides. There were windows at the top of the passageway through which air came into the facilities, but there were no cooling systems. In addition, the air came into the farrowing areas through rectangular openings without a window. An extractor fan was present inside each room. A hopper feeding system with a dish was used in farrowing rooms, but no extra water was provided.
- Two mating farm buildings with fans but without *cooling systems*. The light intensity was low compared to other recently built farms.

The temperature, and air intake and escape speeds were measured with environmental measurement devices:

- Smoke tests: showed that the intake speed was inadequate in many rooms because they lacked windows with deflectors and some of the air extractors reached insufficient revolutions per minute (rpm).
- Temperature: the farrowing rooms reached 30°C on many days of the summer which impaired the sows' ability to eat during the lactation period.

Possible solutions

Light regulation

Ideally, the photoperiod would be controlled throughout the year and especially during these months:

- Install a timer so that the sows have at least 16 hours of light/day.
- Working with an 'erotic' zone (*figure 7*).

Ventilation and cooling control

The walls and ceilings of the maternity sheds must be well insulated. In the specific case of this farm, a system to reduce the temperature of these rooms in summer was necessary and so we recommended the installation of *cooling panels* in the air vents of the central farrowing area passageway ceiling.

The ventilation/extraction equipment which was not correctly functioning also had to be repaired so that they covered the maximum ventilation needs that would be necessary in hot weather (an extraction capacity of 300–400 m^3 lactating sow/hour).

Cooling panel system

This works based on the physical principle of evaporative cooling and reduces the temperature of the air entering the central corridor (and each of the farrowing rooms) by several degrees.

These can drop the air temperature by 5–10°C.

To achieve a good air inlet speed (4–5 m/s) the installation of windows with deflectors that direct the air inlet direction was recommended.

It is important to establish regular maintenance and revision routines for the ventilation and air conditioning systems using environmental measurement devices (*figure 8*).

Newer facilities that allow increased feed intake

Any feeding system that facilitates feed ingestion during these months will improve the WEI. On this farm, the simplest solution was to use an automatic water distribution system incorporated into the feeder to favour wet feeding (*figure 9*).

It is important to avoid administering feed rations during the hottest hours, so it is advisable to give the sows the first feed ration as early as possible.

Weaned sows were provided 350 lux fluorescent lamps or tubes located less than 1 metre from their heads in the mating area.

Figure 7. Artificial lighting system over sows to reduce the impact of the reduction in the photoperiod.

Figure 8. Different systems for environmental control on farms.

This allowed water to be supplied several times a day before and after meals.
It is also possible to attach a device to the maternity dispensers that automatically distributes the feed in the farrowing rooms and allows the feed ration to be divided into more portions to promote increased consumption.

Figure 9. System with a timer for supplying extra water to farrowing pens.

mohdizuan/shutterstock.com

Case 2: second parity syndrome

The lactation phase strongly influences many other factors such as, for example, the sow body condition at weaning, WEI, prolificity rate in the following cycle, useful lifespan of the breeders, and weight and quality of the piglets at weaning.

In order to achieve a good diet in this phase, an individualised feeding program must be implemented for each individual breeder, depending on its cycle, rate of feed consumption, and litter size, thus optimising their potential.

Description of the problem, with data

This farm yields acceptable mean technical results, but there was some room for improvement in some of the indices, such as the feeding management during the lactation period, especially in gilts. In this case, the analysis will focus on these points without going into detail about the rest of the technical data (that were within the normal ranges).

Analysis of breeder performance per cycle

As shown in the *table*, several technical data points are marked with 'second parity syndrome':

- High WEI in gilts (9.5 days).
- The prolificity of these sows in their second farrowing more or less matched, or was worse than, the results from their first farrowing.

This syndrome conditions the rest of the productive life of breeders because it prevents them from expressing their maximum prolific potential and so the expected number of piglets born per farrowing will not be reached.

Figure 10 shows the breakdown and analysis of the WEI in different cycles.

Description of the farm

- Farm with 800 breeders.
- Built in 2002.
- Located in the Ebro valley, with a marked continental climate: high temperatures in summer and low temperatures in winter.
- Negative for PRRSv, *mycoplasma hyopneumoniae*, and porcine epidemic diarrhoea virus.
- Production system in weekly groups.
- Genetic line with medium prolific potential.
- The sows were fed with feed dispensers in all the areas of the farm.

Analysis of the main factors involved

Second parity syndrome has two clearly differentiated components:

- A deficit in the gilt feeding management during its lactation period because it must satisfy both its own maintenance and growth needs as well as ingesting sufficient feed for good milk production. Thus, it is important for these animals to reach high feed intakes as soon as possible.
- The evolution towards leaner breeders and with fewer body fat reserves compromises their productivity when their feeding is restricted.

Moreover, as shown in the PWSY in *figure 11*, if teat development is also stimulated by the presence of a high number of piglets, the consumption needs of the sow will be even greater.

Achieving high levels of feed consumption during lactation requires precision work by qualified personnel who work well in this area: they must progressively and rapidly increase feed rations, and know how to assess the state of the feeder after the sows have fed. Therefore, it is important to create a personalised feeding curve for each sow.

WEI	Cycle N°																			
	0/1	%	2	%	3	%	4	%	5	%	6	%	7	%	8	%	9	%	Total	%
< 4 days			1	0	2	1	3	2	5	2	6	3	3	2					20	1
4 days			118	32	147	54	128	65	142	63	130	61	96	66	19	66			780	54
5 days			121	33	81	30	47	24	67	30	57	27	32	22	8	28	1	100	414	29
6 days			35	10	12	4	5	3	4	2	2	1	3	2	1	3			62	4
7–9 days			17	5	11	4	3	2	1	0	3	1	2	1	1	3			38	3
10–21 days			32	9	9	3	5	3	7	3	12	6	7	5					72	5
> 21 days			42	11	8	3	5	3	1	0	2	1	2	1					60	4
Average N° days			9.1		5.9		5.3		4.7		5.1		5.1		4.4		5.0		6.2	
N° first matings, % total matings			366	89	270	93	196	93	227	90	212	94	145	97	29	97	1	100	1,446	71
Total N° of matings	481		409		291		210		251		226		150		30		1		2,049	
N° of first matings, % total			366	25	270	19	196	14	227	16	212	15	145	10	29	2	1	0	1,446	

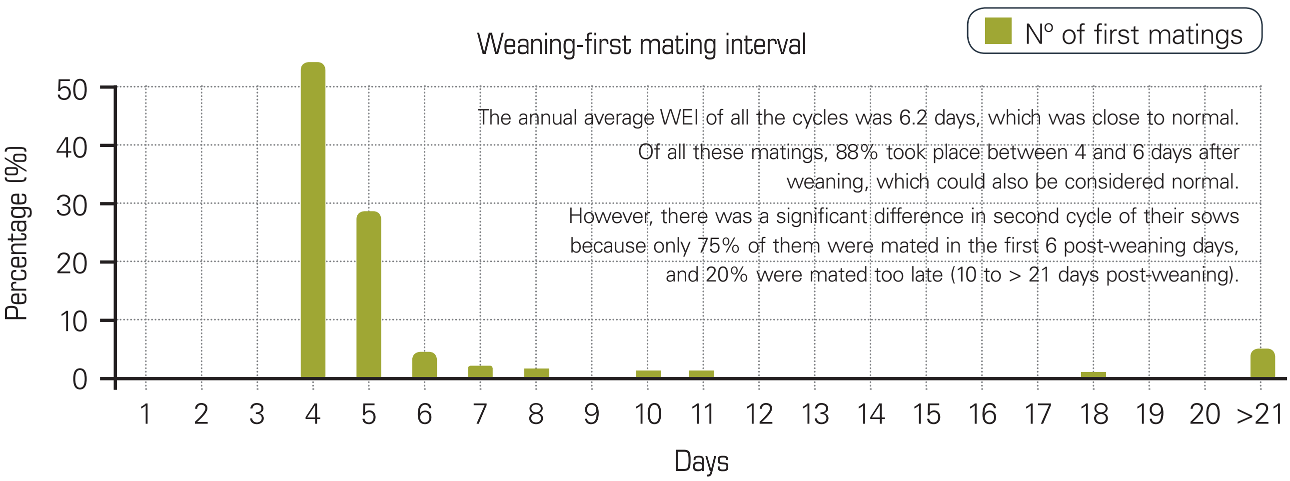


Figure 10. WEI analysis by cycle and repetitions.

Production results by cycle, 2018

Cycle Nº	WEI	Nº cycles	% births from the 1st mating	Total farrowed	Live born piglets	Stillbirths	Index cycle	PWSY
1		380	85	12.67	11.83	0.84	2.43	29.83
2	9.5	287	89	12.75	11.92	0.83	2.33	27.58
3	6.0	209	88	13.20	12.28	0.92	2.33	27.46
4	5.2	233	93	13.86	12.85	1.01	2.42	26.92
5	5.2	226	92	14.23	13.21	1.02	2.41	27.28
6	5.1	181	95	13.67	12.58	1.09	2.43	26.56
7	5.1	116	95	13.24	12.20	1.04	2.42	27.53
8	4.7	28	93	12.21	11.39	0.82	2.40	26.11
9	5.0							
10>								
3.5	6.2	1,660	90	13.27	12.33	0.94	2.39	27.80

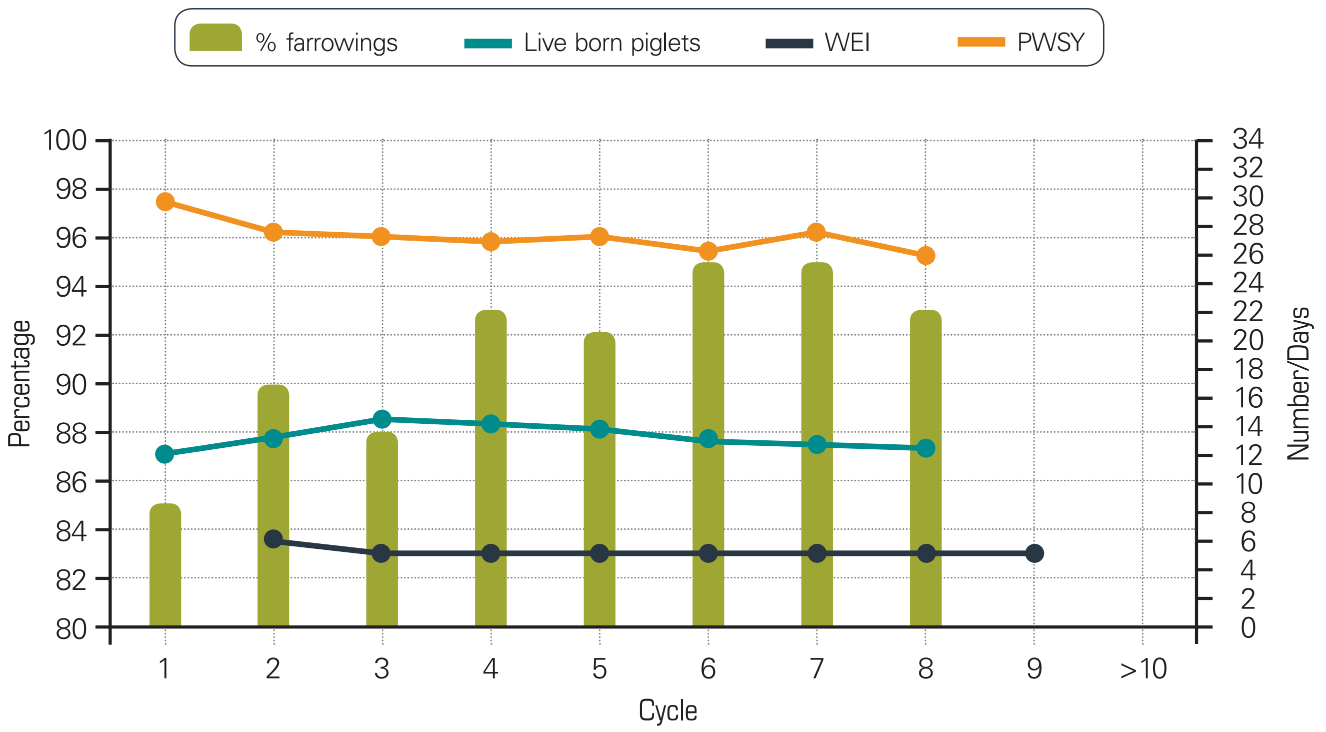


Figure 11. Cycle production results.

What factors cause a late return-to-oestrus?

Poor feeding management may explain the fact that some sows go into heat very late after weaning (> 10 days) because they will have gone into heat during lactation as a consequence of:

- Inadequate feed ration allocations.
- Having been left with only a few piglets.
- Their use as a foster sow without adjusting their feed rations to suit their new needs.

The consequences of a deficit in feeding during lactation are: a WEI increase and a decrease in the prolific potential of the sow's next cycle.

Lactations that are too short. Farrowing is a complex process which has many implications and produces many changes in breeding sows. They therefore require time to be ready again to carry a new pregnancy. This is the reason why lactations of less than 21 days are not recommended, while lactations in excess of 28 days are more likely to guarantee a satisfactory subsequent cycle.

How can the problem be solved?

Achieve good feed consumption at the beginning of lactation in sows farrowing for the first-time

To do this, several factors must be considered:

- Create an individualised feeding schedule for each sow (according to her cycle number, number of piglets, consumption capacity, etc.): standardise and work with protocols so that each worker knows the maximum consumption target of each sow.
- Invest in automated feed and water delivery systems to achieve precision and good feed and water intakes during lactation. Automated systems that can be adapted to traditional dispensers are now available that facilitate the fast and precise distribution of feed into a minimum of 3–4 portions.
- Stimulate consumption with wet feed and provide water within 15 minutes of finishing the feed distribution. Maintain an environmental temperature that is comfortable for sows (about 20°C). Get the sows up to stimulate them to eat and drink. Clean the feeders so that there are no feed remnants that could cause sows to reject new rations.
- Supplement the feed with dextrose (150–200 g/day) during the last week of lactation if reaching the consumption goal had been difficult.
- Do not overfeed the sows during pregnancy as this has a negative impact on their consumption of feed during lactation.
- Make feed adjustments when piglets are moved between litters for litters of small piglets, foster sows, etc.

Avoid lactations of less than 21 days

These lactations compromise the breeder's next cycle because of poor uterine involution.

Avoid leaving sows with only a few piglets (< 8)

- So, they do not go into heat in during lactation.
- Control their return to heat during long lactations (> 28 days).

Unload first-time farrowing sows

If they have more than 13 piglets, remove 1 or maximum of 2 piglets during the last week of lactation so that the sow's body condition at the time of weaning will be better.

Administer GnRH derivatives when weaning first-time sows

Administer gonadotropin-releasing hormone (GnRH) derivatives when weaning first-time sows to encourage them to return to heat 4–5 days after weaning.

Work towards weaning with groups of two boars

Perform heat induction in the morning and afternoon from the first day to achieve early stimulation.

Eric Isselee/shutterstock.com