Pig Development Department

Teagasc Pig Farmers' Conference, 2025

Conference Proceedings

October 7th, Horse and Jockey Hotel, Co. Tipperary
October 8th, Farnham Estate, Co. Cavan

Teagasc
Agriculture and Food Development Authority

PIG FARMERS' CONFERENCE 2025
OCTOBER 7TH & 8TH

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Future lactation housing options and good practices

Vivi Aarestrup Moustsen, SEGES Innovation

Modern pig production is facing increasing demands from society and a global need for sustainably produced food. In this context, barn design is crucial, especially for the highly productive, lactating sows – which we can perceive as and should provide conditions similar to those of other "top athletes". This requires a joint effort throughout the herd – from healthy legs and hooves to optimal body condition and high feed intake, which supports both farrowing and milk production.

The sow of the future is high-yielding and loose during lactation. Therefore, the farrowing pen must be larger than todays crate – but how much larger?

Start with the sow: Space and behaviour

When we design the farrowing pen of the future, it is essential to start with the sow. A sow must have the opportunity to perform natural behaviours such as standing, lying, eating, drinking, dunging, nursing and nestbuilding. This includes, in particular, the ability to turn unhindered. In traditional farrowing crates, the sows cannot turn.

How wide should the pen be for the sow to turn unhindered?

Both practice and research show that sows can turn unhindered at distances shorter than their own body length. But how wide does the pen have to be for the sow's movement not to be limited by the distance between the pen sides?

The required distance can be found by looking at how the sows' back 'curve' when they turn around and how close the sows are to the sides of the pen when the sow turns around.

To assess the distance needed for a sow to turn around unhindered, SEGES Innovation conducted a trial in which late gestating sows were observed turning around in a pen where the pen width was adjusted in random order in 0.2m steps from less than a sow body length (1.2m) to more than a sow body-length (2.2.m). In pens that were 1.2m wide, the sows had to curve significantly more than in pens that were 2.2m wide. The curvature measured in pens 1.4-2.0m wide was no different from the curvature measured in pens with 2.2m width. On the other hand, it was only from 1.6 m and upwards that the distance from the sow's body to the pen sides was greater than at 1.2 m (Moustsen *et al.*, 2025).

The above results lead to the recommendation that where the sow turns around, there must be at least 160 cm in width for the sow to turn around unhindered.

The piglets' needs

In connection with the design of the farrowing pens, the dimensions and behaviour of the piglets must also be taken into account. Piglets need safety zones and space to suckle, rest and play. Data show that the length of the piglets increases from approx. 31 cm at 1-3 days of age to 44 cm at 18-26 days of age. Pigs that are 1-3 days old and that are lying in a partial recumbent position take up 0.03 m2/pig, while pigs that are 18-26 days old take up 0.1 m2/pig when they are lying in a partial recumbent position. The recommendation is that there should be room for all the sow's piglets in the farrowing pen and an area of solid floor of 1.2 m^2 for the piglets.

Pen size

To meet the needs of both the sow and the piglets, it is recommended that the farrowing pen is at least 6.5 m2. If the pen is equalsided, the sides of the pen should therefore be at least 2.55 m. If the pens are rectangular, the recommended dimensions are at least 2.20 m*3.00 m. The pen width of 2.20 m will ensure that the sows can dung on the slatted floor.

Temporary use of confinement

There is an inherent conflict between the consideration of the welfare of the sow and the piglets' survival, especially in the critical first days after farrowing. *Temporary use of confinement is a compromise* where sows can be loose during nesting where they are very active, and then restricted during farrowing and the first 2-4 critical days after farrowing. During these periods, sows are predominantly lying and post farrowing nursing their piglets. The use of confinement reduces the risk of piglets being crushed when they are near the sow's udder. When the critical period is over, the piglets use the creep area to a greater extent, and the sows can again be loose. Therefore, it is recommended to house the sow in a pen with an option to confine for the first 2-4 days after farrowing. This recommendation though has an impact on the floor profile in the farrowing pen, as the sow will be dunging in one position while confined but when loose the sow will turn away from feeding area and dung in a different part of the pen.

Floor profiles and environmental impact

The shape and floor profile of the farrowing pen are important for the environment. Equalsided pens (e.g. 2.6x2.6 m) are often fitted with a fully slatted floor, as it is difficult to place a solid floor in the pen so that it remains dry and clean. In rectangular pens (e.g. 2.2x3.0 m), a partially solid floor is possible, which reduces emissions compared to pens with a fully slatted floor. In the rectangular pen, it is possible to reduce the width of the slurry channels leading to reduced ammonia emissions and to reduced methane emissions if a scraper system is used to frequently empty the channel.

Good practice (GP)

In the EU-funded project WelFarmers, pig producers from the participating eight regions suggested 27 good practices regarding loose housing of lactating sows. Amongst the good practices selected to be the top five GPs was the use of temporary confinement in a pen designed for a loose sow and placing the creep area adjacent to the passageway. These are examples of a GP being a principle (or practice) that have become integrated parts of the pen design making the daily work easier.

Another GP amongst the top 5 GP came from an Irish herd, where comingling is practiced. The use of co-mingling allows the piglets to adapt to other piglets and form group hierarchies while still with their mothers. This is thought to reduce the piglets' level of stress when they are weaned at 28 days. The access to many dams is also believed to reduce the level of teat biting as piglets have greater teat availability. The experience is that the co-mingling works best when piglets are allowed to mix at day 15-20.

Future-proofing - understanding interactions and connections

The investment in future housing of lactating sows is an investment in both animal welfare, productivity and environmental sustainability. There are decision support tools such as 'Cardboard pigs' and associated checklist (Papgrises and checklist helps you to better barn design - SEGES TV) that can help assess whether the design criteria meet the needs of sows, piglets and employees. It is about understanding interactions and connections as well as compromises in order to produce animal foods in a sustainable way. The cardboard pigs were also selected to be amongst the top 5 GP in the first round of GP in WelFarmers.

Recommendations

In order to meet the future requirements for farrowing pens for loose sows, the design criteria should ensure:

- At least 6.5 m^2 of space for the pen.
- At least 160 cm distance to turn.
- Possibility to use the crate for up to 1+4 days.
- 1.2 m^2 solid floor for all piglets to rest on.

Baxter *et al.*, 2025

Figure 1. *Farrowing pens for loose sows with the possibility of using confinement - and where the sow's feed trough, straw reck and piglet creep are located, so that the staff can easily access*

Figure 2. *If the sow is confined in the first days after farrowing, it is important to ensure that the piglets have good access to the sow's udder*

Selected references:

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Moustsen VA, Baxter EM, Boldsen SK, Nielsen MBF and Edwards SA (2025) Sows turned unhindered at less than their own body length - implications for farrowing pen design. Front. Anim. Sci. 6:1588436. doi: 10.3389/fanim.2025.1588436

Feeding the lactating sow: meeting energy requirements in 2025

Peadar Lawlor, Teagasc

Introduction

Born alive on Irish pig farms has increased by ~4.4 pigs/litter in the last 25 years and by 2.6 pigs/litter in the past 10 years, alone. This will increase further in the years to come, with Denmark reporting an average born alive of 18.5 piglets in 2024. Therefore, it's not surprising that optimising nutrition during lactation has become even more essential than ever. The physical intake of our sows must be high and there may also be a case for increasing the energy and nutrient density in lactation diets to help rear these large litters to respectable weaning weights, while at the same time avoiding excessive weight loss in sows during lactation, with all of its negative implications.

What are the energy requirements of a sow during lactation?

The energy and nutrient requirements of lactating sows are calculated from the body weight of the sow (Maintenance component), milk yield (Production) and loss in body weight (mobilisation of body tissue) during lactation.

- **Maintenance** requirement is quite modest. For a sow with an empty body weight of 220 kg, this is 28.1 MJ digestible energy (DE) per day. For a gilt with an empty body weight of 180 kg, this is 24.2 MJ DE per day.
- **Milk production** is the big determinant of the energy and nutrient requirements of lactating sows. Milk production is estimated indirectly from the weight gain of the litter during lactation. This in turn is influenced by the number of pigs weaned by the sow and their average weaning weight. Lactation length will also influence the energy and nutrient requirement of a sow on a daily basis during lactation.

  As a rule of thumb, every 0.5 kg increase in the average pig weight at weaning increases the sow's energy requirement for milk production by ~ 7 to 8 MJ DE/day (increases with higher litter size per sow). Likewise, every extra pig weaned per litter increases the energy requirement for milk production by ~6 to 8 MJ DE/day (increases with higher average piglet weaning weight).
- **Loss in body weight:** Each 1 kg of body weight loss during lactation contributes 12.5 MJ DE to the energy requirements of the sow over an entire lactation. Therefore, for every 10 kg weight loss in a sow during lactation there is a reduction in the sow feed energy requirement of ~4.5 MJ DE/day where lactation length is 28 days and ~3.9 MJ DE/day when lactation length is 32 days. Although an important source of energy for the sow during lactation, it is important that weight loss during lactation should not be greater than 5 % (~10 kg) for first parity sows and 10 % (~22 kg) for older parities if early returns to oestrus, high farrowing rate and a high subsequent litter size are to be achieved.
- **Total lactation Energy Requirement** = Maintenance energy + Milk production energy – Energy from loss in body weight.

Table 1 shows the total average daily energy requirement (MJ DE/day) of sows for a 28-day lactation and how it changes with increasing average piglet weaning weight and increasing number of pigs weaned per litter.

Table 1. *Daily Energy Requirement (MJ DE/day) of sows during a 28-day lactation depending on number of pigs weaned per sow and average piglet weaning weight**

		Average piglet weaning weight (Kg)			
		7.0	7.5	8.0	8.5
Average No of pigs weaned per litter	**13.0**	107.1	114.2	121.3	128.3
	13.5	110.2	117.5	124.8	132.2
	14.0	113.2	120.8	**128.4**	136.0
	14.5	116.3	124.1	132.0	139.9

** Every 10 kg weight loss in sow weight during lactation reduces the sow's feed energy requirement by ~4.5 MJ DE/day. But sow weight loss during lactation should not exceed 10 % for sows and 5 % for gilts.*

By way of example using Table 1 above, a sow weaning 14 piglets at an average weight of 8.0 kg has a daily energy requirement during a 28-day lactation of 128.4 MJ DE/day. However, allowing this sow to lose 10 % (22 kg) from its empty weight during lactation will contribute 9.9 MJ DE/day to the sow's energy demand. Therefore, the average daily energy provided from feed must be 118.5 MJ DE/day (128.4 – 9.9). If feeding a standard diet containing 14.2 MJ DE/kg, then this sow would need to have an average daily feed intake of >8.3 kg. However, if feeding a higher energy diet of 15 MJ DE/kg, then an average daily feed intake of 7.9 kg will achieve the same energy intake from feed. Failure to achieve these feed intakes means that sows will lose excessive weight during lactation and/or milk yield will be depressed. The follow on from this is reduced reproductive performance in sows for the next parity and/or reduced piglet weaning weight.

In Moorepark we have been feeding a lactation diet containing ~15 MJ DE/kg for the past ~8 years now. Our lactation feeding curve provides a potential average daily feed intake of 8.8 kg (132 MJ DE) /day during a 28-day lactation. The average weaning weight of pigs on the unit is currently 8.6 kg. What's more, our average piglet birth weight is >1.4 kg which we believe is also a result of the high energy intakes achieved during the previous lactation. Had we still been feeding a 14.2 MJ DE/kg lactation diet, with our current number weaned per litter of 13.5, then an average daily lactation feed intake of 9.3 kg would have been necessary (to prevent no lactation weight loss in sows), whereas because we feed a 15.0 MJ DE/kg lactation diet, less physical intake (8.8 kg/day) is necessary to achieve the same energy intake. It is also important to note that weight loss (off an empty farrowing weight) in sows during lactation is minimal currently in Moorepark, meaning that sows are weaned in exceptionally good condition.

Decision on diet to use

- Maximising lactation feed intake should always be the first course of action.
- If you can achieve an average lactation feed intake of 8 kg per day then feeding a 14.2 MJ DE diet is sufficient to achieve an average piglet weaning weight of 8 kg with a weaning age of 32 days. However, if the number weaned per litter exceeds 13.5 and weaning is at 28 days then it will be necessary to either increase feed intake (above 8 kg/day) or feed a more energy dense diet (e.g. 15 MJ DE/kg) to prevent excessive sow weight loss or reduced average weaning weight in piglets.
- Feeding a 15 MJ DE/kg lactation diet means that you can achieve a target energy intake with ~0.5 kg/day less physical intake of feed. This certainly helps in achieving high target daily energy intakes during lactation; however, achieving higher physical feed intakes during lactation is the cheaper option and should always be the primary goal.

The following are pointers on how to encourage increased feed intake in lactating sows:

- Don't overfeed during gestation
- Maintain farrowing room temperature at 18-20 0C
- Intakes will be higher with wet compared to dry feed
- Use lactation feed curve to match/exceed desired intake of sows
- Don't let curve or trough capacity restrict intake
- Use a water:meal ratio of 3:1

- First 2 weeks of lactation is critical and it is important to have high intake during this period
- Feed 3 times per day; with larger splits in morning and evening particularly in Summer months
- *Ad-libitum* wet dry feeding is a good alternative
- Pellets better than meal with dry feeding
- Keep feed fresh
- Provide supplementary water
- Remember the curve is your target but valves can be plussed and minused. Therefore, you must monitor the actual intake of each sow by zeroing valves at the start of lactation and recording feed intake at weaning.

Summary

Litter size in sows has increased greatly in recent years and this increase will continue for some years to come. As born alive increases, additional pigs will be weaned per litter and we should aim to wean these pigs at 8 kg or more. These demands mean that the energy requirement of sows is increased. To meet this high requirement for energy, the emphasis should first be to maximise physical feed intake in sows. If productivity (number weaned per litter and average weaning weight of pigs) is so high that the sow's energy demand cannot be met with a 14.2 MJ DE diet, then feeding an increased energy density diet (e.g. 15 MJ DE/kg) should be considered to prevent excessive weight loss in sows.

Good biosecurity leads to improved performance

Louise Clarke & Gerard McCutcheon, Teagasc

Effective biosecurity on pig farms is critical. It is the frontline defence against the introduction of pathogens/disease into the farm and then reduces/limits the spread of diseases where they have entered the herd. Implementing good biosecurity and farm practices can greatly reduce problems with diseases and improve overall herd health, productivity and profitability. It demands that every staff member understands the benefits of good healthcare management procedures and follow sensible protocols to maintain or improve the biosecurity standards on the farm.

In today's environment, no pig farm can afford to overlook the critical role that strong biosecurity plays in minimizing disease outbreaks. Taking effective precautions is essential, especially when specific diseases are known to exist in the farm's surrounding area. This paper is concerned with looking at some aspects of biosecurity that may need to be reviewed on farms. Comprehensive assessments, such as those done in conjunction with your Private Veterinary Practitioner and tools like the Biocheck.UGent risk assessment, are essential to identify vulnerabilities and implement targeted improvements.

Pig herd performance:

Can we link poorer herd performance with health issues on farms? And can this be somewhat linked to inadequate biosecurity management? Research from Teagasc (PathSurv project) showed that mycoplasma hyopneumonia reduced average daily gain by 86 g in finishers, while PRRS was shown to reduce ADG by 31g. Although this study did not evaluate FCE, which likely represents an even greater cost, these findings highlight the significant economic impact to the farm where these problems existed. Effective disease management and strong biosecurity protocols are essential to minimizing these losses and boosting farm profitability where these diseases are present.

The Interpig figures for 2024 year (see Table 1 below) show similar sale weights of pigs at slaughter for Ireland and Denmark (119.7 kg LW in Ireland compared to 118.7 kg LW in Denmark). Interestingly the Danes get their pigs to the factory after 134 days in the weaner and finisher sections compared to 144 days in Ireland. Is this extra 10 days the cost of poorer health management and could it be reduced in Ireland by better biosecurity measures?

Table 1. *Growth performance from weaning to sale in Denmark and Ireland*

	Denmark	Ireland
Weight at weaning (kg)	6.2	7.1
Weight at sale (kg)	118.7	119.7
FCE weaning to sale	2.30	2.37
ADG (g/day) weaning to sale	839	780
Kg of feed (weaning to sale)	258	267

Biosecurity can be broken into two main components: external and internal biosecurity.

External Biosecurity: is where measures are taken to reduce the risk of pathogens or disease being introduced on to a farm.

- **Site:** The farm site must be fully secured, with clear, prominent signage at the entrance warning that access is strictly conditional on adherence to rigorous biosecurity protocols. A robust perimeter fence is essential to safeguard the herd from stray animals and unauthorized human entry. Wherever possible, all feed deliveries, removal of deadstock, and slurry collection should be conducted outside the perimeter fence. Additionally, loading pigs for sale should occur at, or as near as possible to the perimeter fence to minimize any risk of disease introduction from transport vehicles or drivers. These measures are critical in dramatically reducing the threat of new diseases entering the farm through these sources.
- **Visitors:** Visitors to pig farms—whether veterinarians, contractors, sales agents, or casual guests—pose a significant biosecurity risk as potential carriers of pathogens that can introduce or spread disease within the herd. Even seemingly low-risk visits can lead to contamination via footwear, clothing, equipment, or vehicles. To mitigate this risk, strict protocols must be enforced for all visitors.

This includes mandatory prior notification of visits, requiring visitors to disinfect boots and hands before entering pig areas, and providing farm-specific protective clothing. Access should be limited to essential personnel only, with clearly defined routes that avoid contact with animals whenever possible. Vehicles entering the farm must be cleaned and disinfected, especially tyres and wheel arches. Visitors should also be educated on the importance of these biosecurity measures to ensure compliance. By controlling and monitoring all external contacts rigorously, farms can significantly reduce the risk of disease introduction and protect the health and productivity of their herds.

- **Incoming stock**: Bringing new animals into the herd is a risk in terms of introducing new pathogens to the herd. Where farms bring in breeding stock onto a farm the most recent veterinary reports from the supplying herds should be reviewed. These reports should be checked on an updated basis to ensure that pigs that are quarantined are not a new source of infection to the main herd.
- Ideally the quarantine facility would be at least 2 km from any other pigs. The facility should allow 8 weeks accommodation for incoming breeding animals. The facility should be operated on an all-in/all-out basis. It is best to have separate staff operate the quarantine facility. If staff are operating the quarantine facility they may manage it on their way home from work, and shower before returning to the main unit the following day. It is important to use separate clothing and footwear on the quarantine facility.

Internal Biosecurity: is where measures aim to reduce the spread of pathogens once they are already present in the farm

- **Buildings:** Pig housing must be managed with a clear focus on minimizing the risk of disease transmission. Effective building design should support strict **all-in/all-out** pig flow within each production stage, allowing for complete depopulation and thorough cleaning between groups.
- Hygiene protocols must be rigorously applied. All rooms and pens must be pressure-washed using a high-quality detergent to remove organic matter, followed by **thorough drying, disinfection, and a final drying phase** when wet disinfectants are used. These steps are critical to break the cycle of infection between batches.
- Walkways and passages between buildings must be kept clean to prevent pathogens being carried on boots or equipment. Where possible, staff should follow a clean-to-dirty routine, beginning their day in units housing the youngest pigs and moving progressively toward older stock. This disciplined movement strategy significantly reduces the risk of disease spread across age groups.
- **Staff:** Owners and managers must lead by example by strictly following all farm biosecurity protocols and setting a clear standard for the rest of the team. Staff behaviour plays a critical role in either strengthening or undermining on-farm biosecurity. Below are some of the more pertinent areas to focus upon:
    - Staff must have no contact with pigs or pig slurry outside their employment, including pet pigs or pigs kept on other farms.
    - All employees should be provided with dedicated work clothing and boots, kept and maintained on-site. Clean, warm shower facilities must be available, with soap, shampoo, and clean towels provided to ensure that workers do not introduce pathogens onto the farm.
    - Maintain clean warm canteen facilities on the farm. Employees should wash their hands before entering the canteen and boots should be left outside the canteen area. Foodstuffs should not be permitted outside the canteen, and all waste food should be disposed of safely ensuring that no pigs ever have access to it.
    - Facilities for hand washing should be positioned at key locations around the farm. The use of disposable gloves should be encouraged especially in high-risk areas.
    - Depending on the size and layout of the farm, consider assigning dedicated staff to specific production areas (e.g., farrowing, weaning, finishing) to minimize cross-contamination between

age groups and improve biosecurity discipline within each unit. This may not be always possible but perhaps the idea of having separate boots and clothes for each section is worth consideration.

- **Fallen stock:** Dead pigs bins should be stored close to the perimeter of the site and should only be brought to the skips by on-farm personnel. Outside personnel should remove the skips – with a clear divide to ensure that the off- site personnel do and cannot carry pathogens onto the farm. Some farms have put greater thought into this area to reduce the risk of disease spread and improve the biosecurity on their farms.

Conclusion:

This paper does not provide an exhaustive list of biosecurity measures for your farm. It is essential that you thoroughly evaluate your current practices, consult closely with your Private Veterinary Practitioner (PVP), and identify areas where critical improvements can be implemented. Even simple, targeted changes can significantly reduce pathogen transmission and drive substantial long-term gains in herd health and performance.

Flooring - weaners & finishers

Vivi Aarestrup Moustsen, Lisbeth Ulrich Hansen & Torben Jensen, SEGES Innovation

The way growers and finishers are produced is an important element in future pig production, where successful future pig production requires high pig welfare, low environmental and climate impact, good farm economy and societal acceptance. It does not require 'more' legislation. It requires good stockmanship, knowledge transfer and sharing good practices. Sharing good practices is the core of the WelFarmers-project. Knowledge transfer is important in pen design and choice of flooring.

Flooring and pen design are interdependent. Therefore, the optimal flooring will depend on the pen design – and specific pen designs will set 'limitations' for choice of flooring.

To complicate it a bit more, the optimal flooring will also depend on eg. age group, group size, placement of feeder, water and other resources, ventilation and flooring-material.

The minimum pen and flooring spatial dimensions should be determined by the number of pigs in the pen, their body dimensions and how they move dynamically in order to carry out functional (particularly highly motivated) behaviours.

Flooring – comfort and hygiene

Pigs are clean animals which rest in one area, forage in another and dung away from feeding and resting area. The flooring should mirror the pigs use of the pen. To do so, three main categories or types of flooring are used:

- Solid flooring with no openings
- Drained flooring with up to 10% opening[1]
- Slatted flooring with 10-40% opening

Solid floor is considered more comfortable for pigs to lie on – if not soiled and if the temperature as the pigs experience it - is comfortable. In addition, use of solid ¨ flooring also enables the provision of bedding material, which facilitates exploratory and foraging behaviour and can further improve comfort. Thirdly, if the flooring consists of a solid part, it is possible to decrease the slurry channels and thereby decrease the slurry surface leading to lower ammonia emissions – if the solid floor is not soiled.

Slatted flooring can ensure high level of hygiene which is important both for pigs' health, work conditions and emissions – and pen functioning. However, the hygiene depends on the material, beam- and slat-dimensions, age group of pigs and enrichment material.

And 'in between' solid and slatted flooring is drained flooring, which 'drains' moist and to some extent manure but do not decrease slurry surface as a slurry tank (rather than slurry channel) is needed underneath. Drained flooring has recently been acknowledged in the EU-funded-project WelFarmers as one of top five Good Practices regarding improving pig welfare when it comes to space allowance and flooring for weaners and finishers. Drained flooring is useful in all pig producing countries but especially for those with high average temperatures, as it is easier for the pigs to thermoregulate, when there is no solid floor in the pen. Furthermore, drained flooring ensures a comfortable resting area for the pig compared to slatted floor.

Each type of flooring has benefits and constraints, and the best floor in a pen for weaners – and potentially in a pen for finishers – can be of a combination of all three types.

[1] *In Denmark, drained flooring is defined as flooring with a maximum of 10% opening and is equated with solid floor. According to Danish legislation, in pens for weaners and finishers at least 1/3 of the at any time required space allowance must be solid or drained flooring or a combination of solid and drained. Pigs from weaning and until 10 weeks of age must be kept in pens where at least ½ of the at any time required space allowance is solid or drained or a combination of solid and drained.*

Climate control and pen design influence space allowance for resting

Space needed when lying depends on the temperature in the building or pen as well as the size of the pigs – or weight of pigs (Figure 1). If the climate in the building is controlled (mechanically ventilated), the pigs will be resting comfortably in a partly recumbent position.

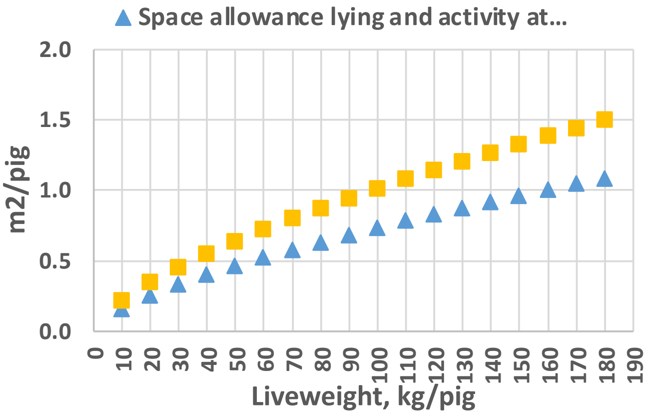

Figure 1. *Illustration of interrelationship between pig liveweight, thermal conditions and space allowance*

However, if the temperature increases beyond the pigs' thermoneutral zone, the pigs will lie fully recumbent which requires significantly more space than if they are lying sternal or partly recumbent. At 30 kg liveweight, this is 0.13 m^2 more per pig and at 100 kg liveweight it is 0.28 m^2 more per pig. Therefore the space needed, depends on the opportunity to control the temperature in the barn.

When pigs are kept within their thermoneutral zone, they lie sternal or partly recumbent in which they use significant less space compared to lying fully recumbent. Therefore to support the function of the pen and flooring, it is important to ensure a good climate for the pigs.

Climate control measures to use include insulating the roof of the building, increasing the air velocity, cooling the incoming air, sprinkling in dunging area, stir fan, and conduction (Figure 2).

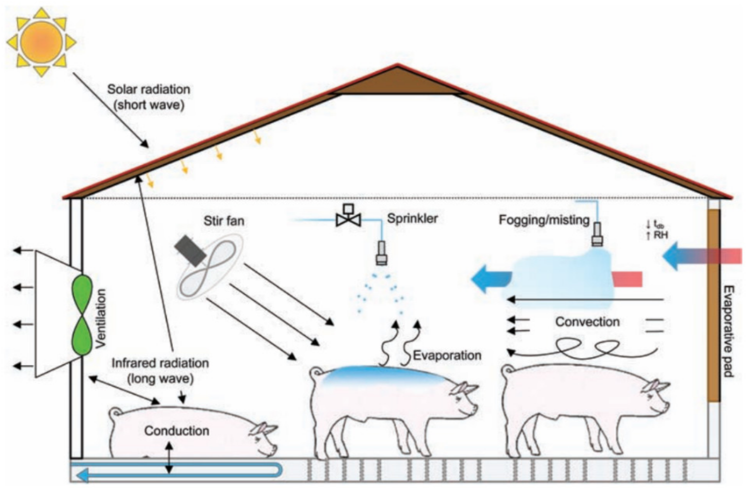

Figure 2. *Illustration of factors influencing and interacting how the pigs perceive the thermal climate (modified after Mayorga* et al.*, 2019)*

Temperature and air velocity in the pigs' lying area are crucial for their lying position and use of the pen. When pigs are placed in a pen, they first choose their lying area, and the dunging area is then established farthest from the lying area. If the temperature in the lying area becomes too high, the pigs choose to lie down in a cooler area – for example on the slatted concrete floor, which feels 3-4 °C colder. When the dunging area becomes a lying area, the pigs use the intended lying area as a dunging area (Aamink *et al.*, 2006).

A Dutch experiment found that pigs weighing 45 kg at a temperature of approximately 24 °C will start to dung in the lying area. This change in behavior was dependent on the weight of the pigs. A pig weighing 100 kg will start to dung in the lying area at approximately 20 °C. It was also found that when approximately 50% of the pigs had been moved to the slatted floor, the incidence of soiling in the lying area increased significantly (5 pigs/pen, pen dimensions were 1.5 x 3.4 m (1.02 m2/pig), 60% solid floor) (Aamink *et al.*, 2006). Bjerg *et al.* (2017) have developed a model that describes the temperature experienced by pigs as a function of room temperature and air velocity. According to this model, pigs will experience 23 °C if the room temperature is 28 °C and the air velocity is 1 m/s (chill factor) (Bjerg *et al.*, 2017).

Knowledge transfer to pen design

SEGES Innovation (Hansen and Jensen, 2023) demonstrated that it was possible to furnish pens for 42 slaughter pigs with a 50 percent solid floor in the resting area, where there was no need for cleaning for 80-100 per cent of the time the pens were in test (Figure 3). The best results were achieved by placing the resting area together in the middle of the pen. The soiling with pig manure in the resting area increased significantly when the pigs reached 65-70 kg, and this was especially the case during warm periods. At that time, the pigs no longer preferred the solid floor as a resting area, but lay on the slatted floor. It is presumed that the reason for achieving acceptable results was that the pens were zoned so that they appeared with a clear division into resting, feeding and dunging areas. Likewise, the placement of fully open or fully closed pen divisions had a great influence on the pigs' behaviour. The climatic conditions in the barn – both season and ventilation system/strategy – affected the pigs' behaviour, and these conditions must therefore be managed in the best possible way in the barn. Therefore, management around sprinkling and control of the speed and direction of the air is of great importance. Time spent on the daily supervision from the pen was no greater in these pens than in traditional pens. On the other hand, periodic soiling of the solid floor in the resting area and the allocation of straw (rooting and employment material) resulted in a greater time consumption compared to pens with a fully drained floor and a wooden block as enrichment. This possibility of zoning is considerably easier in a pen for 40 pigs compared to a pen for 15 pigs. Therefore, the space allowance is or should also be dependent on the group size as it is the case for group housed sows.

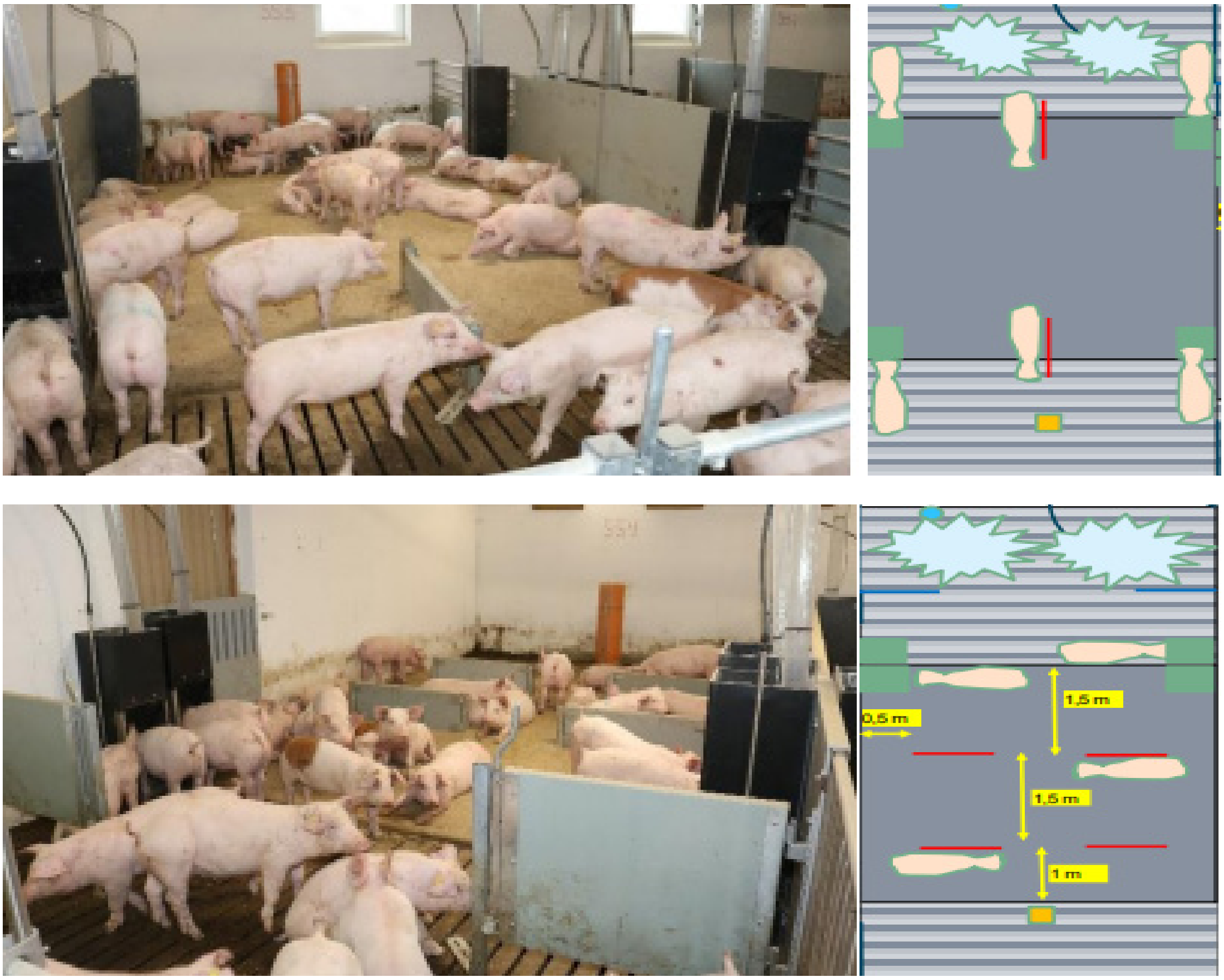

Figure 3. *Photos and illustrations of two test pens where the flooring is a combination of solid and slatted flooring (Hansen and Jensen, 2023).*

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Gaining an Edge in Grower Performance

Emer McCrum and Michael McKeon

Pig production is very simple, it only requires **three simple elements** for maximum efficiency; health, housing & feed. The difficulty is how well these three elements are effectively managed! One of these elements could take a whole paper on their own, so we are only going to deal with one aspect per element.

Health - Intestinal Parasites

Every pig producer is aware that worms can be an issue on pig units and probably think there is 'nothing new for me here'! However, consider the fact that some units are effectively free of worms, and some units are not. Why? Even more worrying some units **think** they are free of worms but they are not! Is your unit actually worm free? Perhaps it's time to re-assess if worms are a silent issue on your unit, as worms on an average unit may cost upwards of €100,000 in lost productivity.

Ascaris suum or roundworm is the most widespread and economically important parasite in pig production. As the clinical signs associated with infection are not always alarmingly obvious, the presence of worms subtly undermines growth and feed efficiency over time thereby increasing feed costs. Migrating larvae cause problems beyond the gut with alterations to the liver, so called milk spots, leading to the condemnation of affected livers at slaughter. Migration through the lungs also cause pulmonary lesions which open the door to pneumonia and other infections particularly in animals co-infected with other viral or bacterial pathogens.

Ingesting a low number of eggs is sufficient to cause chronic infection and the continuous production of larger egg volumes leading to a cycle of continuous reinfection. Most farms have routine worming protocols in place, **but is this really effective**? The prevalence of milk spot lesions is a common diagnostic tool but not the most reliable. Milk spot lesions become visible 7–10 days after infection but will regress within 1–4 weeks so their presence only indicates recent infection or reinfection. Milk spot and liver condemnation rate therefore do not indicate the severity of herd infection. Faecal egg dung sampling on the other hand is a valuable diagnostic tool to detect and monitor intestinal worm burdens, and it is very cheap and fast! Results can also be used to design tailored and targeted treatment and control strategies which helps to minimise the risk of resistance.

The breeding herd also plays a critical role in the introduction and persistence of worms within the herd. Even if grower pigs are managed, poor management in the breeding herd can act as a silent reservoir of parasites, continuously contaminating the environment and reinfecting younger pigs. Piglets can be exposed to infection if sows are shedding in the farrowing house which can impact their growth potential from a very young age. **It is essential to ensure sows are treated in the dry sow house a minimum of two-week pre farrowing**. Some farms introduced routine top-dressing of infeed wormer 3 weeks pre-farrow (at vaccination time) and this has proved very successful in eliminating worms in both the sows and grower herd. Don't forget to also worm boars, these are often the 'forgotten man', but can also harbour and spread worms! Maiden gilts must also be treated in the finisher house at least two weeks before entry into the sow herd, to ensure that they are not bringing a fresh reservoir of worms into the breeding herd.

Worm control programmes should not depend solely on anthelmintics. Operating houses AIAO with thorough cleaning, disinfection, drying and ideally resting between batches is the gold standard. Washing alone will not kill worm eggs but the complete removal of organic matter using high pressure washing particularly in pen corners, feeders, and drinkers where eggs build up, is required to remove worm reservoirs. Some disinfectants are effective against worm eggs however applying disinfectants without thorough washing is largely pointless. It is also recommended to switch disinfectants regularly on farm (every six months) to minimise the development of resistance. Worm eggs require moisture to survive so thorough drying of houses after washing while slow, is very effective. Finally good manure management and control of flies and rodents is recommended.

A recent study[1] estimated the **cost of roundworm infection at €5 - €8/pig** driven by reduced feed conversion and lean meat content, plus increased susceptibility to respiratory pathogens. A worm burden can be a silent and costly problems in terms of grower performance making the implementation of regular monitoring, strategic deworming and strong biosecurity essential to protect herd health and profitability.

Housing – Ventilation

Similar to worms infestation we all know that ventilation is critical to good pig production. When is that last time you **really re-evaluated** how well the ventilation is working in each of your houses. Take a finisher house as an example:

Your 500 pig finisher house was built 20 years ago in 2005. The house was presumably designed for the average national sale weight at the time = 100 kgs liveweight$_2$. The fan size and the size and number of ventilation inlets were also designed for this liveweight. That means your house needed to be able to have an air turn-over of 50,000 M^3/hr. Roll-on 20 years and your sale weight is now 120 kgs$_2$ which means that those 500 pigs now need an air turnover of 60,000 M^3/hr. This means the ventilation rate of your house **is 20% sub-optimal**. In reality it is probably even lower as the pigs/sow/yr have increased from 21.9 to 27.9, so your 500 pigs in that building has probably also 'inched-up' a bit more too. This means that your ventilation rate could be up to **30% sub-optimal**!

Another common problem on units is 'how the pigs use the pen'. If pigs use the pen incorrectly then this will lead to increased aggression, injury and reduced performance. Take another finisher house as an example. Your finisher house has a centre passage with the feeder and drinker beside the passage. The pigs should ideally be lying at the back of the pen underneath the wall vents as this is the warmest part of the pen. The incoming cold air through the vents should fall at the feeder/drinker making this the dunging area. How well is this working in your finisher house? When did you last walk down the centre passage and observe if the back wall is clean or has dung on it? One may ask does it really matter either way? Well yes, a back wall with dung does matter as its effectively money down the slats. Dunging at the back means that this is the coldest area. If the pigs are lying here for the first few days after entry, as will usually happen, then the feed intake in this period is used to stay warm / increased activity rather than growth. Even a modest 3 days of no-growth will increase the finisher period FCE by 0.05 e.g. 2.55 to 2.6. On an annualised basis for a 700 sow herd this equates to €40,000/yr extra feed costs.

Feed – Space Allowance

Pig producers spend a lot of time ensuring that the feed specifications and the nutrient content is 'top-notch' for maximum performance efficiency. However, if the pigs don't eat enough of the feed they simply won't grow, no matter how good the feed is! A recent trial on a commercial unit illustrates this point.

A pig unit was producing its own high specification feed. The housing, pig health and management on the unit were excellent but the finisher performance was very disappointing. The finishers entered at 40kgs and were sold at 125 kgs. The growth rates were 1040g/day and the FCE was 2.85 over this period. While the growth rate was above the national average (998g/day), the FCE was poor considering all the main elements were excellent (health, housing, feed). When the pigs were put on trial they were weighed at three different stages; grower (40-80kg), finisher 1 (80-105kgs) and finisher 2 (105-125kgs). The feed allowance per valve was recorded each week and any pigs removed off-trial (minimal) were recorded. For the benefit of consistency, the pigs remained on grower feed throughout the trial period.

The trial data showed that the pigs performed very well in the grower stage with growth rates of 1,111 g/day and an FCE of 2.3. However, in the finisher stage the performance deteriorated rapidly with a growth rate of 997g/day and a FCE of 3.3. However, when the space allowance was increased by 15% the growth and feed conversion improved dramatically (Table 1).

The FCE improvement alone arising from this increased space allowance equates to an estimated €15.93/pig, which on an annualised basis is equivalent to a saving (excluding extra accommodation costs) of €312,228 for a 700 sow herd producing 28 pigs/sow/year.

Table 1. *Performance results from increased space allowance*

Space Allowance	KPI	Grower	Finisher 1	Finisher 2	Overall
Standard	**ADG** g/day	1,111	997		1,040
	FCE^	2.30	3.31		2.85
Standard +15%	**ADG** g/day	1,044	1,383	1,336	1,211
	FCE^	2.14	2.31	2.52	2.29

^ *Kg feed per kg liveweight gain*

In conclusion, the key elements of pig production are simple; housing, health & feed, but their **effective implementation** can be difficult! This paper illustrates the financial benefit of re-assessing aspects of these key elements with a 'new eye' rather than falling into the trap of 'continuing to do what we have always done'.

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