

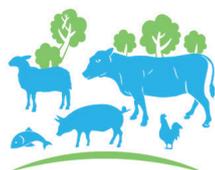


The Case Against High-Concentration CO₂ Stunning and Killing of Pigs

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Executive Summary

Around 10 million pigs are slaughtered in the UK each year.¹ DEFRA has reported in 2024 that 90% of pigs are now stunned/killed using high concentration CO₂ in England and Wales.² CO₂ stunning/killing causes severe suffering for up to 30-60 seconds prior to loss of consciousness and death.³ There are viable alternatives to the use of high-concentration CO₂ stunning, the most promising for both pig welfare and economic factors being inert argon gas.⁴ The RSPCA has stated in a March 2025 open letter to Government that the suffering endured by pigs is “unnecessary, preventable, and incompatible with the UK’s commitment to animal welfare”.⁵

The British public demonstrates a consistent preference for governments to protect farmed animal welfare, with consistent supermajority (>67%) support for stronger government legislation.⁶ We are not aware of specific polling on attitudes to high-concentration CO₂ stunning/killing, but extrapolating from polling on farmed animal welfare, there will be substantial majority opposition. At the same time, the British public is largely unaware of the practice of high-concentration stunning/killing pigs. A 2020 YouGov poll found that 78% did not know if this happens often in the UK, and 8% believed it happens rarely (5%) or not at all (3%).⁷ Only 14% believed that CO₂ was used a lot (5%) or a fair amount (9%) when slaughtering animals in the UK.

¹ "Total Amount of Annually Slaughtered Clean Pigs in the United Kingdom (UK) from 2003 to 2023." accessed 19 April, 2023, <https://www.statista.com/statistics/298330/clean-pigs-slaughtering-in-the-united-kingdom-uk/>.

² Department for Environment Food and Rural Affairs, *Results of the 2024 FSA Slaughter Sector Survey in England and Wales* (London, UK, 2024), https://assets.publishing.service.gov.uk/media/67c5cf0e750837d7604dbdbf/25-02-14_Slaughter_Sector_Survey_2024_REVISSED_.pdf.

³ Søren Saxmose Nielsen et al., "Welfare of pigs at slaughter," *EFSA Journal* 18, no. 6 (2020). Merel Verhoeven et al., "Time to loss of consciousness and its relation to behavior in slaughter pigs during stunning with 80 or 95% carbon dioxide," *Frontiers in veterinary science* 3 (2016).

⁴ Jenny L Mace and Andrew Knight, "Pig welfare and ethical considerations during abattoir stunning: CO₂ vs. alternative methods such as argon gas," *Frontiers in veterinary science* 12 (2025). Elena Nalon, "European Commission's project finds viable alternatives to high-concentration CO₂ stunning of pigs," (2025). <https://www.linkedin.com/pulse/european-commissions-project-finds-viable-co-stunning-elena-nalon-eavmf/?trackingId=hIKLL4mTI6S%2FacGEMp5gg%3D%3D>.

⁵ Royal Society for the Prevention of Cruelty to Animals and Compassion in World Farming, *Open Letter: An Urgent Call to End the Use of High-Concentration CO₂ in Pig Slaughter* (2025), <https://www.rspca.org.uk/getinvolved/campaign/farming/pigstunning>.

⁶ See Appendix I of this report and Steven McCulloch, Paul Chaney, and Lisa Riley, *Political Animals: The Democratic and Electoral Case for Strong Animal Welfare Policies in UK General Elections*, Humane Society International UK (London, UK, 2024), <https://www.politicshome.com/ugc-1/1/21/0/Political%20Animals%20Report%20-%20Final%2012..pdf>.

⁷ YouGov. *What Do Brits Think of UK Farming Practices?* YouGov (2020). https://docs.cdn.yougov.com/iyxfibltcj/Internal_AnimalWelfare_200901_W.pdf. Prescott-Smith. "What Do Brits Think of UK Farming Practices?" 2025. (2020). Accessed 20 April, 2025. <https://yougov.co.uk/topics/consumer/articles-reports/2020/09/29/what-do-brits-think-uk-farming-practices>.

There is therefore major market failure in the UK with respect to high-concentration CO₂ killing of pigs, due to lack of public awareness and information asymmetry.⁸ Currently, widespread misleading labelling and marketing means that consumers, including those who pay a premium for higher welfare products, are largely unaware that the pork they consume is produced from pigs experiencing severe suffering at slaughter. Given widespread suffering, British public preferences to protect farmed animal welfare, and impacts on consumers, legislation on pig slaughter in the UK is clearly a case of policy failure in need of urgent reform.

The report makes the following five recommendations to reform UK slaughter policy for pigs:

1. Government should urgently introduce legislation to ban the use of high-concentration CO₂ stunning/killing of pigs. Given the severe welfare impacts⁹ in around 90% of pigs slaughtered in the UK, the method must be phased out within three years, by 2028.
2. Legislation in the UK currently requires killing, as well as stunning, of pigs when using gases. Government should amend the relevant legislation¹⁰ to permit pigs to be stunned, and not necessarily killed, to make the use of alternative gases such as argon more feasible.
3. Government should provide funding for abattoirs to retrofit slaughterhouses using CO₂ stunning to facilitate the change to inert gases such as argon.¹¹
4. Government should adopt the recommendations of the National Food Strategy (the 2021 'Dimbleby report') for a 30% reduction in meat consumption by 2032.^{12 13}
5. Government should not permit meat from pigs killed using high concentration CO₂ to be labelled as higher welfare, as the practice is clearly misleading to consumers.¹⁴ Such schemes include Red Tractor, RSPCA Assured and Soil Association Organic.

⁸ Government, industry, food assurance schemes and supermarkets are aware of high concentration CO₂ stunning/killing welfare impacts, but consumers are not.

⁹ Nielsen et al., "Welfare of pigs at slaughter."

¹⁰ The Welfare of Animals at the Time of Killing (England) Regulations 2015 and parallel legislation in devolved administrations. <https://www.legislation.gov.uk/uksi/2015/1782/contents/>. [Accessed 18 April 2025]

¹¹ In line with the public goods for public money principle under the Agriculture Act 2020. <https://www.legislation.gov.uk/ukpga/2020/21/contents>. [Accessed 18 April 2025]

¹² Henry Dimbleby, *National Food Strategy: The Plan (Part Two: Final Report)* (2021), https://www.nationalfoodstrategy.org/wp-content/uploads/2021/10/25585_1669_NFS_The_Plan_July21_S12_New-1.pdf.

¹³ The recommendations of the National Food Strategy are based on UK Climate Change Committee recommendations to reduce greenhouse gas emissions to meet net zero targets. Reduced meat consumption should have substantial benefits for farmed animal welfare. In the context of pig slaughter, high levels of meat consumption contribute to arguments for the continued use of high concentration CO₂ within the paradigm of highly intensive farming practices and maximising economic efficiency.

¹⁴ Digital Markets, Competition and Consumers Act 2024.

<https://www.legislation.gov.uk/ukpga/2024/13/contents>. [Accessed 3 April 2025]

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FAWC 2003 and EFSA 2020 Recommendations to Ban High-Concentration CO₂ Stunning of Pigs

The British Farm Animal Welfare Council (FAWC) recommended in a 2003 report that high concentration CO₂ use for stunning pigs should be prohibited by law.¹⁵ At the time the report was published, FAWC documented there to be around one third of pigs in Britain being stunned using high concentration CO₂. Based on scientific evidence available at the time, FAWC concluded “the use of high concentrations of CO₂ to stun and kill pigs is not acceptable and we wish to see it phased out in five years.” (FAWC 2003, p.29)

The European Food Safety Authority (EFSA) is widely considered to be the most authoritative welfare advisory body in the world. In its 2020 ‘Welfare of pigs at slaughter’ scientific opinion, EFSA stated the following on the welfare consequences of high concentration CO₂ use in pigs:¹⁶

“Exposure to CO₂ at high concentrations (defined in this opinion as higher than 80% by volume) is considered a serious welfare concern by the Panel, because it is highly aversive and causes pain, fear and respiratory distress.” (EFSA 2020, p.100)

The findings led EFSA to recommend a ban on high-concentration CO₂ stunning in the EU.

High-Concentration CO₂ Welfare Impacts on Pigs

The EFSA (2020) recommendations were based on scientific findings from a large body of literature on high-concentration CO₂ stunning in pigs. Examples of evidence include Verhoeven et al. (2016), who found that exposure to 80% and 95% CO₂ was associated with retreat attempts, jumping and gasping prior to loss of consciousness.¹⁷ They found that time to loss of consciousness was 47+/-6 seconds in 80% CO₂ and 33+/-7 seconds in 90% CO₂. Steiner et al. (2019) have reviewed the use of CO₂ stunning in a range of species, including pigs, and reported a range of welfare compromises including air hunger, anxiety, fear, and pain.¹⁸

Humane stunning can mean the instantaneous loss of consciousness, such that the animal does not experience pain, distress or suffering. Alternatively, humane stunning could mean the loss of consciousness over a period of time, which was not associated with pain,

¹⁵ Farm Animal Welfare Council, *Report on the Welfare of Farmed Animals at Slaughter or Killing - Part 1: Red Meat Animals*, Farm Animal Welfare Council (London, 2003), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325241/FAWC_report_on_the_welfare_of_farmed_animals_at_slaughter_or_killing_part_one_red_meat_animals.pdf.

¹⁶ Nielsen et al., "Welfare of pigs at slaughter."

¹⁷ Verhoeven et al., "Time to loss of consciousness and its relation to behavior in slaughter pigs during stunning with 80 or 95% carbon dioxide."

¹⁸ Aline R Steiner et al., "Humanely ending the life of animals: Research priorities to identify alternatives to carbon dioxide," *Animals* 9, no. 11 (2019).

distress and suffering.¹⁹ High concentration CO₂ causes a range of severe welfare impacts in pigs, until loss of consciousness between 30 to 60 seconds.²⁰

Based on a review of the evidence, Mace and Knight (2025) summarise the welfare impacts of high-concentration CO₂ on pigs as follows:

“CO₂ is an aversive stimulant to pigs, which is why they respond in these ways [gasping, vocalizations (squeals), and escape attempts]. CO₂ irritates the mucosal lining of the trachea and nostrils, and when combined with natural bodily moisture, carbonic acid can also form on the eyes... CO₂ causes acidosis (acidifying blood and tissues) and hypercapnia (excessive levels of CO₂ in the blood), which creates a sense of breathlessness, hyperventilation, and “air hunger”.” (Mace and Knight, 2025, p.2)

In its 2020 report, EFSA concluded that the only way to prevent the pain, fear and respiratory distress caused by high concentration CO₂ was to replace it with other gas mixtures:

“There are no preventive or corrective measures to the pain, fear and respiratory distress caused by the exposure to high CO₂ concentrations as this is inherent to the stunning method. The only way to prevent the hazard related to exposure to high CO₂ concentrations is to use other gas mixtures like inert gasses or mixtures of inert gases containing low CO₂ concentrations” (EFSA 2020, p.68)

Higher Welfare Alternatives to CO₂ Stunning and Killing

Commercially in the UK, pigs are stunned either with high concentration CO₂ gas or by electrical stunning. The benefit of using gas is that pigs can be stunned in groups, which provides welfare and economic benefits compared to separating pigs to perform electronarcosis. Despite this, as documented above, high concentration CO₂ is highly aversive to pigs and causes a range of severe welfare impacts.

Alternatives to CO₂ stunning are therefore either improved electrical stunning, or stunning using less aversive gases than CO₂.²¹ The inert gases nitrogen, argon, xenon and helium have been demonstrated to be less aversive than CO₂ to pigs.²² Argon, like CO₂, is heavier than air and therefore easier to contain in a slaughterhouse environment. EFSA (2020)

¹⁹ Donald M. Broom, *Domestic Animal Behaviour and Welfare* (Wallingford, UK: CABI, 2022), 545.

²⁰ E.g., see Verhoeven et al., "Time to loss of consciousness and its relation to behavior in slaughter pigs during stunning with 80 or 95% carbon dioxide."

²¹ A DEFRA-funded Humane Slaughter Association study found that low atmospheric stunning (LAPS) caused barotrauma and severe ear pain in pigs. Department for Environment Food and Rural Affairs and Humane Slaughter Association, *Developing an alternative method to the use of high concentration CO₂ for the commercial stunning of pigs - MH0154* (London, UK, 2020), <https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectId=19805>.

²² Nielsen et al., "Welfare of pigs at slaughter." *ABM Raj and Neville G Gregory*, "Welfare implications of the gas stunning of pigs 1. Determination of aversion to the initial inhalation of carbon dioxide or argon," *Animal welfare* 4, no. 4 (1995).

reports that time to reach unconsciousness with argon is both shorter and less variable compared to exposure with high concentration CO₂. For example, EFSA (2020) cites Raj et al. (1997) who found indicators of loss of consciousness in pigs in 13-18 seconds with argon, compared to 17-25 seconds for high concentration CO₂.²³

As it is less aversive and causes a more rapid loss of consciousness, argon is therefore superior to CO₂ from a welfare perspective. In terms of economic costs, argon is slightly more expensive than CO₂ and means a longer time to death (seven minutes compared to five with CO₂).²⁴ These factors mean that switching from CO₂ to argon will involve some increased costs. Despite this, it should be clear that continued use of high concentration CO₂ is completely unacceptable from a welfare point of view.

European Commission PigStun Project and Retrofitting CO₂ Sites to Use Argon

The European Commission commissioned the three-year PigStun project to investigate practical alternatives to high-concentration CO₂ stunning of pigs. PigStun investigated four methods: an argon retrofit system that can be adapted to current CO₂ stunning equipment, a helium system, an adapted CO₂ stunning system, and improved electrical stunning. The findings were presented at the final workshop of the PigStun project in April 2025.²⁵

Dr Elena Nalon, senior veterinary adviser at Eurogroup for Animals, summarised the PigStun findings in her article 'European Commission's project finds viable alternatives to high-concentration CO₂ stunning of pigs'.²⁶ Nalon documents how the argon retrofit system performed best for both animal welfare and feasibility, since argon generally does not cause irritation to the airways of pigs nor agitation prior to loss of consciousness.²⁷ Furthermore, argon gas is readily available, and the argon stunning system can be installed using existing CO₂ slaughterhouse infrastructure, greatly facilitating conversion.²⁸

²³ Note the longer duration to loss of consciousness findings in Verhoeven et al (2016) documented above: 47+/-6 seconds in 80% CO₂ and 33+/-7 seconds in 90% CO₂. [Verhoeven et al.](#), "Time to loss of consciousness and its relation to behavior in slaughter pigs during stunning with 80 or 95% carbon dioxide."

²⁴ [Mace and Knight](#), "Pig welfare and ethical considerations during abattoir stunning: CO2 vs. alternative methods such as argon gas."

²⁵ See "PigStun Dossier," EU Reference Centre for Animal Welfare: Pigs, 2025, accessed 18 April, 2025, <https://eurcaw-pigs.eu/dossier/pigstun>.

²⁶ Elena Nalon, "European Commission's project finds viable alternatives to high-concentration CO₂ stunning of pigs," (2025). <https://www.linkedin.com/pulse/european-commissions-project-finds-viable-co-stunning-elena-nalon-eavmf/?trackingId=hKLL4mTI6S%2FacGEMp5gg%3D%3D>.

²⁷ Nalon (2025) also reported the PigStun findings of potential for improved electrical stunning, with a large commercial slaughterhouse in the Netherlands using the system for two and a half years and maintaining a high throughput.

²⁸ Nalon reports the important point that the European Commission expressed satisfaction with the results of the PigStun project and encouraged industry to move away from high-concentration CO₂ stunning. The Commission also stated that the methods tested by PigStun (inert gases and improved electrical stunning) are already listed as approved in Council Regulation 1099/2009, meaning they do not need to go through the regulatory approval process, though for argon the technical specifications will need to be added within the Annex of the Regulation.

Concluding her article summarising the PigStun findings, Nalon wrote the following with respect to the EU context:

“Considering the findings of the PigStun project, it is clear that continuing to use high-concentration CO₂ stunning is no longer acceptable from a scientific and ethical standpoint. The European Commission EU Health and Food Safety should phase out this method and consider introducing financial incentives for early adopters.” (Nalon, 2025)

UK Context and RSPCA Campaign

Returning to the UK context, the RSPCA has stated in a March 2025 open letter to the Government that animal advocates, scientists, industry and farmers believe that recent technical advancements mean that phasing out CO₂ is now economically and practically possible.²⁹ Based on this, the RSPCA recommend that the Government amend relevant UK legislation such that pigs do not need to be killed when they are stunned, as is the case in the EU, which will make alternatives gases like argon more feasible to use. The RSPCA also recommends that Government provide funding to slaughterhouses to retrofit existing CO₂ sites, so that argon or other potential alternatives can be used.³⁰ Given there are a relatively small number of slaughterhouses using high concentration CO₂, government policy to support retrofitting existing sites should be both practical and highly impactful.

UK Slaughter Legislation

Slaughter legislation in the UK and the western world has long been based on the principle of humane killing. This has generally been provided for through stunning prior to slaughter causing instantaneous loss of consciousness. Humane slaughter could also involve stunning that did not cause instantaneous loss of consciousness, but which was not aversive or otherwise cause suffering to farmed animals.³¹

EC Council Regulation 1099/2009 on the protection of animals at the time of killing (PATOK) is retained EU legislation still in force in the UK.³² EC Council Regulation 1099/2009 is implemented by the Welfare of Animals at the Time of Killing (England) Regulations 2015³³ and equivalent regulations in devolved nations.

²⁹ [Royal Society for the Prevention of Cruelty to Animals and Compassion in World Farming, Open Letter: An Urgent Call to End the Use of High-Concentration CO₂ in Pig Slaughter.](#)

³⁰ In line with the public money for public goods principle of the Agriculture Act 2020. See further sections of this report on public preferences for government regulation to protect animal welfare and the current state of market failure in the UK.

³¹ [Broom, Domestic Animal Behaviour and Welfare](#), 545.

³² Council Regulation (EC) No 1099/2009. <https://www.legislation.gov.uk/eur/2009/1099/contents>. [Accessed 18 April 2025]

³³ The Welfare of Animals at the Time of Killing (England) Regulations 2015. <https://www.legislation.gov.uk/uksi/2015/1782/contents>. [Accessed 18 April 2025]

Article 3 of EC Council Regulation 1099/2009 ‘General requirements for killing and related operations’ states the following in Section 1: “Animals shall be spared any *avoidable pain, distress or suffering* during their killing and related operations” (italics mine). Appendix I includes a list of stunning methods and related specifications, which includes CO₂ at high concentration in Table 3. Despite this, the preamble to the 2009 Regulation states clearly that recommendations to phase out the use of CO₂ for pigs were not included in the Regulation because an impact assessment revealed that such recommendations were not economically viable at the time (2009). It then goes on to state that it is important to continue this discussion in the future.

British Public Beliefs and Attitudes to CO₂ Killing of Pigs

The British public is largely unaware of the practice of high-concentration stunning/killing pigs. A 2020 YouGov poll found that 78% did not know if this happens often in the UK, and 8% believed it happens rarely (5%) or not at all (3%).³⁴ Only 14% believed that CO₂ was used a lot (5%) or a fair amount (9%) when slaughtering animals in the UK. Given that 90% of pigs in England and Wales are killed using high concentration CO₂, only around one in 20 British consumers are aware of how pigs are killed to produce pork and other products.

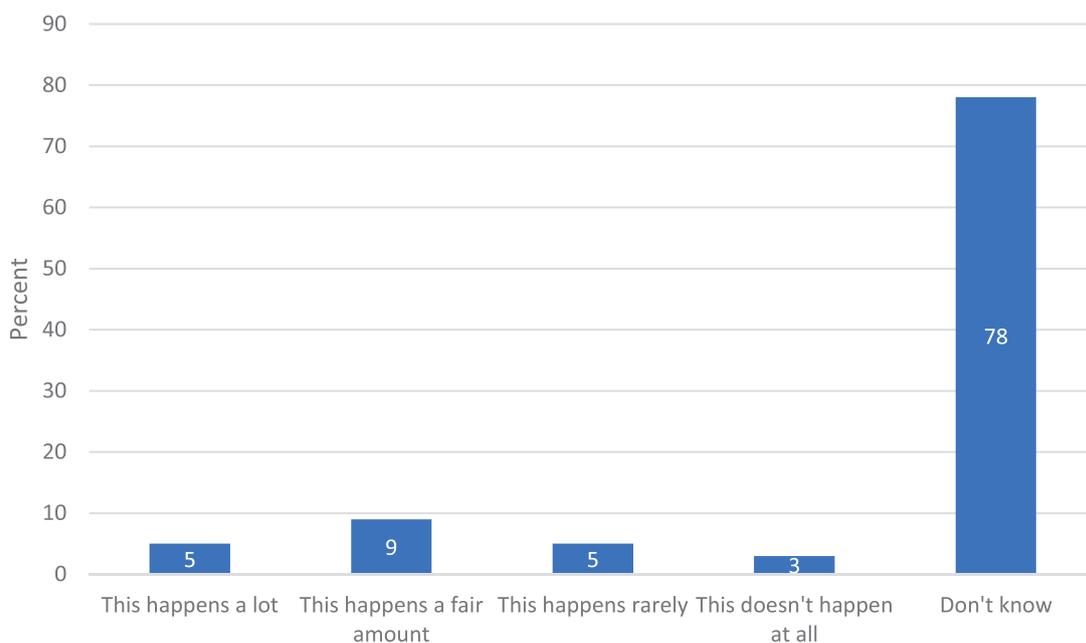


Figure 1: Do these practices happen often in the UK? Use of carbon dioxide when slaughtering animals? (YouGov, 2020).

The British public consistently demonstrates strong support for government regulation to protect farmed animal welfare. Representative polling repeatedly reveals supermajority

³⁴ YouGov. *What Do Brits Think of UK Farming Practices?* YouGov (2020). https://docs.cdn.yougov.com/iyxfibltcj/Internal_AnimalWelfare_200901_W.pdf. Prescott-Smith. "What Do Brits Think of UK Farming Practices?" 2025. (2020). Accessed 20 April, 2025. <https://yougov.co.uk/topics/consumer/articles-reports/2020/09/29/what-do-brits-think-uk-farming-practices>.

levels of support for legislation to ban harmful practices, considered as at least two thirds of the population.³⁵ For instance, 77% support a ban on keeping farmed animals in cages, 77% support a ban on lower welfare imports, 68% support method of production labelling, and 68% support government subsidies to phase out the use of farrowing crates for pregnant and lactating sows. Nearly two thirds (63%) support legislation to phase out intensive farming *per se*, to protect the environment and animals. (See Appendix I for poll references.)

A 2024 RSPCA-commissioned Savanta poll revealed that 35% of consumers *would not* change their buying habits if they were aware of the suffering CO₂ causes to pigs. We do not have access to the full poll data, but this suggests that a large proportion of respondents *would* change their purchasing behaviour if they were aware of the welfare impacts of high-concentration CO₂ killing.³⁶ This therefore suggests a large, probably majority opposition to high-concentration CO₂ killing of pigs, together with a strength of opposition such that those polled would change their buying habits.

Note the problem with contemporary pig farming and the pork industry in this context; majority are not aware of this harmful practice, which if they were aware they oppose to such a degree that they would not purchase the product. Given that 90% of pigs in England and Wales are killed using high concentration CO₂, this means that around half or more of British consumers would need to abstain from consumption of pork, bacon and other pig products for their purchasing and consumption habits to align with their beliefs and values.³⁷

Pig Slaughter and Government Policy Failure

Given the serious suffering CO₂ stunning causes to pigs, given that the British public strongly supports legislation to protect farmed animal welfare, and given that they know very little about pig slaughter, slaughter legislation for pigs in the UK is clearly a case of

³⁵ [McCulloch, Chaney, and Riley](#), *Political Animals: The Democratic and Electoral Case for Strong Animal Welfare Policies in UK General Elections*.

³⁶ This figure would be 65% of consumers if the question was a simple binary 'yes' or 'no' item, or perhaps more like 50% of consumers, if around 15% were 'unsure' or 'uncertain'. [Royal Society for the Prevention of Cruelty to Animals](#), "Recent polling shows that 35% of shoppers wouldn't change their buying habits despite discovering about the suffering caused by CO2 gas.," 2025.

³⁷ Of course, there are other major problems with the British pig industry. These are principally widespread mutilations, where 70-80% of piglets have their tails amputated, despite routine tail docking being prohibited under The Mutilations (Permitted Procedures) (England) Regulations 2007. And around 60% of the UK's breeding herd, almost all those kept indoors, being confined in farrowing cages for around five weeks each litter, 2.3 times per year, or nearly a quarter of their adult breeding lives. The female pigs are so closely confined in these cages that they cannot even turn round, such that farrowing crates violate all five welfare needs in Section 9 of the Animal Welfare Act in England and Wales. [S. McCulloch](#), "The veterinary profession must condemn intensive pig farming," *Veterinary Record* 195, no. 8 (2024). [Steven McCulloch](#), "Pig vets, pig tails, British pork and the law," *Veterinary Record* 196, no. 6 (2025). See S. McCulloch, *Banning Farrowing Crates in the UK: Transitioning to Free Farrowing to Meet the Welfare Needs of Pigs*, Conservative Animal Welfare Foundation (UK, 2022), <https://www.conservativeanimalwelfarefoundation.org/wp-content/uploads/2022/07/Banning-Farrowing-Crates-Report-Brochures-V6.pdf>.

government policy failure. Pig slaughter is a case of policy failure simply because the objective of legislation is humane slaughter. For example, Council Regulation (EC) No 1099/2009 provides for a duty to spare animals any “avoidable pain, distress or suffering” during their killing.³⁸ The claim that high-concentration CO₂ stunning/killing is the “only commercially viable option” is based on successive government not implementing and enforcing legislation to protect pig welfare at slaughter, and the pig industry’s lack of investment in humane alternatives.

Furthermore, high-concentration CO₂ stunning/killing itself is only “commercially viable” because the British public are largely unaware of the practice and the suffering it causes. If British consumers were more aware, given the severe suffering it causes, the terrible optics of pigs writhing in gas chambers, and the emotive nature of slaughter, it is obvious that high-concentration CO₂ stunning/killing itself would be far from commercially viable.³⁹ The same applies for instance in the European Union, given similarly high use of CO₂ stunning in pigs and Eurobarometer surveys demonstrating consistent public preferences for strong farmed animal welfare protections.

Furthermore, government policy that continues permitting CO₂ stunning of pigs is not only a problem for transparency in food production and consumer rights, but it poses a major risk for public trust in the British pork industry. This is particularly the case because governments, the pork industry, the veterinary profession, and other stakeholders have known about the severe welfare harms for over two decades, and the current situation is clearly incompatible with a nation that seriously values farmed animal welfare, transparency in food production, and consumer rights related to ethical attributes of food consumption. For these reasons, there is a very real risk of significant public backlash against the British pork industry, when consumers become more aware of high-concentration CO₂ stunning/killing in pigs.^{40 41}

³⁸ Council Regulation (EC) No 1099/2009. <https://www.legislation.gov.uk/eur/2009/1099/article/3>. [Accessed 20 April 2025]

³⁹ As the public as consumers would not purchase pig meat produced from such cruelty.

⁴⁰ The British film ‘Pignorant’ (2024) is focused on the first undercover video footage of pigs in UK slaughterhouses. The film is likely to continue to significantly raise public awareness of the use of high concentration CO₂ as a stunning and killing method for pigs. Joey Carbstrong, “Pignorant,” (2024). <https://pignorantfilm.com/>.

⁴¹ Note also the fundamentally important point made by Mace and Knight (2025): “if no feasible stun method exists that can provide acceptable animal welfare outcomes, then from ethical and animal welfare perspectives, the species concerned should not be slaughtered in abattoirs.” [Mace and Knight](#), “Pig welfare and ethical considerations during abattoir stunning: CO₂ vs. alternative methods such as argon gas,” 02.

Mace and Knight’s conclusion may at first sight appear radical. Despite this, it clearly follows first from the UK’s long standing policy objective and repeated statements by governments, the veterinary profession and stakeholders that farmed animals should/must be provided a *humane death* at slaughter. And secondly, it follows from the rapidly increasing availability of meat alternatives, such that it is becoming increasingly problematic to argue the case for the necessity of meat consumption in the year 2025.

Pig Slaughter and Market Failure

There is a major lack of transparency in the UK about the welfare impacts of high-concentration CO₂ stunning/killing of pigs. This lack of transparency causes a moral problem in relation to citizens with stated preferences for government to protect farmed animal welfare, and for consumers who have the right to make informed decisions about the food they purchase. From an economic and policy standpoint, misleading labelling and marketing generates major market failure, given that only around 14% of British consumers believe that CO₂ is used either a lot (5%) or a fair amount (9%).⁴² Indeed, given that 90% of pigs in England and Wales are killed using high concentration CO₂, only one in 20 UK consumers is aware of the reality of British pig slaughter practices, which given the severe suffering caused to a highly sentient farmed animal, is a staggering statistic.^{43 44}

The lack of transparency in pig farming and pork production begins with government and its agencies. For instance, the 'Results of the 2024 FSA Slaughter Sector Survey in England and Wales' categorises how animals were slaughtered to a significant degree with a focus on standard methods, halal methods, or shechita methods. The survey also includes a focus on whether animals were *stunned* prior to slaughter. The survey states the following on pigs:⁴⁵

"90% of pigs were stunned with high concentration CO₂ with almost all the remaining 10% being stunned through electronarcosis to the head. In 2022 the proportions were 88% and 12% respectively. *All pigs were stunned before slaughter.*" (DEFRA, 2024, p.10) (Italics mine)

The key point here is that the British public will largely falsely equate "stunning" with *humane slaughter*, in contrast to considering "non-stun" slaughter being *inhumane*. But as described in this report, high-concentration CO₂ stunning/killing causes *severe suffering* to pigs.⁴⁶ Furthermore, governments, industry, and the veterinary profession have known about this for over two decades.

⁴² YouGov. *What Do Brits Think of UK Farming Practices?* YouGov (2020).

https://docs.cdn.yougov.com/iyxfibltcj/Internal_AnimalWelfare_200901_W.pdf. Prescott-Smith. "What Do Brits Think of UK Farming Practices?" 2025. (2020). Accessed 20 April, 2025. <https://yougov.co.uk/topics/consumer/articles-reports/2020/09/29/what-do-brits-think-uk-farming-practices>.

⁴³ On market failure, see for instance Farm Animal Welfare Committee, *Economics and Farm Animal Welfare*, Farm Animal Welfare Committee (London: Farm Animal Welfare Committee, 2011); John McInerney, *Animal welfare, economics and policy: Report on a study undertaken for the Farm & Animal Health Economics Division of Defra* (London, 2004), <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=3ee106ec1b5c7e58e0ff2144a11057ab23347486>.

⁴⁴ The situation is very similar for farrowing crates. In a *Survation* 2023 poll, 63% had not heard of farrowing crates, and 14% had heard of them but didn't know much, if anything, about them. [Survation](#), *Topical Poll March 2023: Conducted by Survation on behalf of Humane Society International*.

⁴⁵ [Department for Environment Food and Rural Affairs](#), *Results of the 2024 FSA Slaughter Sector Survey in England and Wales*.

⁴⁶ I have used the 2024 Food Standards Agency (FSA) as an illustrative example. The point being made is that the discourse around farmed animal welfare at slaughter tends to centre around conventional

In terms of certification schemes, Red Tractor, RSPCA Assured, and Soil Association Organic all prohibit non-stun slaughter for halal or shechita. Despite this, they all *permit* the use of high concentration CO₂ stunning/killing. The Red Tractor ‘Pork standards’ page omits any reference to CO₂ stunning/killing of pigs.⁴⁷ The RSPCA Assured homepage, under ‘Our Assurances’, includes the false claim ‘Humane Slaughter’ (with a large green tick).⁴⁸

Similarly, the British supermarket Sainsbury’s recently announced a ten-year deal with Cranswick Foods, posting on LinkedIn ‘We’re going the whole hog on welfare!’.⁴⁹ The announcement related to a deal for Cranswick to move some of its farms from permanent to temporary crating, despite animal protection NGOs supporting a full ban on cages.⁵⁰ Again, this kind of messaging on social media is highly misleading, in part as Cranswick has its own high-concentration CO₂ processing plant. The deal is a very long way from ‘going the whole hog’, and a deal for temporary crates and not fully free farrowing remains a major welfare problem for breeding sows. Again, this is misleading to British consumers.

The UK Centre for Animal Law stated the following in its submission to the Government’s Animal Welfare Committee 2024 consultation on CO₂ stunning/killing:

“Until an alternative can be found that scientists agree meets the high welfare standards generally protected under the 2009 Regulation and WATOK, *meat from pigs killed using CO₂ should not be permitted to be labelled as high welfare, as this is misleading to consumers.* Currently, voluntary assurance schemes Red Tractor, RSPCA Assured, and Soil Association Organic, require stunning prior to slaughter for certification, giving a *false impression* to consumers that the stunning provided assures high animal welfare.” (UK Centre for Animal Law, 2024) (Italics mine)

The recommendation was based on retained Regulation (EU) No 1169/2011 (“the 2011 Regulation”) relating to the provision of food information to consumers.⁵¹ Article 3(1) of the 2011 Regulation provides that:

slaughter with pre-stunning being *good* for welfare, and non-stunned animals being *bad* for welfare. This discourse exists in documents like the FSA 2024 report but is found throughout assurance schemes, supermarket policies, within the veterinary profession and the media, and so on.

⁴⁷ “Pork standards,” accessed 18 April, 2025, <https://redtractor.org.uk/our-standards/pork-standards/>.

⁴⁸ “Homepage,” accessed 18 April, 2025, <https://www.rspcaassured.org.uk/>. The RSPCA Assured webpage for pigs has recently been updated to include some information on CO₂ stunning, but the claim to ‘humane slaughter’ on the homepage obviously remains highly misleading. Regardless, most British consumers will not consult such websites, as they will quite reasonably assume that higher welfare schemes do not assure practices that cause serious suffering to pigs.

⁴⁹ Sainsbury’s, “We’re going the whole hog on welfare!,” 2025.

⁵⁰ “Sainsbury’s and Cranswick sign ten-year partnership to set new standards in pig welfare and to help build a more resilient UK farming sector,” 2025, accessed 18 April, 2025, <https://www.about.sainsburys.co.uk/news/latest-news/2025/20-03-2025-sainsburys-cranswick-partnership-sets-new-standards-in-pig-welfare>.

⁵¹ Regulation (EU) No 1169/2011 of the European Parliament and of the Council. <https://www.legislation.gov.uk/eur/2011/1169/contents>. [Accessed 3 April 2025]

“[t]he provision of food information shall pursue a high level of protection of consumers’ health and interests by providing a basis for final consumers to make *informed choices* and to make safe use of food, with particular regard to health, economic, environmental, social and *ethical considerations*.” (Italics mine)

Furthermore, in its 2024 report ‘Food Chain Misinformation’, the Animal Law Foundation documents how the Digital Markets, Competition and Consumers Act 2024 Act prohibits unfair commercial practices in the UK.^{52 53} It defines these as any practices which are likely to cause an average consumer to make a transactional decision which they would otherwise not have taken, due to misleading action or omission of material information from an invitation to purchase. The Act defines misleading actions as including the provision of false or misleading information, presentation of information likely to mislead consumers, and marketing of a product that creates or is likely to create confusion.

Conclusion and Recommendations

High-concentration CO₂ stunning causes severe suffering to around nine million pigs at slaughter in England and Wales each year. Current slaughter legislation in the UK is a clear case of policy failure; 90% of pigs are stunned/killed with CO₂ and experience up to 30-60 seconds of severe suffering. This is despite slaughter legislation being based on the principle to provide for a *humane death*, and the British public consistently demonstrating strong preferences for government to legislate to protect the welfare of farmed animals.

Furthermore, labelling schemes, supermarkets, the media and other institutions perpetuate, either directly or indirectly, through commission or omission, the false impression that pigs are killed humanely because they are stunned prior to slaughter. For example, Red Tractor, RSPCA Assured, and Soil Association Organic all do not certify products from non-stunned animals, but do certify products from stunned pigs, 90% of which will have been stunned using CO₂ and therefore will have suffered considerably.

Indeed, the lack of British public awareness of CO₂ killing of pigs is staggering. In a 2020 YouGov poll, only one in 20 respondents were aware that CO₂ is used “a lot” to slaughter animals.⁵⁴ Furthermore, there is a major problem with the legitimacy of British pig farming,

⁵² Animal Law Foundation and Animal Equality UK, *Food Chain Misinformation: Misleading Depictions of Animals Raised for Food and How it Affects Public Perception and Purchasing Decisions* (London, UK, 2025),

<https://static1.squarespace.com/static/63257c5fe37f66705b2bcf79/t/67d47219a3ddc9751075ce94/1741976096476/Food+Chain+Misinformation+Report+%28March+2025%29.pdf>.

⁵³ Digital Markets, Competition and Consumers Act 2024.

<https://www.legislation.gov.uk/ukpga/2024/13/contents>. [Accessed 3 April 2025]

⁵⁴ YouGov. *What Do Brits Think of Uk Farming Practices?* YouGov (2020).

https://docs.cdn.yougov.com/iyxfibltcj/Internal_AnimalWelfare_200901_W.pdf. Prescott-Smith. "What Do Brits Think of UK Farming Practices?" 2025. (2020). Accessed 20 April, 2025.

<https://yougov.co.uk/topics/consumer/articles-reports/2020/09/29/what-do-brits-think-uk-farming-practices>.

given public beliefs. A Savanta 2024 poll found that 35% of respondents would not change their consumption habits if they were aware of the suffering CO₂ causes to pigs.⁵⁵ But this suggests that around half or more of British consumers *would* change their purchasing habits. But given that 90% of pigs in England and Wales are killed using high concentration CO₂, such consumers would need to abstain from consuming pork and other pig meat altogether, for their consumption to align with their values.⁵⁶

From both an animal welfare and economic perspective, the inert gas argon is the best alternative to high concentration CO₂ use to stun/kill pigs.⁵⁷ Pigs find argon far less aversive, and the time to loss of consciousness is more rapid compared to high concentration CO₂. The PigStun project has demonstrated that argon is a commercially viable alternative, and existing CO₂ slaughterhouses can be retrofitted for argon use.⁵⁸ The PigStun project also found that improved electrical stunning, currently carried out in a slaughterhouse in the Netherlands, is another commercially viable option with welfare outcomes superior to high concentration CO₂.

Government policy to permit the use of high-concentration CO₂ means continued suffering at slaughter for around ten million pigs in the UK each year. This is a problem for democratic governance as UK citizens consistently demonstrate supermajority (>67%) support for strong farmed animal welfare legislation. And it is a food transparency and consumer rights problem due to widespread misleading labelling and marketing, ultimately resulting in major market failure in the British pig meat sector.

Based on the findings, the report makes the following five recommendations to reform UK slaughter policy for pigs:

1. Government should act urgently to introduce legislation to ban the use of high-concentration CO₂ stunning/killing of pigs. Given the severe welfare impacts⁵⁹ in around 90% of pigs slaughtered in the UK, the method must be phased out within three years, by 2028.
2. Legislation in the UK currently requires killing, as well as stunning, of pigs when using gases. Government should amend the relevant legislation⁶⁰ to permit pigs to be stunned, and not necessarily killed, to make the use of alternative gases such as argon more feasible.

⁵⁵ [Royal Society for the Prevention of Cruelty to Animals](#), "Recent polling shows that 35% of shoppers wouldn't change their buying habits despite discovering about the suffering caused by CO₂ gas.," 2025.

⁵⁶ This should not be considered a radical outcome; it is based on respecting the moral principle to provide for humane slaughter for farmed pigs, which the British public has been led to believe is the reality for some time by governments, industry, supermarkets and other stakeholders.

⁵⁷ [Mace and Knight](#), "Pig welfare and ethical considerations during abattoir stunning: CO₂ vs. alternative methods such as argon gas."

⁵⁸ [Elena Nalon](#), "European Commission's project finds viable alternatives to high-concentration CO₂ stunning of pigs," (2025). "PigStun Dossier," EU Reference Centre for Animal Welfare: Pigs, 2025, accessed 18 April, 2025, <https://eurcaw-pigs.eu/dossier/pigstun>.

⁵⁹ [Nielsen et al.](#), "Welfare of pigs at slaughter."

⁶⁰ The Welfare of Animals at the Time of Killing (England) Regulations 2015 and parallel legislation in devolved administrations. <https://www.legislation.gov.uk/ukxi/2015/1782/contents/>. [Accessed 18 April 2025]

3. Government should provide funding for abattoirs to retrofit slaughterhouses using CO₂ stunning to facilitate the change to inert gases such as argon.⁶¹
4. Government should adopt the recommendations of the National Food Strategy (the 2021 ‘Dimbleby report’) for a 30% reduction in meat consumption by 2032.^{62 63}
5. Government should not permit meat from pigs killed using high concentration CO₂ to be labelled as higher welfare, as the practice is clearly misleading to consumers.⁶⁴ Such schemes include Red Tractor, RSPCA Assured and Soil Association Organic.

⁶¹ In line with the public goods for public money principle under the Agriculture Act 2020.
<https://www.legislation.gov.uk/ukpga/2020/21/contents>. [Accessed 18 April 2025]

⁶² Henry Dimbleby, *National Food Strategy: The Plan (Part Two: Final Report)* (2021),
https://www.nationalfoodstrategy.org/wp-content/uploads/2021/10/25585_1669_NFS_The_Plan_July21_S12_New-1.pdf.

⁶³ The recommendations of the National Food Strategy are based on UK Climate Change Committee recommendations to reduce greenhouse gas emissions to meet net zero targets. Reduced meat consumption should have substantial benefits for farmed animal welfare. In the context of pig slaughter, high levels of meat consumption contribute to arguments for the continued use of high concentration CO₂ within the paradigm of highly intensive farming practices and maximising economic efficiency.

⁶⁴ Digital Markets, Competition and Consumers Act 2024.
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Appendix I: Key Polling of British Public on Farmed Animal Welfare Policy⁶⁵

Table 1: Summary of key polling of the British public for animal welfare legislation and policy.

	Survey question	UK/GB	Poll	Positive response
Government responsibility	Animal welfare should be protected by the government through legislation.	UK	YouGov 2023 ⁶⁶	83%
More government legislation	I would like to see the UK Government pass more laws designed to improve animal welfare and protect animals from cruelty.	GB	Focaldata 2023 ⁶⁷	71%
Intensive farming	The government should bring in legislation to phase out intensive farming to protect the environment and animals.	GB	Focaldata 2023 ⁶⁸	63%
Cages	To what extent would you support or oppose a ban on keeping farmed animals in cages?	UK	YouGov 2020 ⁶⁹	77%
Subsidies to phase out farrowing crates	The government providing financial assistance to support farmers to move from using farrowing crates in pig farming to cage-free farming methods.	UK	Survation 2023 ⁷⁰	68%
Method of production labelling	Do you think that meat and dairy products should or should not be labelled to show the conditions that animals have been reared in, similar to the way shell eggs are currently labelled?	UK	Opinium 2021 ⁷¹	68%
Bans on lower welfare imports	When we ban a type of farming in the UK for being too cruel, we should also ban imports of products produced in the same way overseas.	GB	Focaldata 2023 ⁷²	77%

⁶⁵ Table amended from [McCulloch, Chaney, and Riley](#), *Political Animals: The Democratic and Electoral Case for Strong Animal Welfare Policies in UK General Elections*, 5-6.

⁶⁶ Briony Gunstone, Prescott-Smith, and Zöe Chamberlain, *RSPCA Kindness Index 2023*, YouGov (2023). Gunstone, Prescott-Smith, and Chamberlain, "RSPCA Kindness Index 2023." The Gunstone, Prescott-Smith, and Chamberlain (2023) PowerPoint document was provided by the RSPCA.

⁶⁷ [Focaldata](#), "Animal Welfare - Pre-election Poll - Data Tables - 27092023."

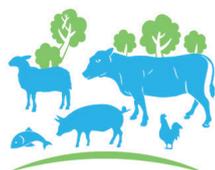
⁶⁸ *Ibid.*

⁶⁹ Respondents were provided the following information: "In the European Union (EU), more than 300 million farmed animals (e.g. hens, pigs, rabbits, ducks, geese, calves etc.) are kept in cages to be raised for food. Some people argue that the confinement and restriction of natural movement caused by cages is not justifiable. Other people argue that cages are necessary for economising farming as it allows animals to be farmed on a large scale." YouGov, *Compassion in World Farming Survey Results*, YouGov (2020). [Compassion in World Farming](#). "88% of UK public think cages are cruel," CIWF, 2020, accessed 18 April, 2025, <https://www.ciwf.org.uk/news/2020/12/88-of-uk-public-think-cages-are-cruel>.

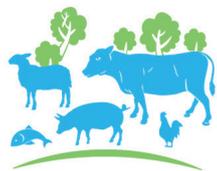
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⁷¹ "Overwhelming majority of British people want clear labelling showing how their meat and dairy was produced, new poll finds," 2021, accessed 20 July, 2023, <https://www.ciwf.org.uk/media/press-releases-statements/2021/12/overwhelming-majority-of-british-people-want-clear-labelling-showing-how-their-meat-and-dairy-was-produced-new-poll-finds>.

⁷² [Focaldata](#), "Animal Welfare - Pre-election Poll - Data Tables - 27092023."



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