

Teagasc Pig Farmers' Conference 2026

Conference
Proceedings

13th October, Kilmore Hotel, Co. Cavan
14th October, Horse & Jockey Hotel, Co. Tipperary

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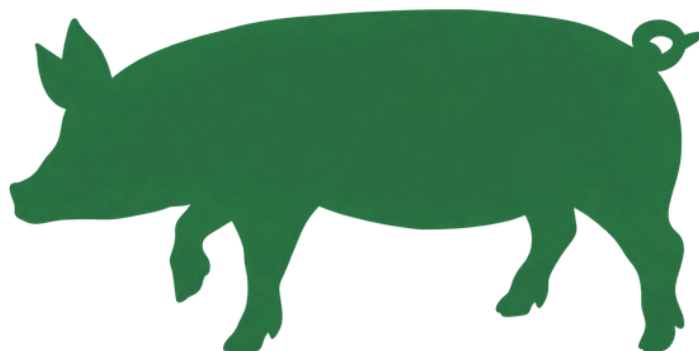


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New Environmental Rules for Smaller Pig Farms

Gerard McCutcheon and Ciarán Carroll, Teagasc

Currently a pig farm requires an Industrial Emissions licence if the size of the farm exceeds 750 sow places or 2000 places for “production pigs” – where a “production pig” is defined as a pig over 30kg liveweight. Now these threshold figures are being amended which will impact smaller pig farms below these thresholds in the future.

Initially the proposal was to include all livestock farms with over 150 Livestock Units (LSU) in a permitting or licensing system under the Industrial Emissions Directive (Council Directive 2010/75/EU). Bovines, pigs and poultry were included in the calculation of livestock units at the start. The requirement to bring in the permitting of livestock rearing was to reduce health issues associated with ammonia emissions and associated respiratory issues in humans.

As discussions and amendments progressed on this proposal the 150 LSU threshold increased, and bovines were removed from the calculation. The new threshold figure for the “rearing of pigs” is now 350 LSU – so if you exceed this you must comply with the amended Industrial Emissions Directive. There is a different threshold for poultry farms depending on the system. If a farm is rearing pigs and poultry the threshold is now if the livestock units of the combined pigs and poultry exceed 380 LSU.

Relevant EU Directive

The Directive was finalised as Directive 2024/ 1785 and is dated 24th April, 2024. The LSU level is calculated based upon the following conversion rates for pigs (shown in Annex 1a):

- Breeding sows > or equal to 50kg liveweight are 0.500 LSU
- Piglets < or equal to 20kg liveweight are 0.027 LSU – suckling piglets are excluded from this calculation
- Other pigs are 0.300 LSU

This Directive also lays down rules “designed to prevent or, where that is not practicable, to continuously reduce emissions into air, water and land, to prevent the generation of waste, improve resource efficiency, and to promote the circular economy and decarbonisation, in order to achieve a high level of protection of human health and the environment as a whole”.

Article 70 (i) 2 of the Directive states that the Commission shall by 1 September 2026 adopt an implementing act to establish uniform conditions for operating rules for each of the activities referred to in Annex 1a. This “implementation date” was missed by the Commission but it is expected that an “implementing act” will be established before the end of 2026, and the date that it is established will determine when exactly farms will be required to be registered or

permitted (see reference to 4, 5 and 6 years below).

The uniform conditions for operating rules shall be consistent with the use of best available techniques (BAT) for the activities listed in Annex 1a and shall take into account the nature, type, size and stocking density of those installations, the size of the herds of single animal types in mixed farms, and the specificities of pasture-based rearing systems, where animals are only seasonally reared in indoor installations.

The “operating rules” are defined in the Directive as “rules included in permits or general binding rules for the operation of activities referred to in Annex 1a, setting out the emission limit values, the environmental limit values, associated monitoring requirements, and where relevant, land spreading practices, pollution prevention and mitigation practices, nutritional management, feed preparation, housing, manure management, including collection, storage, processing and land spreading of manure, and storage of dead animals, and which are consistent with the use of best available techniques”.

It should be noted that the “land spreading of manure” is only relevant to any manure spread within the “installation”.

Uniform Conditions for Operating Rules for Livestock (UCOL)

It is required that each Member State shall apply the laws, regulations and administrative provisions for farms with pigs only within:

- 4 years of for an installation with a capacity of 600 LSU or more, after the Implementing act date,
- 5 years of for an installation with a capacity of 400 LSU or more, after the Implementing act date,
- 6 years of for an installation with a capacity of 350 LSU after the Implementing act date.

The threshold figure of 350 LSU is reached on a pig unit rearing pigs from birth to sale and producing 27 pigs per sow per year at an integrated sow herd of c.118 sows plus progeny. The 350 LSU is reached on a finishing unit above 1,166 finisher places. Post 2032 all pig farms above this size will require a “permit” to comply with the requirements of this Directive.

This new permitting system will be administered and controlled by the Environmental Protection Agency. They will ensure compliance with the requirements of the UCOL rules that apply to the pig sector and are summarised below.

There are 18 uniform conditions (UC 1 to 20, excluding UC 3 and 4 which are specific to poultry rearing), rules that relate to pig production. These are briefly outlined below in Appendix 1. Most of these “rules” aim to the prevent or, where that is not practicable, minimise emissions of nitrogen, phosphorus, ammonia, methane, odour, dust and microbial pathogens to the environment. More refer to noise nuisance, and the efficient use of water, electricity and fuel, and require monitoring of some input items (feed, electricity, fuel, water) in the pig production operation to assess how efficiently they are used.

There are techniques which are very similar to the Best Available Technologies (BAT) that current EPA licensees must comply with as part of their Industrial Emissions Licence. Where new pig “plants” or buildings are being considered, they will need to be designed to reduce future ammonia and methane emissions, thereby adding extra construction costs.

Conclusion

These new requirements will bring extra monitoring, recording and reporting requirements for smaller pig farms in the years to come. This will bring some extra cost in terms of pig production costs. The upgrade in new housing requirements will also require extra capital expenditure. It is important that pig producers are aware of these new requirements and factor them into any future developments for their farms.

APPENDIX 1:

A Brief overview of the relevant Uniform Conditions for the activity of pig rearing: Each “Uniform Condition” or UC is numbered.

UC 1 requires diet formulation and nutritional strategies to minimise total nitrogen and total phosphorus excreted, thus preventing and/or minimising nitrogen and phosphorus efficiency, while meeting the nutritional needs of the animals.

UC2 Requires animal housing to be designed and operated with techniques to prevent or, where that is not possible to minimise ammonia and methane emissions to air. There are maximum values of ammonia emissions for new, existing and

specific plants (buildings), and techniques are similar to the BAT requirements for larger farms.

UC 5 Refers to animal houses being designed to prevent or minimise ammonia, methane, dust and odour emissions, and the efficient use of water and energy and list techniques to achieve this.

UC 6 Refers to manure storage and techniques to prevent or, where that is not practicable, minimise emissions to air of ammonia, methane and odour, and emissions to soil and water of nitrogen, phosphorus and microbial pathogens.

UC 7 Looks at techniques of on-farm processing of manure is used, what techniques are used to prevent or, minimise emissions of nitrogen, phosphorus, methane, odour and microbial pathogens to the environment.

UC 8 Outlines techniques to minimise emissions in the case of on-farm landspreading of manure to prevent or, minimise emissions of emissions of nitrogen, phosphorus and microbial pathogens to the environment. (Note this only relates to landspreading in the installation).

UC 9 Refers to on-farm storage of dead animals to prevent or, where that is not practicable, minimising emissions of odour.

UC 10 States that odour emissions and/or odour impact shall be prevented or, where that is not practicable, minimised, ensuring appropriate distances between the plant/farm* and sensitive receptors by using an appropriate combination of techniques in animal housing, on -farm storage, on-farm manure processing and on-farm manure landspreading.

**Is only applicable to new farms/plants.*

UC 11 Outlines techniques to prevent noise

emissions and/or noise impact or, where that is not practicable, minimised, using one or a combination of techniques outlined. This only applies where a noise nuisance at sensitive receptors is expected and/or has been substantiated.

UC 12 Refers to using water efficiently and waste water should be properly managed. It lists techniques that may be implemented.

UC 13 Refers to using energy efficiently and monitored. It lists techniques that may be implemented.

UC 14 Requires Total nitrogen and total phosphorus to be monitored annually using a Mass balance of N and P based on feed intake, crude protein, total phosphorus in the diet, and animal performance.

UC 15 Refers to ammonia emissions monitoring to be done annually using a mass balance technique or an emissions factor technique.

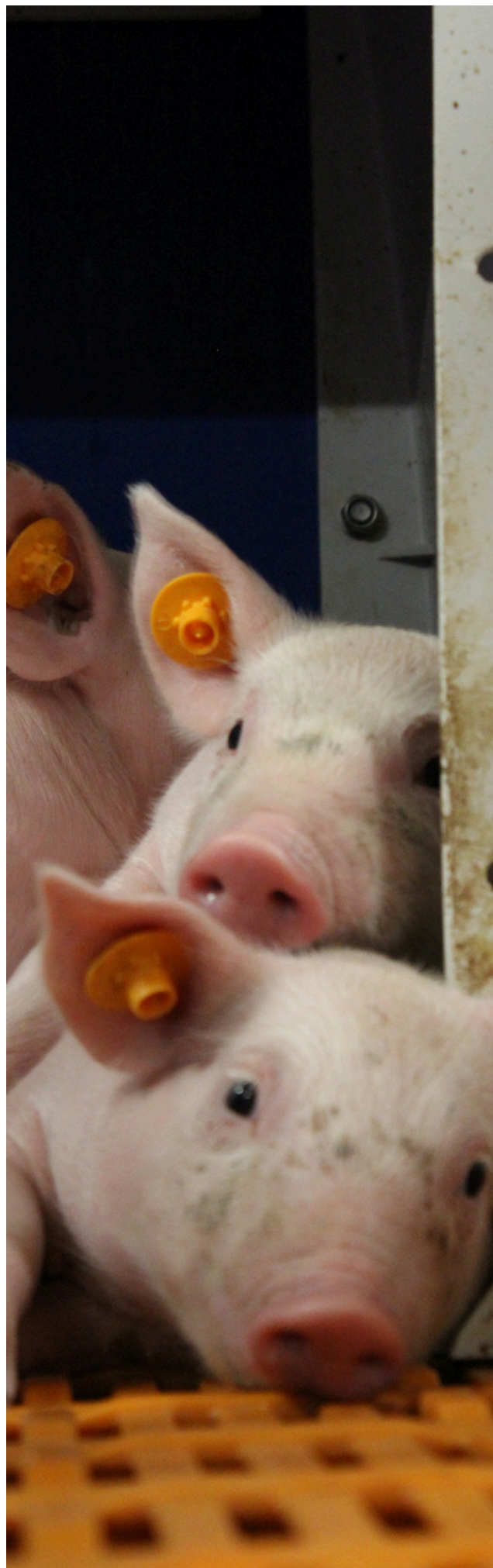
UC 16 Refers to annual methane emissions monitoring using an emissions factor technique.

UC 17 Requires annual dust emissions from animal houses to be monitored using an emissions factor technique.

UC 18 Requires odour emissions to be monitored in cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.

UC 19 Requires the performance of air cleaning systems to be monitored at commissioning phase and on a monthly basis thereafter.

UC 20 Requires water consumption, electric energy consumption, fuel consumption, feed consumption, the number of animals including births and deaths, and the quantity of manure generated to be monitored annually.



‘Every Day is a School Day’

Louise Clarke and Michael McKeon, Teagasc

Across the country, farmers are continually adapting their systems to meet changing demands around performance, profitability, welfare and sustainability. Some of the most valuable learning does not necessarily come from research trials, but from seeing what is happening on commercial farms and asking what can be learned from those experiences. This paper highlights four areas where recent experiences on Irish pig farms provide useful learning points for others: better profitability through older weaning, identifying the optimum sale weight, challenges of rearing pigs with intact tails and designing loose lactation systems.

1. Better profitability from older weaning age

The farrowing house is the foundation for pig performance, health and ultimately farm profitability. While much of the focus in recent years has been on increasing litter size and the number of pigs weaned per sow, it is important that we do not lose sight of another key measure of performance: the effect of weaning age & weight on pig lifetime performance.

Most units have a standard 5 weeks farrowing accommodation (1 week pre-farrow and 4 weeks post-farrow) which delivers an average piglet weaning age of 26-27 days. At this stage the piglets starch digestive enzymes are increasing in concentration, and these are vital to enable

the pig to breakdown the nutrients in solid food. The older the pig becomes the higher the level of digestive enzymes and therefore better digestion/performance. If piglets have lower levels of digestive enzymes at weaning, due to the piglet being younger/weaker, then a higher proportion of the nutrients are not digested in the small intestine and will be passed into the large intestine. These nutrients will then provide energy for the bacteria we don't want – E.coli, salmonella etc. This in turn can cause scours, oedema and higher mortality in these piglets.

If you can delay the weaning age until 31-32 days then the piglet has more time to consume dry creep in the farrowing house, which in-turn stimulates more enzyme production. This higher enzyme level means less undigested nutrients are escaping to feed the harmful bacteria in the large intestine. An additional benefit is that the pig's immune system is developing rapidly day-by-day and an extra five days gives the pig a much better defence against diseases (fig.1)

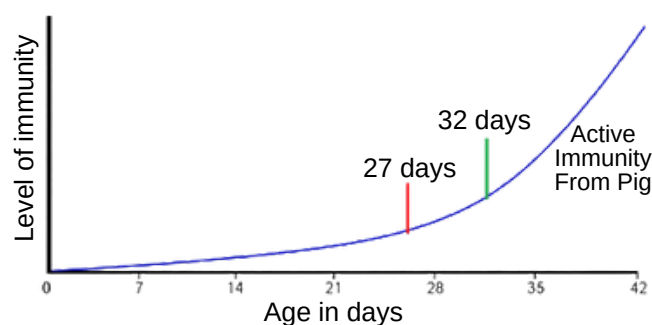


Fig. 1 Correlation between age and active immunity

A case study was undertaken on a pig unit that built an extra week’s farrowing accommodation (34 crates). The cost of this extra accommodation was €210,000. Their weaning age increased from an average of 27 days to 32 days, and the weaning weight rose from 7.2kgs to 8.7 kgs (See table 1).

Even though the litters/sow/year dropped from 2.35 to 2.30 as weaning age increased, there was a reduced mortality rate in weaners and finishers (by 1.0% and 0.5% respectively) in the older pigs. Therefore, the number of pigs sold /sow/year were nearly identical at 30.2 vs 30.1. However the big difference / gain was the superior efficiency of the older pigs.

This translated into lowering the cost of production in these older pigs by **5.7 c/kg dwt. or €5.10 per pig** – this figure included the capital costs of the new farrowing house, spread over 10 years.

However, increasing weaning age across the whole herd can be challenging for some units due to their layout. In these situations, a portacabin could provide additional farrowing accommodation, allowing the selection of nurse sows and 20% of the piglets (lightest/youngest) to continue for another week. If these sow & litters are moved into this house, the normal weeks washing can still be accomplished in the main farrowing house. This could provide an opportunity to increase the weaning age & weight of the most ‘at-risk’ piglets, thereby reducing mortality and increasing profitability.

Ultimately, an increased potential profitability per year of **€108,000** for an

average sized herd needs to be explored. This is even more pertinent in the light of recent grading changes having reduced sale-weights, thereby increasing the cost of production.

Table 1. Financial comparison of 27 day & 32 day weaning age

Weaning Age Comparison: 27 vs 32 days		
Ave Weaning Age (days)	27	32
Sow Herd Size	700	700
Pigs /Sold/ Sow /Year.	30.2	30.1
Ave Weaning weight (kg)	7.2	8.7
Weaner Wt. at transfer (kg)	35.6	39.4
Weaner ADG (g)	450	488
Finisher FCE (g)	2.6	2.42
Finisher ADG (g)	1020	1075
Cost of Production Comparison		
Cost saving per kg dwt		5.7 cent
Cost saving per Pig		€5.11
Cost saving per year		€107,667

2. Finding the Optimum Sale Weight

The introduction of the new pig grading system has significantly changed how farmers approach sale weight. For many producers, the practical target has moved towards approximately 118–120 kg live weight, with the aim of maximising the proportion of pigs falling within the Golden Box for both weight (80 to 94.99kg dead weight) and lean meat (>60%). Achieving the Golden Box is clearly important, but the question for farmers is whether it should be the only consideration when deciding when to sell pigs.

The new grading system means that weight and lean meat percentage need to be considered together. Where pigs are consistently falling outside the Golden Box, there is an opportunity to improve returns through changes to genetics, nutrition, health or management. Bringing sale weight back towards 118–120 kg has been an appropriate response on many farms, but achieving the desired grading result does not automatically mean that this is the most profitable sale point for every farm. The important question is: what happens to the cost of production when pigs are sold lighter?

Analysis of slaughter data from several farms provides an interesting perspective. In some cases, reducing sale weight has resulted in an increase % of pigs getting into the golden box. However, as the average sale weight falls the non-feed costs per pig remains the same, therefore the non-feed cost per kg dwt increases. Where is your sale weight sweet spot, whereby you maximise the net pig price while minimising the non-feed cost per kg.

Space and stocking density are also important. Reducing sale weight allows pigs to leave the farm sooner and may help relieve stocking pressure. On a farm operating close to capacity, getting pigs away earlier can have a significant benefit by improving throughput and reducing pressure on accommodation. Where space is not limiting however, the economics of carrying pigs for additional kilograms may be very different.

Equally, simply keeping pigs to heavier weights is not necessarily the answer. Once pigs move beyond their optimum point, feed conversion can deteriorate and the cost of producing each additional kilogram can increase. If heavier pigs move outside the most favourable area of the grading grid, the additional carcass weight may not generate sufficient income to compensate for poorer grading and the cost of keeping the pig for longer. The challenge is therefore to find the economic optimum for each individual farm.

Farmers should use their own data to assess sale weight alongside:

- Feed cost and feed efficiency
- Non-feed costs
- Available housing space
- Stocking density
- Growth rate
- Grading results
- Days on farm
- Overall throughput

What is optimal on one farm may not be optimal on another. A farm with high non-feed costs and limited space may place greater value on reducing days on farm,

while a farm with lower costs and sufficient accommodation may benefit from carrying pigs for additional kilograms.

The Golden Box remains a critical target, but it should be viewed as part of the decision rather than the entire decision. Farmers need to know not only how many pigs are achieving the target, but also what it costs to get them there.

The more useful question is therefore not simply, “What weight should I sell my pigs at?”, but “At what weight does selling another kilogram give me the best return on my farm?”. AI apps can help to rapidly identify the optimum weight but it is important to include your monthly non-feed cost and monthly pigs sales in this calculation. A more detailed analysis can be obtained from your pig adviser as per the table 2.

3. Learning from Farmers Rearing Pigs with Intact Tails

The move towards rearing pigs with intact tails is an important step in improving pig welfare, but the experience of farmers who have already implemented the system demonstrates that it is not without challenges.

One of the clearest messages from commercial experience has been the association between intact-tail production and increased carcass condemnations, particularly those associated with multiple abscessations. On one farm that was studied, the records showed a clear relationship between the time periods when long-tailed pigs were being supplied and the resultant increase in

condemnations. During periods of heavier long-tailed pig production in 2024 and 2025, whole-carcass condemnations due to multiple abscessations increased substantially, with additional partial condemnations also recorded. At their highest, total condemnations associated with long tailed pigs tripled.

Importantly, the farm did not simply accept this outcome. The data were monitored continuously, and different interventions were trialled e.g. straw racks, toys etc. Following a return to tail docking as the general policy, whole-carcass condemnations fell and is currently running at 0.3%.

These figures are based on a relatively small volume of pigs and should not be interpreted as definitive industry-level results. However, they demonstrate the value of monitoring slaughterhouse data and using it to assess the practical consequences of management decisions. It also highlights the importance of getting the post-mortem data system in use in slaughter plants into widespread operation. This would give continuous weekly/monthly reports for each farm.

Factory condemnations may also represent only part of the problem. Pigs identified on-farm with tail-related or other abscesses may not reach the factory at all. In some cases, post-mortem examinations and veterinary investigations identified spinal or other abscesses in pigs that had already been removed from the production system. Consequently, relying solely on factory condemnation data may underestimate the overall impact.

Table 2: Optimum sale weight calculator

Live weight @ sale	115	117	119	122	125	128	131	134	137
Dead weight @ sale	88	89.5	91	93.3	95.6	97.9	100.2	102.5	104.8
Wt gain 30kgs - Sale	85	87	89	92	95	98	101	104	107
Finisher FCE	2.36	2.365	2.37	2.39	2.41	2.44	2.48	2.52	2.56
Finisher feed usage kg/pig	200.6	205.755	210.93	219.88	228.95	239.12	250.48	262.08	273.92
Finisher feed cost / tonne	€318	€318	€318	€318	€318	€318	€318	€318	€318
Finisher feed cost / pig	€63.79	€65.43	€67.08	€69.92	€72.81	€76.04	€79.65	€83.34	€87.11
Weaner feed - cost/pig (creep/link/weaner)	€19.00	€19.00	€19.00	€19.00	€19.00	€19.00	€19.00	€19.00	€19.00
Feed cost sow - cost / pig	€17.88	€17.88	€17.88	€17.88	€17.88	€17.88	€17.88	€17.88	€17.88
Total feed cost / pig	€100.67	€102.31	€103.96	€106.80	€109.69	€112.92	€116.53	€120.22	€123.99
Total feed cost / kg dwt	€1.14	€1.14	€1.14	€1.14	€1.15	€1.15	€1.16	€1.17	€1.18
Non feed cost / week	€27,000	€27,000	€27,000	€27,000	€27,000	€27,000	€27,000	€27,000	€27,000
Pigs sold / week	500	500	500	500	500	500	500	500	500
Non feed cost / pig	€54.00	€54.00	€54.00	€54.00	€54.00	€54.00	€54.00	€54.00	€54.00
Non feed cost / kg dwt	€0.61	€0.60	€0.59	€0.58	€0.56	€0.55	€0.54	€0.53	€0.52
Total cost per kg dwt (feed + non-feed)	€1.76	€1.75	€1.74	€1.72	€1.71	€1.70	€1.70	€1.70	€1.70
Ave Net Pig Price c/kg	1.81	1.8	1.78	1.76	1.74	1.72	1.7	1.68	1.66
Net Margin (Pig Price - Total cost) c/kg	€0.05	€0.05	€0.04	€0.04	€0.03	€0.02	€0.00	-€0.02	-€0.04

Another important learning point concerns environmental enrichment. Farm experience demonstrated that providing straw, hay and other forms of enrichment does not necessarily eliminate tail-related problems. In some groups, pigs had access to substantial enrichment, yet tail-related health problems still occurred. This does not mean that enrichment is ineffective or unimportant. Rather, it demonstrates that tail biting is a multifactorial problem, and no single intervention can be expected to prevent it in every situation.

There is also an important human welfare consideration. When tail damage becomes common within a group, farm staff can potentially become accustomed to seeing it. A problem that initially appears obvious can become normalised simply because it is seen repeatedly. Recognising that a problem has become common must not mean that it becomes acceptable.

Regular observation, early identification of tail damage and appropriate intervention remain essential. Successful intact-tail production will require close monitoring of the pigs, environmental conditions, enrichment, health outcomes and slaughter data, together with a willingness to change management when problems arise. If there is a higher cost with intact tail production then this cost must be recognised and quantified.

The objective is not to present intact-tail production as either a success or a failure, but to learn from those already doing it and to use the evidence generated on commercial farms to improve future systems.

4. Learnings from pig units using 'Loose Lactation' systems

The move towards loose lactation systems represents a significant change in how farrowing accommodation is designed and managed. While research and technical specifications provide important guidance, some of the most valuable lessons are coming from farmers who have already installed and operate these systems under commercial conditions.

The first message is that there is no one-size-fits-all system. Building dimensions, pen size and existing infrastructure can have a major influence on the final design. In one system, restricted pen dimensions resulted in the crate being positioned at an angle to maximise usable space, particularly behind the sow. A larger pen may not require the same approach. The dimensions of the existing building therefore need to be considered carefully before a system is selected. It should not be assumed that a particular crate will simply fit into an existing room and function effectively.



Farmers have also highlighted the importance of looking beyond the initial installation and considering how the system will perform over many years. One farmer was very positive about the crate being used, describing it as solid and robust, but concerns were raised about its relatively small turning circle and the legs of the crate sitting directly on the floor. Over time, these legs may be susceptible to corrosion, potentially weakening the structure and the slats underneath. This raises an important question for anyone making a significant investment: what will this component look like after 10 or 15 years of use?

The sow's turning circle is another important consideration. Sows have increased in size over time, and breeding programmes are likely to continue influencing mature body size. A turning



area that appears adequate for today's sow may not provide the same level of freedom for the sow of the future.

Another system discussed by farmers provided a 1.8 m turning circle and had no legs sitting directly on the floor. The crate could also be opened outwards, and the crate sides could be lifted into a vertical position – this is future proofing in-case of a move to towards fully loose farrowing in the future. However, flexibility can introduce new design considerations. A low wall was required at the rear to anchor the crate, potentially creating challenges where crates are installed back-to-back. Bars across the top of the crate were also identified as potentially useful to prevent gilts from flipping backwards when first introduced. If the crate is positioned near a pen division will the sow pin piglets against the wall. Many new crate designs are placing the crate at a 45-degree angle to the passage to prevent this happening.

Commercial experience has also demonstrated the importance of refinement. Features such as anti-crush bars, solid areas and drinker position were reviewed and modified once systems were being used. These changes should not necessarily be seen as criticism of the original design; they are responses to what farmers observe in practice. The interaction between the sow and piglets is particularly important. Changes to walls, solid lying areas and the position of the heated nest can alter where piglets choose to lie and consequently where potential risks occur. Observing animal behaviour is therefore essential. A design change may solve one problem while creating another.

Cost is another major consideration. Loose lactation systems represent a substantial investment, particularly where existing accommodation needs to be modified or rebuilt. Farmers need to consider not only the purchase price of the crate but also alterations to buildings, floors, ventilation and other infrastructure. The experiences from these farms are early learning points rather than definitive recommendations.

Farmers considering investment should ask:

- Will the system fit my building?
- Are the floor supports and ventilation system sufficient
- Is it durable?
- Is there sufficient space for today's sow and the sow of the future?
- How will the sow and piglets use the space?
- Can the system be adapted in the future?
- What refinements might be required?
- What is the total investment?

Perhaps the most important lesson is that the finished system may not be the same as the system you start with. Continued observation, farmer feedback and refinement will be essential as commercial experience with loose lactation develops.

Conclusion

The common message across all four areas is simple: 'every day is a school day'.

Whether it is producing an older weaned pig, finding the most profitable sale weight, managing pigs with intact tails or investing in loose lactation, there is no single answer that will suit every farm.

The farms that will adapt best are those that monitor their own data, observe their animals closely, question whether current practices remain appropriate and are prepared to learn and change. The objective is not simply to produce more pigs, but to produce better pigs, manage them effectively and make decisions that deliver sustainable performance, welfare and profitability for the individual farm.



Effects of Nutrition and Genetics on Improving Pork Carcass Leanness

Bob Goodband, Kansas State University

The pork industry has spent decades moving toward pigs that grow rapidly, convert feed efficiently, and produce a high percentage of lean carcass tissue. Improvements in both genetics and nutrition have made today's pigs substantially more capable of depositing lean tissue at heavier market weights than in the past. However, the challenge for producers is that maximizing carcass leanness is not always the same as maximizing total profitability or pork quality. Carcass value and therefore profitability depend on the interaction among feed costs, lean percentage, carcass weight, and primal value. Yet there is a potential problem, from the consumer standpoint, excessive emphasis on leanness may also reduce desirable good meat quality characteristics such as marbling, juiciness, and eating quality.

Genetic Effects on Carcass Lean

While this is a presentation on the nutritional effects on carcass lean, it is impossible to discuss improving lean value without mentioning genetics. Genetic selection is one of the most powerful tools for changing carcass composition. Genetic selection for lean pigs has the greatest influence on carcass lean content and feed

efficiency. Backfat thickness is one of the most important drivers in calculating carcass lean. Backfat thickness is moderately to highly heritable, with most estimates typically ranging near 0.40–0.50. Consequently, selection for reduced backfat thickness has been an effective means of increasing carcass leanness.

Pietrain vs. Duroc Sired Pigs

Genetic lines differ in both the rate at which protein is deposited and the body weight at which maximum protein deposition is reached. In the U.S., terminal boar lines have been heavily based on Pietrain composites. Pietrain influenced sires excel in growth rate, feed efficiency and carcass leanness. However, in the last three to five years, breeding stock companies and producers have been shifting more towards Duroc composite sire lines for perceived pork quality advantages. Some genetic comparisons would suggest that Duroc-sired pigs will grow as- or slightly faster than Pietrain-sired pigs, but be 0.10 to 0.12 units less efficient, have less loin depth and more backfat thickness. Because backfat depth and loin depth are the two primary drivers of calculating percentage lean, based on U.S. equations for estimating carcass lean,

Duroc-sired pigs will have approximately 1% unit less carcass lean at an approximate hot carcass weight of 100 kg. hot carcass weight (Table 1).

Table 1. Effects of sire line on carcass leanness

Item	Sire line	
	Pietrain	Duroc
Hot carcass weight, kg	100.4	100.3
Backfat, mm	15.27	16.02
Loin depth, mm	70.68	66.67
Carcass lean, %	56.31	55.36

Adapted from PIC 2025

These differences illustrate why genetic decisions must be evaluated on an integrated basis. A sire line that produces greater percentage lean may also improve feed conversion and carcass yield, compounding its economic advantage, yet with potential negative effects on marbling, juiciness, and eating characteristics.

Nutritional Effects on Carcass Lean

Nutrition should not be viewed simply as a means of producing the leanest possible pig. Feeding programs should allow the pig’s genetic potential for lean growth to be expressed. This is particularly important because approximately 75 to 80% of the feed required to produce a pig is consumed

during the grow-finish period, giving finishing nutrition a major influence on production cost.

Dietary Energy Density

Energy is the most expensive component of the diet and changing energy density will affect average daily gain, feed efficiency, and percentage lean. The optimum energy concentration should therefore be selected based on the relative economics of the grain and fat sources available. Increasing dietary energy density can have negative effects on carcass lean; once the pig's capacity for protein deposition is maximized, excess energy is deposited as fat. In the U.S., we feed higher energy diets based almost entirely on corn- vs. the wheat- or barley-based diets fed in Europe. Therefore, Irish pigs should have slightly poorer feed efficiency but inherently have greater carcass lean than U.S. pigs who are fed relatively high energy diets.

Dietary Lysine and the Lysine-to-NE Ratio

Lysine is generally the first limiting amino acid in practical swine diets and is a key driver of protein deposition. Once an economical dietary energy level is established, diets should be formulated according to a lysine-to-energy ratio. If energy intake increases, amino acid intake must increase proportionally so the pig can use the additional energy for lean tissue deposition. Conversely if energy density increases and lysine intake does not, a pig will become fatter. Figure 1 presents standardized ileal digestible lysine requirement estimates for boars and gilts fed a wheat-based diet.

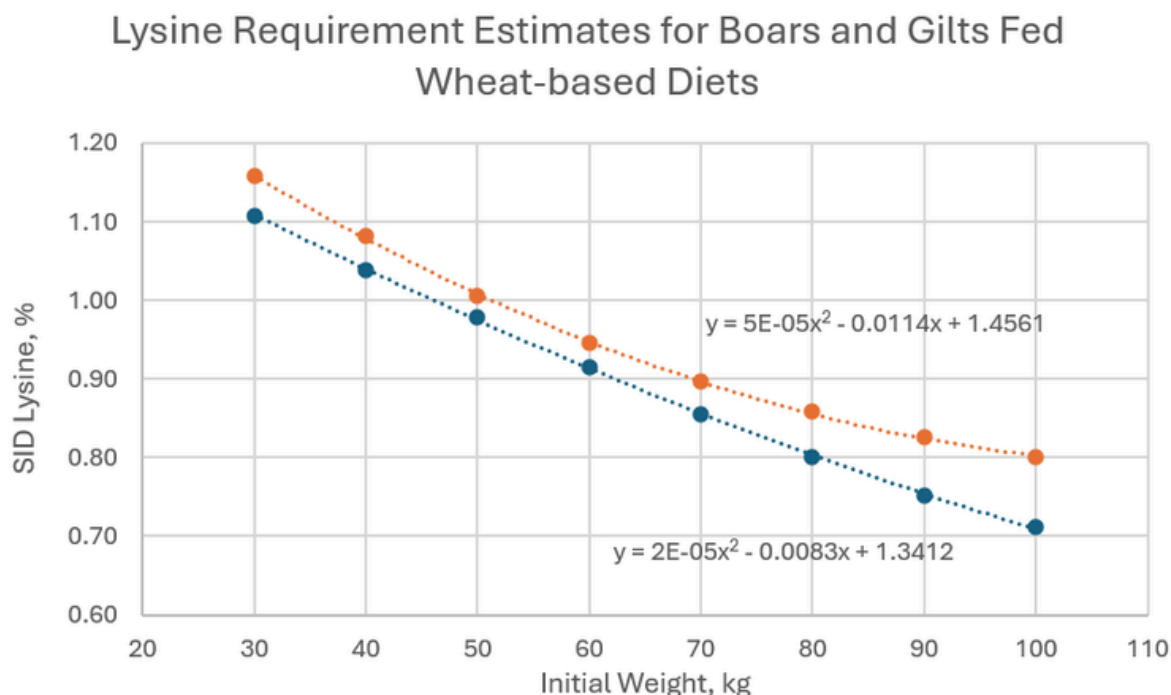


Figure 1. Standardized ileal digestible lysine requirement estimates for boars (top, orange line) and gilts (bottom, blue line), fed wheat-based diets. (Adapted from PIC, 2021).

Amino Acid Ratios to Lysine

Once the appropriate lysine level is established, other essential amino acids should be supplied relative to lysine (Table 2). Increasing dietary lysine alone without a proportional increase in the other amino acids will result in one of these secondary amino acids becoming deficient and result in decreased growth, feed efficiency and carcass lean. A common misinterpretation of the data looking at increasing dietary lysine to increase carcass lean is that only lysine needs to be provided, or practically just adding more L-lysine HCl to the diet.

Lysine-to-Crude-Protein Ratios

Increasing use of crystalline amino acids allows diets to contain lower crude protein while still meeting essential amino acid requirements. However, crude protein cannot necessarily be reduced indefinitely. There is concern with minimum crude-

Table. 2 Minimum ratios of other amino acids relative to lysine

	Weight range, kg			
	25 to 50	50 to 75	75 to 100	100 to 135
Isoleucine ^a	56	56	56	56
Leucine	100	100	100	100
Methionine & Cystine	56	56	58	60
Threonine	63	63	64	65
Tryptophan ^b	18 - 21	18 - 21	18 - 21	19 - 21
Valine	69	69	69	69

^aDiets with high leucine (ex. > 140% of Lys) require higher isoleucine (ex. 60% of lysine).

^bOptimal tryptophan:lysine ratio depends on value of weight gain.

protein concentrations for heavy finishing pigs and suggests that pigs over 100 kg should receive at least approximately 13% crude protein to prevent reductions in performance.

Consequently, formulating solely to a lysine specification can become problematic when crude protein falls too low. An excessive lysine-to-crude-protein ratio can indicate that the diet is becoming deficient in non-essential amino acids. The goal should be to reduce unnecessary crude protein while maintaining adequate lysine, essential amino-acid ratios, and overall crude protein supply for maximum economically efficient lean gain.

Split-Sex and Phase Feeding

Sex is another important source of variation in lean-growth potential. Gilts generally have lower protein deposition and percentage carcass lean, while having more backfat than boars. These biological differences provide the basis for split-sex feeding. Rather than feeding a different set of diets, from a practical management and feed milling standpoint, we can feed the same diets to gilts and boars but change the feed budget to keep boars on a higher lysine diet longer than gilts. Split-sex feeding may also allow different marketing strategies, because the sexes may reach optimum carcass specifications at different weights or ages. As for feeding multiple diets over the finishing period, or phase feeding, there is considerable opportunity for potential savings per head when advancing from 1 to 2, or 2 to 3 dietary phases. In general, there is potentially greater opportunity in economic

justification to adding a 3rd phase diet vs split sex-feeding only 2 phases.

Concluding Thoughts – Negative Effects of Producing Pigs That Are Too Lean – What’s Happened in the U.S.

Leaner pigs have advantages in feed conversion and may receive processor premiums on a carcass merit buying program. However, the leanest carcass is not necessarily the most desirable pork product. In the past, U.S. packing plants mandated carcass lean and weight buying grids. These implemented incentives resulted in decreasing back fat depth and increased carcass leanness. However, as pork producers raised leaner pigs, today, packers will consider pigs are lean enough and there is little incentive to further increase carcass leanness. Therefore, much of the packer buying programs are now more heavily based on carcass weight. Pork quality research continues to evaluate marbling, color, pH, tenderness, juiciness, water-holding capacity, and other traits important to consumers. Therefore, genetic and nutritional programs that aggressively minimize fat should be balanced against the need to maintain a positive eating experience. Reducing marbling may create pork that meets a lean specification but is less consistently juicy and flavorful. In the U.S., this issue is particularly important for the loin. The loin's contribution relative to the total carcass cutout decreased relative to other primal cuts. Pork quality ultimately requires a meaningful economic signal, similar to the signal that has historically driven increased leanness.

WelFarmers: European pig farmers sharing practical solutions for the welfare challenges ahead

Neil Joseph Tirchett, Ciarán Carroll and Edgar Garcia Manzanilla

European pig production is entering a period of change. The European Commission is currently preparing a targeted revision of EU pig-welfare legislation, with a proposal expected by the second quarter of 2027. Among the issues identified are the transition from sow crates towards pen systems and the development of practical on-farm welfare indicators. The Commission has also stated that the revision will consider the economic, social and environmental impacts of potential changes.

For pig farmers, however, the challenge is not simply identifying what could improve animal welfare. The more difficult question is: what can actually work on a commercial farm?

This is the question at the centre of the EU-funded WelFarmers project. Rather than starting with theoretical solutions and asking farmers to implement them, WelFarmers has taken a bottom-up approach: identify practices that farmers are already using, evaluate them with different stakeholders, and share those that demonstrate potential to improve pig welfare while remaining technically and practically feasible.

Bringing European pig farmers together

WelFarmers established regional innovation networks in eight European countries: Denmark, Finland, France, Ireland, Italy, Portugal, Romania and Spain. Together, these countries represent more than half of EU pig production. The consortium deliberately brings together different types of expertise and production realities, including research organisations, advisory services and farmer organisations from the different countries.

Farms differ in climate, herd size, housing systems, labour availability, markets, premium schemes, infrastructure and manure-management systems. A practice that is relatively straightforward in one country may be much more difficult to implement in another.

The project therefore did not set out to identify a single European "gold standard". Instead, it aimed to identify real examples of what farmers are already doing and what lessons can be transferred to other production systems.

WelFarmers focuses on four major themes:

- **Ban of cages:** opportunities and solutions for loose housing of lactating sows.
- **Pigs with undocked tails:** practical approaches to moving towards production of pigs with intact tails.
- **Avoiding pain during castration:** alternatives and approaches including immunocastration, analgesia and anaesthesia, and production of entire males.
- **Space allowance and flooring:** opportunities to improve housing design, the pig environment and performance.

The project website (www.welfarmers.com) now provides access to the collected practices and a growing library of supporting material.

From farmers' practices to WelFarmers Champions

Across two rounds of collection, approximately 200 good practices were submitted from farms across Europe. The practices were documented using structured templates. Farmers were asked not only to describe what they do, but also to explain their farm context: housing design, pen dimensions, flooring, climate control, management practices and other factors that could influence their production. Information was also collected on economic and environmental considerations, the potential for replication elsewhere and possible improvements to the practice.

The practices were then evaluated through a multi-actor process.

The thematic expert groups assessed practices against three broad criteria:

- **Excellence / technical quality** – Does the practice address an identified challenge? Is there scientific evidence behind it? Does it improve welfare when correctly applied? Has it been tested in an operational environment and does it represent an innovative approach?
- **Impact** – What could the practice contribute to the pig sector? What are the economic and environmental implications? Could it generate wider knowledge and skills?
- **Exploitation / probability of success** – How feasible is it to implement? Can other farmers adopt it? Can it work on different farm sizes? How quickly could it be taken up?



Practices were scored from 0 to 5 across these criteria and their associated sub-criteria.

The thematic groups then selected the best 5 strongest practices for each theme. These were subsequently brought back to the Regional Networks, where farmers and other stakeholders considered the practices from their own national perspective and had to vote for the winning 3 practices per theme per round. This process was an important part of the project, as it aimed to focus on the collection of comments about the practices from the different stakeholders, with a focus on the farmers.

It is important to note, that the selected practices should not be interpreted as European gold standards. Instead, they are to be considered as examples that can provide inspiration and demonstrate what is possible under real farm conditions.

What are the winning practices?

Ban of cages / Loose housing of lactating sows

The first theme addresses one of the most significant changes facing European pig production, the move from conventional farrowing crates towards systems that provide greater freedom of movement for sows. The winning practices demonstrate different ways of approaching this challenge.

Examples include keeping sows loose until only the day before expected farrowing, smart piglet nests with adaptive access, and free-farrowing systems using larger pens and carefully controlled piglet environments.

The Irish practice "**Loose lactation & piglet commingling**", from Ashleigh Farms and represented by Jason McGrath, was one of the winners within this theme.

This practice is particularly relevant to Ireland because it demonstrates that loose lactation and piglet commingling are not simply theoretical concepts. The farm uses 6.5 m² lactation pens, with farrowing crates opened after four days. Piglets are subsequently allowed to co-mingle from approximately 20 days of age and are weaned at 28 days. A particularly interesting feature is that the system was developed around practical farm experience. Opening the crates earlier than four days was associated with increased piglet mortality, while the later opening point provided a balance between increased sow freedom and piglet survival. The system also allows piglets to experience social mixing while still with their mothers, potentially helping them adapt to other pigs and establish social hierarchies before weaning.



WelFarmers winner - Loose lactation & piglet commingling (Ashleigh Farms, Ireland)

An important message should be considered that change does not necessarily mean completely rebuilding a farm from scratch. Indeed, Irish farms are already adapting farrowing facilities, including systems where crates can be opened to provide the sow with greater space and freedom.

Pigs with undocked tails

The second theme focuses on perhaps one of the most complex practical challenges, commonly discussed when talking about pig welfare – the production of pigs with intact tails while preventing tail biting. The selected practices demonstrate that there is no single intervention that solves the problem. Examples include adapting rooting material to the preferences of the pigs, providing dehydrated alfalfa, and using digital tools such as the SAPARO application to assess risks, record tail-biting indicators and develop action plans. The wider message from this theme is, that successful production of pigs with intact tails depends on the whole production environment. Feed, water, health, stocking density, climate, enrichment, flooring and management can all contribute to the risk of tail biting.

This is particularly relevant to Ireland, as most pigs are produced with docked tails, so some management techniques should be considered for local application. However, one should note, that several of the European practices rely heavily on straw as enrichment or bedding for the successful production of undocked tails. While straw can be an effective material, its availability, handling requirements and potential

biosecurity implications need to be considered within Irish production systems. The question for Irish farmers is therefore not simply whether a practice works somewhere in Europe, but which parts of that practice can be adapted to Irish conditions.

Avoiding pain during castration

The third theme looks at approaches to avoiding or reducing the pain associated with surgical castration. The winning practices include avoiding castration through social management and production of entire males, immunovaccination approaches and adjustments to feeding and management around immunocastration. This theme illustrates another important feature of WelFarmers, where different European countries face very different starting points. For the case of Ireland, surgical castration is not a routine practice in commercial pig production and intact males are commonly produced. Consequently, most of the solutions identified under this theme have less immediate relevance to Irish producers. Nevertheless, the practices provide useful information about how other European production systems are addressing the issue and demonstrate why European-level knowledge exchange is valuable.

Space allowance and flooring

The final theme addresses housing design, stocking density, flooring, climate and the wider environment in which pigs are kept. The winners from the first round featured systems with drained flooring, improved space allowance and microclimate

management, and examples demonstrating that both new and renovated older buildings can provide good pig environments. While the second-round also identified practices that include increased space for increased efficiency, a welfare-focused fattening barn integrated with a methanation unit, and the use of a floor plate for slatted flooring that can provide a solid surface and a location for enrichment.

For many farms, including the Irish, increasing space allowance could potentially be approached through reducing the number of pigs housed per square metre. However, this immediately creates another question: if fewer pigs are produced, can the remaining pigs be produced efficiently enough to maintain the economic viability of the enterprise?

This is why welfare improvements cannot be considered separately from production efficiency. Improvements in housing need to be considered alongside growth rate, feed conversion, mortality, health, labour and the value of the final product.

Can the identified winning practices simply be transferred?

This is perhaps the most important question raised throughout WelFarmers. The answer is: not necessarily! A practice developed in Denmark, France or Portugal may provide an excellent starting point for improving pig welfare. However, pig farmers, such as the Irish must consider the local Irish conditions that they are surrounded in. Climate, construction costs, available materials, manure-management systems, farm size,

labour, disease risks, market requirements and slaughter specifications can all influence whether a practice is feasible.

There are also factors outside the farmer's direct control. Changing a building may require planning or environmental permits. Market incentives can influence whether additional production costs can be recovered. Slaughterhouses and processors influence specifications and payment structures. Regulations influence what can be built and how animals must be managed. Therefore, improving welfare cannot be viewed as a responsibility resting solely with the individual farmer. It's an action where the whole value chain has a role to play.

From European examples to Irish solutions

This is where the WelFarmers project can provide value to Irish pig farmers. The objective is not to tell farmers that one particular system should be adopted. It is to make practical examples available so that farmers, advisors, researchers and other stakeholders can examine what has worked elsewhere and ask how elements of those systems might be adapted locally. The collected practices and additional material are available through the WelFarmers website – www.welfarmers.com. Farmers can access practice abstracts, videos, infographics, podcasts and immersive 360° virtual farm tours. The winning practices are also being supported by environmental and economic assessments examining their feasibility, transferability and potential application in different countries. The website therefore provides more than a list

of ideas. It allows farmers to explore the farm behind the practice and understand how the system operates.

What happens next?

The work of WelFarmers does not end with the Champions selection. The project is moving towards its final stage, with the results due to be presented in Brussels to a range of European stakeholders, including farmer organisations, representatives of the food chain, researchers, advisors and policymakers, including the European Commission. This timing is particularly important, considering that the European Commission's current timetable is for a targeted revision of EU pig-welfare rules by the second quarter of 2027.

WelFarmers provides an opportunity to bring the experience of commercial farms into that wider discussion: not simply what society would like pig production to look like, but what farmers are already doing, what has worked, what has not worked, and what conditions are necessary to make improvements feasible.

Discussions are also ongoing around the possibility of a follow-up initiative that could continue facilitating the exchange of information and experience between pig farmers across Europe. In addition, a further analysis is being planned to examine the scoring and stakeholder information generated throughout the project in greater depth. One particularly interesting area will be understanding how different stakeholder groups viewed the practices. For example, whether farmers, researchers and other experts placed

different emphasis on technical quality, impact or feasibility. That information could provide an important insight into where scientific ambition and farm-level practicality align, while also identifying where further work may be required.

Learning from farmers

Ultimately, the strength of WelFarmers lies in the concept that there are already farmers solving many of the challenges that the European pig sector is being asked to address. Across Europe, farmers are adapting housing, changing management systems, developing new approaches to enrichment, experimenting with intact-tail production, improving climate control and finding ways to provide greater freedom of movement.

These examples do not provide a single answer for the future of pig production. What they provide is something equally valuable, evidence from real farms about what is possible.

For Ireland, now the task is to take those examples and assess them through an Irish lens. Some practices may be directly transferable. Others may require modification. Some may not be appropriate at all. The important point is that the discussion can now be based increasingly on practical examples rather than assumptions.

WelFarmers is about putting those examples in the hands of farmers, advisors, researchers and policymakers, and creating a stronger European conversation about how welfare improvements can be achieved while maintaining productive, economically viable and resilient pig farms.

Improving Sow Livability

Bob Goodband, Kansas State University

Introduction

Sow livability has become one of the most important biological, economic, and welfare challenges facing modern pork production. Genetic progress has produced females that are leaner, faster growing, larger framed, and substantially more productive than previous generations, but the modern sow is also being asked to remain reproductively efficient through repeated cycles of gestation, farrowing, and lactation. At the same time, commercial systems are operating with larger herds, tighter labor supplies, and greater expectations for individual-animal care. As an unintended consequence, sow mortality rates in the U.S., Ireland, Spain, and Denmark have gradually increased over time (Figure 1). Mortality rates in the U.S. are at approximately 14% with some individual herds experiencing levels up to 20%.

Fortunately, recent benchmarking suggests some stabilization as a result of concerted efforts on breeding herd management, feeding programs, and genetics. Yet breeding herd mortality remains well above historical levels. Improving livability requires coordinated attention to gilt development, body condition, locomotion, health, reproduction, and early identification of compromised females.

Causes of Sow Mortality

Trends over time

Rising sow mortality is not caused by a single disease. Rather, the profile of removals reflects the interaction of reproduction, locomotion, acute disease, farrowing complications, pelvic organ prolapse (POP), and management decisions. MetaFarms' 2025 database grouped more

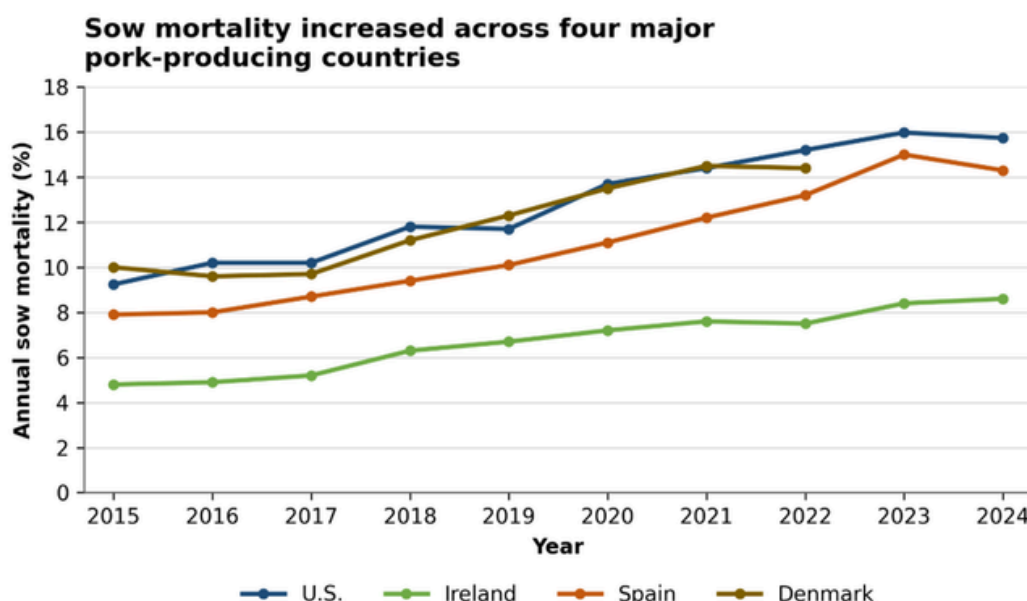


Figure 1. Annual sow mortality in the U.S., Ireland, Spain, and Danish herds from 2015 to 2024 (Denmark 2015 to 2022; Chat GPT).

than 600 individual death and euthanasia codes into six categories (Figure 2). These classifications include: Performance (due to difficulty farrowing, parity, or old age); Reproduction (due to abortions, not in pig, returns, and prolapses); Locomotion (due to lameness, broken bones, and feet/legs injuries); Intestinal (due to ulcers and gut related issues); Disease/Health (due to C-section, ileitis, sickness, twisted gut, stress) and Other (due to unknown causes).

Retained pigs, prolapses, reproduction, lameness, and other causes

Farrowing-associated problems deserve special attention because risk is concentrated around late gestation, parturition, and early lactation. Difficult farrowing, retained piglets, uterine infection, mastitis, anorexia, and acute metabolic or gastrointestinal disorders can progress rapidly. Management records frequently classify these cases simply as 'other,' 'sudden death,' or 'farrowing difficulty,' which is why routine necropsy of a representative subset of deaths is critical.

Pelvic organ prolapse remains a major, multifactorial cause of loss. Potential contributors investigated in U.S. work include body condition, perineal score, genetics, housing, feed particle size, mycotoxins, water quality, induction and obstetrical procedures, and health status. Research has found meaningful genetic variation with across-parity heritability of approximately 0.35. This does not mean POP can be solved genetically; rather, it establishes that genetic selection can be one component of a broader prevention program.

Category	2024	2025
Disease/Health	31.1%	25.1%
Intestinal	0.9%	1.0%
Locomotion	17.9%	22.4%
Other	25.5%	21.4%
Performance	20.1%	5.5%
Reproduction	4.6%	24.6%
Total	100.0%	100.0%

*Prolapse moved from Performance to Reproduction category

Figure 2. Sow mortality reasons between 2024 and 2025, MetaFarms, 2025

Lameness remains a leading reason for euthanasia and premature removal. Poor feet and leg structure should be selected against before gilts enter the breeding herd. Once a sow is severely lame or down, treatment success is limited and welfare concerns may require euthanasia. Therefore, prevention through proper flooring, nutrition, hoof integrity, and appropriate body weight are key factors.

Porcine reproductive and respiratory syndrome

Herd health changes the background risk against which all other mortality factors operate. PRRS is especially important because it reduces reproductive performance, alters feed intake, increases secondary disease pressure, and consumes labor that would otherwise be available for routine sow care. A recent U.S. industry estimate placed 30% of the U.S. herds with active PRRS outbreaks with another 20% PRRS positive but stable. Only 40% of the herds in the U.S. were PRRS negative. It is estimated that the annual economic cost of PRRS at approximately \$1.2 billion USD,

including \$380.8 million USD in the breeding herd. Even when PRRS is not listed as the direct cause of sow death, outbreaks can increase abortions, fever, anorexia, respiratory compromise, and the number of animals requiring individual care.

Improving Sow Longevity

Gilt development and management

The most effective longevity program starts with gilts before first mating. The goal should include successful development of a parity-1 female that is structurally sound, reproductively mature, and likely to remain through at least parity 3. Data indicate that gilts bred before 225 days of age had greater retention and more pigs born through parity 3, whereas females bred above approximately 160 kg had lower retention, particularly from parity 1 to parity 2 (Canavate and Dritz, 2025). Producers should therefore track age and weight at first service, estrus number, structural soundness, parity-1 lactation performance, wean-to-service interval, and reasons for P1-to-P2 removal.

Gestation feeding and body condition: using the caliper

Gestation nutrition should restore condition lost in the previous lactation without creating an over-conditioned sow. This is increasingly important because modern females have more lean tissue and less backfat than older genetic lines. Over-conditioned sows tend to consume less feed in lactation, lose more weight, and have poorer longevity and subsequent

reproductive performance. Conversely, thin sows enter lactation with inadequate reserves and may experience excessive tissue mobilization which can lead to welfare concerns and increased mortality.

The sow caliper provides a practical way to make feeding decisions more objective. The value of the caliper is not the device itself but the consistency it creates. Caliper scoring around the time of weaning (or breeding) can be used to make feeding or culling decisions. For example, weaned sows with a caliper score less than 7, will likely not recover regardless of feeding program and should be culled. Caliper readings between 7 and 10 should be skipped and mated on the following estrus. Sows with caliper scores of 10 to 13 should be, provided extra feed during gestation and readings greater than 13 should be fed the normal herd's feed allowance.

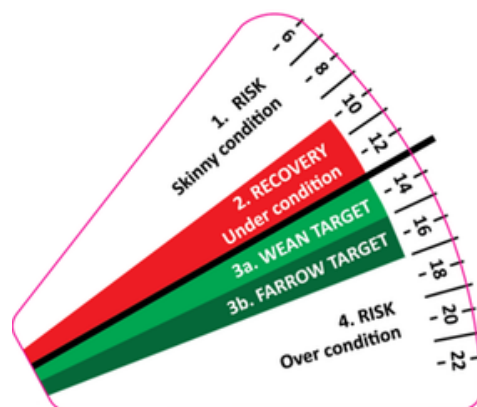


Figure 3. Use of a sow body-condition caliper to objectively assess body condition (Knauer and Baitinger, 2015). The caliper is positioned over the sow's last rib to quantify topline angularity and help guide gestation feeding.

Lactation management: feed intake and early intervention

Lactation is where multiple risks converge: high milk demand, rapid changes in nutrient requirements, large litters, farrowing stress, and the possibility of uterine disease, lameness, or anorexia. The nutritional objective is to drive feed intake while minimizing unnecessary body-condition loss.

Daily feed intake is also one of the most useful health-monitoring tools available. The Iowa State early-intervention program used lactation feeding time as the observation window. Staff are encouraged to walk the farrowing rooms while animals are being fed, flag any sow that is not eating or not at the feeder, and return later to examine and treat her according to the farm's standard operating protocol. Lack of appetite was the most useful early signal, often appearing before a sow was obviously ill. The program's central lesson was that by the time a compromised sow is recumbent or severely affected, treatment may be too late.

Conclusions

Improving sow livability requires a shift from viewing mortality as an unavoidable endpoint to treating retention as a measurable production process. The goal is to reduce avoidable losses, especially before the sow has recovered her development cost and before the most productive middle parities. International comparisons show that high productivity does not guarantee low mortality: Denmark produces exceptionally high numbers of pigs per sow

while mortality remains near U.S. levels, whereas Ireland currently operates at lower mortality but has also experienced an upward trend.

The most practical opportunities are consistent across systems: develop structurally sound gilts and mate them within appropriate age and weight targets; manage body condition throughout gestation with objective tools such as the caliper; encourage feed intake and limit excessive tissue loss in lactation; aggressively manage lameness and farrowing-associated disease; maintain strong herd-health and PRRS-control programs; and make daily observation of appetite and behavior a formal job responsibility. Finally, accurate cause-of-death records and periodic necropsies are essential. A farm cannot improve what it does not measure, and mortality codes that collapse complex biological failures into 'other' provide little direction for prevention.

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