



Cows eat grass, don't they?

Results of a social science project on the role of grass-based and indoor systems in the UK dairy sector.

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Contents

Introduction	3
Background	4
Methods	5
Results	6
System differences don't matter	6
Animal welfare	8
Stakeholder interviews: Pro-indoor	8
Stakeholder interviews: Pro-grazing	9
Farmer survey: Preference for cows to graze	11
Farmer interviews: Indoor is fine	12
Farmer interviews: Preferences for cows to graze	13
Grass-fed milk labels	14
Economics and farm origin stories	15
Grass is best	15
Grass isn't best	18
The environment	19
Conflicting accounts	19
Conclusion	21
Appendix 1. Documents analysed	23
Appendix 2. Details of Scottish survey results	25
Acknowledgements	27

Summary

This is a report for the 'Cows eat grass, don't they?' project which ran from 2018-2021 and looked at the future of grass-based, higher-feed-input and indoor dairy systems in the UK and Ireland. It's a social science project funded by the British Academy. This report details the findings of the UK research, another report can be found on the Irish findings, on the project website: www.docowseatgrass.org.

The project is about understanding industry views towards indoor dairy farming and the role of grass and grazing in the UK dairy sector. Research has shown the public aren't in favour of housing cows all year round, but no research has been carried out with those working in the dairy sector in the UK.

The research questions were:

- What are farmer and key stakeholder views of pasture-based and indoor dairy systems in the UK?
- What are farmer and key stakeholder views on the role of grass in the UK dairy sector?
- How can the findings help understand debates about the future of the UK dairy sector?

This report is based on a survey with 254 dairy farmers in Scotland, analysis of 38 documents, interviews with 25 UK key stakeholders and 21 GB dairy farmers.

Findings:

- **Dominant industry view: systems differences don't matter**
The dominant industry view was that system differences (indoor, grass-based, higher-feed-input) don't determine economic, animal welfare and environmental outcomes, but management is more important.
- **Grazing matters**
While farmer research participants also agreed that management was more important than system: 82% of Scottish farmer survey respondents agreed or strongly agreed that stock keeping was more important than management for welfare outcomes, they also had pro-grazing views. 68% agreed or strongly agreed that cows should graze, and 51% agreed or strongly agreed that animal welfare was better if cows grazed.
- **Why grazing matters: farmers enjoy working with cows outside**
Farmer interviewees' preferences for grazing were based on an enjoyment of seeing and working with the cows outside, and did not necessarily equate to negative views about indoor dairy farming.
- **Indoor dairy farming as industrial farming?**
Charity campaigns framed indoor dairy farming as fundamentally different from pasture-based dairy farming because keeping cows indoors means treating them as components in a production system, rather than living creatures. For farmer interviewees, (grazing or non-grazing), indoor dairy farming was not a fundamental change in the relationship with cows. According to farmer interviewees, all farmers need to relate to their animals in terms of productivity, profitability and care, and indoor farming is no different.
- **Moving away from grass is the conventional route**
In the stories farmer interviewees told about the origins of their farms, the 'conventional' route meant a decreasing emphasis on the importance of grazed grass, following advice to increase yields through breeding cows with Holstein genetics fed more concentrate indoors. Farmer interviewees who built their system around grazed grass often got advice from outside the UK and felt they were marginalised in the UK dairy sector.
- **'Grass-based' isn't one thing**
'Grass-based' included farmers whose system was built around maximising milk from grazed grass, using fertiliser inputs; farmers who grazed but also used bought in feed to maximise milk yields; and extensive, low input grass-based farmers. These groups had different diagnoses of the problems in the dairy industry,

different skills, networks, beliefs and farm origin stories. Different ways of calculating farm greenhouse gas emissions can favour grass-based or higher-feed-input systems.

- **Grass-fed labels: industry stakeholders sceptical, farmers more positive**

Many mainstream dairy stakeholder interviewees saw grass-fed labels as potentially divisive and making false claims about the benefits of grazing. The farmers I interviewed generally had more pragmatic views, seeing them as a market opportunity, and for the grazing farmers, a potential financial reward for a practice they enjoyed.

Recommendations for industry:

Embrace diversity without division. The idea that ‘systems differences don’t matter’ is inclusive of all types of dairy systems. But it ignores the ways in which systems differences do matter to farmers and others. Allow parts of the sector to champion their point of differentiation without that being interpreted as divisive.

Consider use of environmental metrics. The development of environmental metrics to assess dairy farms should take into account the diversity of the sector and the fact that some metrics may be beneficial for certain systems over others.

Recommendation for charities/Non-governmental organisations:

Indoor ≠ industrial. Calling indoor dairy farming ‘factory’ or ‘industrial’ farming is too simplistic. While the role of grass and grazing are important in discussions about the environment, animal welfare and a good working life for farmers, language or claims that create a binary between grass-based and indoor systems can ignore complexity on the ground.

Recommendation for government:

How grazing is done matters. If there is going to be public money for public goods for grazing practices this needs to consider how grazing is done to achieve sustainability outcomes, as ‘grass-based’ is not a homogeneous category in the UK in terms of nutrient management and use of inputs. Advisory support may be needed to achieve outcomes.

Introduction

I remember the ‘mega-dairy’ storyline in the rural radio soap opera *The Archers* in 2011. Plans for a 1000 cow indoor dairy farm were dividing the residents of the fictional village of Ambridge. The storyline was partly in response to the real-life controversy over the 2010 proposal for an 8000-cow indoor dairy farm in Lincolnshire. In *The Archers*, farming families were worried about more traffic, pollution, and the dairy farm as a harbinger of ‘industrialisation’ that drives out smaller farms.

In real life, the narrative about indoor dairy farming seemed to coalesce around consumers versus Big Ag. The story often told around scientific or agricultural controversies is that the public don’t understand, if they did, they would no longer object. While it’s definitely true that we, consumers or the public, don’t know much about modern farming, when controversy erupts, it’s usually the case that it has touched a collective nerve and tapped into deeply held anxieties. In the case of indoor dairy farming the anxieties are about the place of animals in society and our interaction with the natural world. Grazing is a ‘natural’ behaviour and being outside in ‘nature’ is important. The word ‘natural’ is vague and confusing but it’s also incredibly powerful for expressing deeply held beliefs that there should be limits to our control over the world around us.

There is research with the public about indoor dairy systems, but not with people who work in the industry. In *The Archers* the indoor farm was creating division within a small rural community, rather than between agricultural insiders and outsiders. I wanted to know how people working in the dairy industry thought about important concepts like naturalness, industrialisation, and human-animal relationships.

I always wanted to know more about the role of grass and grazing in the UK. When I wrote the project proposal in 2016, I was reading about the optimism and excitement in the Republic of Ireland’s dairy sector following the removal of EU milk quotas in 2015. Ireland’s plan was to double milk production in 5 years with more cows eating more grass. The UK and Irish dairy sectors have important structural differences (in terms of calving patterns and markets), but even so, I wanted to know why attitudes towards grass seemed lukewarm in the UK compared to the grass-fanaticism in Ireland. The role of grass has also become important in the discussion of how dairy and other livestock sectors respond to the climate emergency¹.

I was very lucky to get funding from the British Academy to explore these questions for three years. I got to travel around the UK and Ireland speaking to stakeholders and farmers.

The results are laid out under the broad themes of animal welfare, economics and the environment. Each of the sections draws on the interviews I carried out with key stakeholders working in the dairy sector and farmers, as well as a survey with Scottish farmers. It’s a social science project, so it explores beliefs, values, practices and systemic forces: policy, markets and culture. The report isn’t intended to draw conclusions about which type of system is ‘better’ in these domains, but to show what people believe and why. In relation to the environment the report focuses on greenhouse gas emissions, and does not discuss biodiversity, ammonia emissions, soil health or other environmental issues.

By indoor system I mean one where some or all cows on the farm are housed all year round. By ‘pasture-based’ system I mean one where cows graze. The term ‘grass-based’ can mean several things, but in the section on economics and farm origins stories I use it to mean a system a focused on grass: the infrastructure, skills and the farmers’ networks are built around producing milk from grass. By ‘higher-feed-input’ system I mean a farm where the cows may or may not graze, but where there is less focus on grass and the farm is structured around achieving milk yields through bought in feed.

The research questions were:

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- What are farmer and key stakeholder views on the role of grass in the UK dairy sector?
- How can the findings help understand debates about the future of the UK dairy sector?

Please do get in touch if you’ve any questions or comments.

1 Polly Hyson, “Sustainable Dairy Farming – Is It Possible?,” *Eco & Beyond*, 2021, 04.06.21.

Background

Dairy farming in the global north has undergone a process of consolidation for decades with fewer, larger and more productive herds². Grazing and forage feeds have decreased in importance with more non-forage feedstuffs such as concentrate and cereals used to increase yields³. A survey with 2000 farms in the UK showed that milk yield from grazed grass had decreased between 2009 and 2019⁴. The number of dairy farms where cattle graze and the amount of time cows spend grazing has declined in recent decades in countries in Europe, including the UK⁵. Estimates of dairy farmers housing all or some of the cows all year round in the UK range from 16%⁶ to 23%⁷. Year-round housing allows farms to expand beyond the limits of their grazing platform, to increase yields through feeding more energy dense feed indoors and/or to have greater control over the health and activities of the cows⁸.

There has been debate about the animal health and welfare implications of housing cows all year-round. Evidence suggested that indoor dairy farming can result in worse health outcomes for cows in relation to lameness and mastitis⁹ and cows show some preference for spending time outside when given the choice¹⁰. A study suggested grazing was beneficial for cows' subjective wellbeing¹¹. These claims are disputed within the dairy industry, and there are calls for more up to date research and greater understanding of the implications of year round housing for animal health and welfare¹².

The issue of indoor dairy farming became prominent in the media in 2010 because of an application for an 8000-cow indoor farm in Lincolnshire, later changed to an application for 3770 cows. Charities such as Compassion in World Farming and World Animal Protection positioned themselves against the proposal^{13,14}. World Animal Protection launched a campaign called 'Not in my cuppa' and Compassion in World Farming a campaign called 'Cows belong in fields' to raise awareness about indoor dairy farming, oppose the Nocton dairy application and put pressure on retailers to be transparent about the origin of their dairy produce. The Nocton dairy application was eventually rejected in 2011 by the local planning authority based on environmental concerns.

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- 2 H.W. Barkema et al., "Invited Review: Changes in the Dairy Industry Affecting Dairy Cattle Health and Welfare," *Journal of Dairy Science*, 2015, 7426–45, <https://doi.org/10.3168/jds.2015-9377>.
 - 3 J.W. Reijs et al., "Grazing Dairy Cows in North-West Europe," *LEI Wageningen UR, The Hague* (The Hague, 2013), https://www.wageningenur.nl/upload_mm/b/b/3/dd5ba8e2-8543-453b-904d-0189ae8341c4_Rapport_2013-001_Reijs_DEF_WEB.pdf.
 - 4 Kingshay, "Dairy Costing Focus" (Glastonbury, 2019).
 - 5 Agnes van den Pol-van Dasselaar, Deirdre Hennessy, and Johannes Isselstein, "Grazing of Dairy Cows in Europe-an in-Depth Analysis Based on the Perception of Grassland Experts," *Sustainability* 12, no. 3 (2020), <https://doi.org/10.3390/su12031098>.
 - 6 M D March et al., "Current Trends in British Dairy Management Regimens.," *Journal of Dairy Science* 97, no. 12 (2014): 7985–94, <https://doi.org/10.3168/jds.2014-8265>.
 - 7 Kingshay, "Dairy Production Systems Report 2018" (Glastonbury, 2018).
 - 8 POST, "Livestock Super Farms," *POSTnote* (London, 2012), <http://www.parliament.uk/business/publications/research/briefing-papers/POST-PN-404%5Cnpapers2://publication/uuid/76133D41-99B9-48FE-96CA-4DB6C6AA83AA>.
 - 9 G. Arnott, C. P. Ferris, and N. E. O'Connell, "Review: Welfare of Dairy Cows in Continuously Housed and Pasture-Based Production Systems," *Animal* 11, no. 2 (2017): 261–73, <https://doi.org/10.1017/S1751731116001336>; EFSA, "Scientific Report on the Effects of Farming Systems on Dairy Cow Welfare and Disease," *EFSA Journal*, vol. 7 (Rome, 2009), <https://doi.org/10.2903/j.efsa.2009.1143r>.
 - 10 Arnott, Ferris, and O'Connell, "Review: Welfare of Dairy Cows in Continuously Housed and Pasture-Based Production Systems"; Gemma L. Charlton and S. Mark Rutter, "The Behaviour of Housed Dairy Cattle with and without Pasture Access: A Review," *Applied Animal Behaviour Science* 192 (2017): 2–9, <https://doi.org/10.1016/j.applanim.2017.05.015>.
 - 11 Andrew Crump et al., "Optimism and Pasture Access in Dairy Cows," *Scientific Reports* 11, no. 1 (2021): 4882, <https://doi.org/10.1038/s41598-021-84371-x>.
 - 12 Amy Jackson, "Can We Learn to Love the Megadairy? Politics, Planning and PR," 2012; Arnott, Ferris, and O'Connell, "Review: Welfare of Dairy Cows in Continuously Housed and Pasture-Based Production Systems."
 - 13 World Animal Protection, "Not in My Cuppa," 2010, <https://www.worldanimalprotection.org.uk/campaigns/success-stories/not-in-my-cuppa>.
 - 14 Compassion in World Farming, "RE: Planning Application No. 10/1397/FUL | Erection of an Intensive Dairy Unit North of Dunston Heath Lane and West of B1188 Nocton Heath Lincoln I," vol. 44 (Godalming, 2011).

In the last decade, a number of pasture-based labels have been launched in the UK, including the Pasture Fed Livestock Association¹⁵ and Free Range Dairy Network¹⁶. Several supermarkets including Waitrose, Marks and Spencers, and the Co-op source their own brand liquid milk from grazing herds.

The environmental aspects of pasture-based and indoor systems are also debated. It is claimed that systems involving a high proportion of grass in the diet have lower greenhouse gas emissions per litre of milk because of carbon sequestered in grassland¹⁷. There have been criticisms from the media and charities that purchased feed for livestock is an inefficient use of resources and leads to environmental degradation in its location of production¹⁸. Ammonia emissions are higher from indoor herds than grazing herds¹⁹.

In defence of the environmental credentials of higher-feed-input systems, others point out that intensification through more bought in feed could reduce emissions per litre of milk: as production per cow increases, greenhouse gases per litre of milk may decrease because fewer cows are needed to produce the same amount of milk, meaning a relative reduction in methane emissions²⁰.

Research has shown that the majority of the public in the UK are not in favour of indoor dairy farming: a survey found that 95% of public respondents stated they did not think it was acceptable to keep cows inside all year-round²¹; a YouGov poll commissioned by World Animal Protection found 86% of respondents agreed cows should graze²²; and a YouGov poll carried out by the Free Range Dairy Network found 74% of respondents were prepared to pay more in coffee shops for milk from cows that had spent time outdoors²³. A study with UK citizens found that they ranked access to grazing; cow comfort; and health and welfare as their top priorities²⁴. There has been research with dairy farmers in Germany²⁵ and Denmark²⁶ about their views of grazing and year round housing, but not in the UK.

Methods

This report is based on a survey with 254 dairy farmers in Scotland, analysis of 38 documents, interviews with 25 UK key stakeholders and 21 GB dairy farmers.

I designed a survey to gather information about the types of systems farmers are operating; their reasons for choosing systems; and their attitudes towards indoor and pasture-based systems. An online version of the survey was disseminated through Twitter, agricultural organisations, farming and local press from August 2018 until February 2019. In Scotland, a paper copy of the survey was sent to all 909 dairy Scottish farms in September 2018 because contact details for Scottish dairy farmers were available. A donation of £2 was made to charities supporting farmer wellbeing for every survey completed. There were 370 responses to the survey: 254 from

15 Pasture Fed Livestock Association, "Pasture for Life," 2019.

16 Pasture Fed Livestock Association; Free Range Dairy, "Pasture Promise," 2019.

17 D O'Brien et al., "A Case Study of the Carbon Footprint of Milk from High-Performing Confinement and Grass-Based Dairy Farms," *Journal of Dairy Science* 97, no. 3 (2014): 1835–51, <https://doi.org/10.3168/jds.2013-7174>; A. Leip et al., "Evaluation of the Livestock Sector's Contribution to the EU Greenhouse Gas Emissions (GGELS) - Final Report," 2010.

18 Rebecca Smithers, "Vast Animal-Feed Crops to Satisfy Our Meat Needs Are Destroying Planet," *The Guardian*, 2017, <https://www.theguardian.com/environment/2017/oct/05/vast-animal-feed-crops-meat-needs-destroying-planet>.

19 Defra, "Clean Air Strategy 2018" (London, 2018).

20 Pierre Gerber et al., "Productivity Gains and Greenhouse Gas Emissions Intensity in Dairy Systems," *Livestock Science* 139, no. 1–2 (2011): 100–108, <https://doi.org/10.1016/j.livsci.2011.03.012>.

21 Ellis et al. (2009)

22 Charlie Taverner, "British Public Want Dairy Cows Grazing, Poll Shows," *Farmers Weekly*, 2015, <http://www.fwi.co.uk/business/british-public-want-dairy-cows-grazing-poll-shows.htm>.

23 Carol Lever, "Press Release: YouGov Poll Shows Strong Desire for Pasture Promise Free Range Milk alongside Sustainably Sourced Coffee Beans," 2018, <http://www.freerangedairy.org/2018/02/press-release-yougov-poll/>.

24 Amy Jackson, "Is It Just about Grazing? UK Citizens Have Diverse Preferences for How Dairy Cows Should Be Managed," *Journal of Dairy Science* 103, no. 4 (2020): 3250–63, <https://doi.org/10.3168/jds.2019-17111>.

25 Henning Schaak and Oliver Mußhoff, "Understanding the Adoption of Grazing Practices in German Dairy Farming," *Agricultural Systems* 165, no. July (2018): 230–39, <https://doi.org/10.1016/j.agsy.2018.06.015>.

26 T. Kristensen, M.L. Madsen, and E Noe, "The Use of Grazing in Intensive Dairy Production and Assessment of Farmers' Attitude towards Grazing," in *Grassland in a Changing World*, ed. H. Schnyder et al. (Kiel: European Grassland Federation, 2010).

Scotland, 76 from England, 25 from Northern Ireland and 15 from Wales. A donation of £504 was made to the Royal Scottish Agricultural Benevolent Institute, £172 to the Royal Agriculture Benevolent Institute and £50 to Rural Support Northern Ireland in March 2019.

Because the Survey was posted to Scottish farmers, there was a much higher response rate in Scotland than other UK countries. As a result, only the survey responses from Scottish farmers are reported here.

Interviews, or 'qualitative research' involves asking in depth questions to get detailed information on experiences and views about a particular topic. A relatively small number of participants are selected whose experiences are relevant to the research questions. The aim is not to generalise to a larger group of people e.g. 'all dairy farmers think or do x', but to look in detail at the reasons underlying the responses and draw conclusions based on the respondents' circumstances.

In 2018 and 2019 I carried out document analysis of key stakeholder documents, and interviews with key stakeholders in the UK. Documents from government, research, non-governmental organisations (NGO) and agricultural industry organisations were collected through internet searches between February and October 2018. A total of 38 UK documents were analysed: 15 industry; 11 government; 4 research and 8 NGO. A list of documents is given in appendix 1. Documents published after 2010 that described an organisation or individual's policy or position about the UK dairy sector relevant to the research questions were chosen. I carried out 25 interviews with key stakeholders in the UK including 16 from industry, 4 from NGOs, 3 from academia and 2 from government. Industry includes commercial actors, agricultural and dairy industry organisations. I have anonymised the interview data by giving the interviewees a letter corresponding to their sector: G for government, N for NGO, I for industry, A for academia and F for farmer.

I contacted a small number of respondents to the survey who indicated they were willing to take part in an interview. I chose people based on their location: to interview people in a range of locations across the UK, but also to keep the logistics manageable because I intended to do as many as possible in person. I contacted people who operated different kinds of production systems and had different views. I interviewed 21 farmers: 9 from Scotland, 4 from Wales and 8 from England. 4 of the farmers were female the rest were male. I finished the interviews in Great Britain at the beginning of March 2020, with the intention of speaking to farmers in Northern Ireland in April 2020. Covid put a stop to these plans, and while I could've carried out interviews with Northern Irish dairy farmers remotely, I found I already had more than enough data to analyse. From the interviews with stakeholders across the four countries of the UK, I was finding interesting differences and issues in the different countries, but it is beyond the scope of this project to analyse and compare the findings at the level of the four different countries in the UK.

Results

System differences don't matter

While research has shown that indoor dairy farming is unpopular with the public, the dominant view I encountered from people in mainstream agricultural organisations, academia and companies involved in dairy supply chains was that environmental, welfare and economic outcomes are largely *independent* of the type of system: whether it's pasture-based or indoor, grass-based or higher-feed-input, spring calving or year-round calving. Any system can 'work' if it is managed well.

A1: What makes a system work or not is the attention to detail within the system. So I think we have umpteen pointless discussions about whether we should have a spring calving grazing system or a housed system, I actually think that that's not the question. I think the question is you form your overall system with a whole series of things in mind: what does your milk buyer want, what is your grass growing conditions like, how many cows have you got?

The 'optimal' system is framed as depending on the location – the climate, growing conditions; the market – milk contract; and the preferences of the farmer. In relation to profitability, a government and industry report on the future of the dairy industry states:

Our evidence shows that system and herd size are not predictors of profitability. Any system of any size, run well, can be profitable and sustainable. We want to grow the whole industry and see a role for small, medium and large herds²⁷.

In this 'any system can work' narrative, the message was that grass should be optimised in *any* system²⁸. The economics of grazing were not seen as straightforwardly beneficial.

A1: I'm not always convinced that grazed grass drives that lowering of cost for everybody. So it depends on what the grass growth is and what other feeds are available. [...] There are situations where you could say buying in some feed would be a better option than growing more grass or having more land to grow more grass, it depends on the price of land and all those sorts of factors.

A benchmarking report by DairyCo states:

However, relationships between milk from forage and total cost of production is complex. For example, benefits resulting from a higher use of forage can be eroded by unnecessary expenses related to the production and feeding process of forage²⁹.

Within the stakeholders' dominant view, no system was seen as inherently more environmentally friendly than another³⁰. An industry stakeholder states:

I3: It again becomes an aspect that's quite difficult to quantify on a national level versus an individual farm level. And ultimately it does come down to, on this individual farm or plot of land, what is the best, most efficient use that we could make of that land? And is it grazing cattle, is it grazing something else, is it ploughing it up and putting it into corn to feed cattle? As I say, I don't think there's an overall 'this is the answer'.

The industry stakeholder states that environmental recommendations are only possible on a micro, farm scale rather than a system scale.

The dominant vision in the UK was also about decoupling welfare outcomes from the type of production system. The main factors seen to affect welfare were the quality of the facilities and crucially the quality of stock keeping. The National Farmers Union dairy strategy states that one of their objectives is to bring about:

A recognition that welfare standards are underpinned by the suitability of the farm system to meet the needs of the animals and the skills of the stockman, and that the type of production system does not dictate the health and welfare status of the cow³¹.

This emphasis on the differences between farms rather than systems can be seen as a cause and product of the UK's diverse dairy sector. The UK's population of 66 million creates a large demand for liquid milk all year round: almost half of milk produce goes onto the liquid milk market³². The demand for fresh milk means 81% of herds calve all year round³³. Whereas spring calving herds produce the majority of their milk from spring and summer grass, year round calving herds need to feed consistently year round to provide their milk buyer with a level supply. Depending on a farm's calving pattern and milk contract, there will be a different role for grazed grass.

Within a diverse industry, it can be difficult for organisations to show 'leadership' if this means expressing views that are not palatable or possible for segments of the industry.

27 P. Dawson et al., "Leading the Way: The British Dairy Industry's Sustainable Growth Plan" (London, 2014), <https://doi.org/10.1037/e515422010-040>.

28 DairyCo, "Managing Costs: Key Findings of the Milkbench+ Dairy Benchmarking Programme Regarding the Efficiency of Dairy Production in the UK" (Kenilworth, 2013).

29 DairyCo.

30 NFU, "Dairy Farming Systems in Great Britain," 2010, <http://www.thedairysite.com/articles/2549/dairy-farming-systems-in-great-britain/>.

31 NFU, "Dairy Cow Welfare Strategy," (Stoneleigh, 2010).

32 Dairy UK, "The White Paper" (London, 2017).

33 AHDB Dairy, "Delivering a More Competitive Industry through Optimal Dairy" (Stoneleigh, 2017).

I1: And I think there's problems with leaderships because there are so many different systems and the leadership groups within the industry have all got members from all different types of systems so they are very reluctant to put their head above the parapet and say ultimately "this is what you should be doing" or "ultimately there's benefits to doing this".

Agricultural advisory and extension services in the UK were increasingly privatised since the 1980s, meaning different advisers might cater to different types of systems and advice can be linked to product sales³⁴. In the UK a diverse range of actors advise a diverse range of farmers, making the 'any system can work' vision the dominant one, and meaning the role of grazing within dairy systems is presented as complicated and context dependent.

The view that individual farm management and circumstances are more important than system was also expressed by farmer interviewees, and as can be seen below, was endorsed in the farmer survey. Though this view co-existed with other values and beliefs about the role of grass and grazing.

Animal welfare

Stakeholder interviews: Pro-indoor

In relation to animal welfare, the majority view among key stakeholders from mainstream agricultural organisations was that welfare could be good in indoor systems. Stakeholders stated high yielding cows like Holsteins could be better suited to living inside because of their dietary needs:

I11: Pedigree Holsteins and they're yielding a lot more, I think their needs are catered for a lot better inside. [...] You control the diet so much more effectively if they're indoors.

The stakeholder adds that it's possible for stock keepers to have more control in a year round housed environment which can be beneficial for high-yielding cows:

I11: You can detect things a lot earlier, a lot more effectively.

34 Chris Garforth et al., "Fragmentation or Creative Diversity? Options in the Provision of Land Management Advisory Services," *Land Use Policy* 20, no. 4 (2003): 323–33, [https://doi.org/10.1016/S0264-8377\(03\)00035-8](https://doi.org/10.1016/S0264-8377(03)00035-8).



The argument that grazing is a 'natural' behaviour is a moot point because cows are no longer natural creatures:

I9: Yeah, naturally, cows would be grazing, but a milk production cow is no longer a wild animal, is it? It's been bred as a farming animal to produce food. And it's a long way, it's a long, long way, especially a high yielding Holstein from a wild ox or whatever, so it's a different argument, isn't it? But it's not the way it's seen by the public, I understand that, you know, it's perception of, a cow should be eating grass.

The stakeholder goes on to voice a view I encountered in the interviews that cows like comfort, and it's not a given cows prefer being outside.

I9: But you have cows eating grass, on a wet day, like you were describing today, up in Aberdeen, and the storm's coming in, how many of those cows are actually out eating grass? They're not. They're standing against the hedge, and they'd rather be inside.

Similarly, a charity stakeholder points out that cows' behavioural requirements can be met in an indoor system:

N2: I've not yet been able to get a negative effect of holding cows indoors in facilities which are built for their specific needs, because if you look at an ethological sort of, ethogram of their daily time budget, it ain't that exciting, for us, but for them, they can fill up and two or three hours of eating, half an hour of drinking, so after fourteen hours of lying down, chewing the cud, and resting, say, two or three hours of loafing around socialising, and then, the time it takes to milk them. That's their life.

Thus, key stakeholders pointed to mechanisms by which cows could have good welfare in fully housed systems and argue against a view that cows need to graze.

Stakeholder interviews: Pro-grazing

I encountered the view that systems involving grazing are best for animal welfare from people working in animal welfare charities, among some academics and those working in alternative dairy supply chains with a focus on grazing. Welfare concerns centred around cows' health, subjective wellbeing and ability to express natural behaviour.

N3: There's the health aspects, and there's the welfare aspects [...] from the science that is available at the time which, you kind of documented the research papers that were available at the time were enough to convince us that they weren't, that the intensive indoor systems would be bad on their health.

I1: Well as I said, from the ethical perspective, to me, cows are a ruminant, they are supposed to be outside grazing on fields. All their relatives, the wildebeest, the bison and all the rest of it, they go roaming about the plains, you know, it's the natural habitat.

Year-round housing could limit social behaviour. A stakeholder who was not necessarily 'pro-grazing' but had complex views on the issue of grazing and year round housing states:

I7: I think it's very hard for cows to have an adequate social interaction within confined environments such as cubicle housing. So, no matter how wide you make the cubicle passageway, unless you go to extremes of sort of, five metre passages, I don't think there's sufficient room in those for cows to adequately socially interact.

Many stakeholders wondered whether the experience of going outside was beneficial for cows. The stakeholder N2 who above described his positive views of indoor systems, says:

N2: But, also, watching a cow lying in the sunshine in a nice sunny day, with its eyes closed, chewing the cud, one cannot help, I know it's possibly anthropomorphic, but one cannot help but think, for her, that's a positive experience.

Thus, there was direct disagreement among stakeholders about the implications of housing cows year-round for health, wellbeing and ability to express natural behaviours.

Industrial indoor farms

For some stakeholders, indoor farming represented a fundamentally different type of system compared to dairy farms that graze, with a different relationship to the animals. An NGO stakeholder describes their use of the phrases ‘industrial agriculture’ and ‘factory farming’.

N3: We moved away from the arguments based around scale, because, as far as we’re concerned, if you even have three hundred cows, which are permanently housed, that would be a factory farm system.

N3: It’s the way that animals are processed within that system, and treated within that system as numerical outputs, and the kind of, measurements you use, in terms of the efficiencies, you know, so animals become part of a machine system rather than a farm system which involves caring for your animals. Not saying that intensive farmers don’t care for their animals, but nonetheless those animals are, I suppose you could look at it as they’re more, the numerics attached to them are similar to what you’d find in industrial system that was supplying non-living components.

N1: It comes down to whether the animal is given choices or the animal is used as a unit of production and a system that respects the wishes of the animal, the welfare of the animal, is a proper agricultural system and a system that just uses her as a way of making cheap milk is a factory farm and, I mean, the dividing lines I’ve given fairly clearly: it’s a factory farm where she’s not going outside.

This was the discourse seen in the media around the time of the Nocton dairy application: indoor farming was a fundamental and problematic change in dairy farming towards ‘industrial’ or ‘factory’ farming, where animals are treated as numbers rather than sentient beings. We’ll return to this question of motivations for housing cows all year round and whether it represents a fundamentally different type of farming in the farmer interviews below.

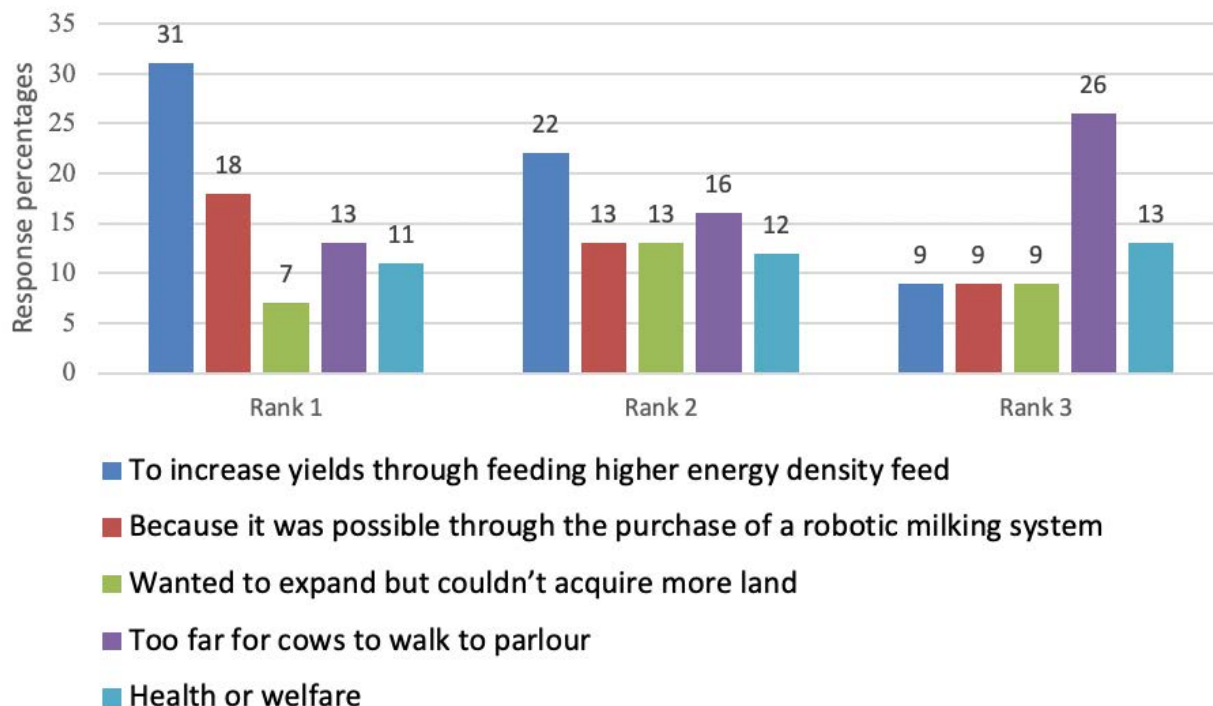


Fig 1 Reasons farmers housed cows all year round

Farmer survey: Preference for cows to graze

These results are based on the 254 responses from Scottish farmers. More details of respondents' demographic and farm details can be found in appendix 2.

Of the Scottish respondents, 19% housed some or all of the cows for all of the year. This figure is similar to previous studies for the UK, which showed 16%³⁵ and 23%³⁶. Figure 1 shows the ranking of first, second and third choice reasons for moving production indoors all year round.

Logistics is cited in the literature as an important reason why farmers move production indoors³⁷. In relation to increasing yields, research has also shown that being a high producing farmer is part of what it means to be a 'good farmer': it bestows status in the farming community and can be taken as a demonstration of skill³⁸. There could be different reasons for pursuing production increases through an indoor system: a matter of survival, increasing profits, a challenge, a preference for a modern and progressive system, etc. The interviews go into more detail on reasons for going indoors.

A summary of the responses to attitudinal questions is shown in Figure 2. Respondents were asked to indicate how much they agreed with the statement 'Cows should have access to pasture for at least part of the year' and 68% strongly agreed (43%) or agreed (25%). Respondents were asked to respond to the statement 'Animal welfare is better if cows have access to pasture for part of the year' and 51% strongly agreed (31%) or agreed (20%). Few respondents saw animal welfare as being better on indoor systems: 15% (4% strongly agree, 11% agree). Most respondents endorsed the statement 'The farmer's stock keeping skills are more important than the type of system (indoor or pasture-based) for animal welfare': 82% strongly agreed (47%) or agreed (35%).

The figure of 68% of respondents who strongly agreed or agreed that cows should graze was lower than surveys with the public³⁹. The endorsement of access to pasture among respondents was nevertheless surprisingly

35 March et al., "Current Trends in British Dairy Management Regimens."

36 Kingshay, "Dairy Production Systems Report 2018."

37 POST, "Livestock Super Farms."

38 Rob J F Burton, "Seeing through the 'good Farmer's' Eyes: Towards Developing an Understanding of the Social Symbolic Value of 'Productivist' Behaviour," *Sociologia Ruralis* 44, no. 2 (2004): 195–215, <https://doi.org/10.1111/j.1467-9523.2004.00270.x>.

39 Ellis et al., "Public Opinions on UK Milk Marketing and Dairy Cow Welfare"; Taverner, "British Public Want Dairy Cows Grazing,

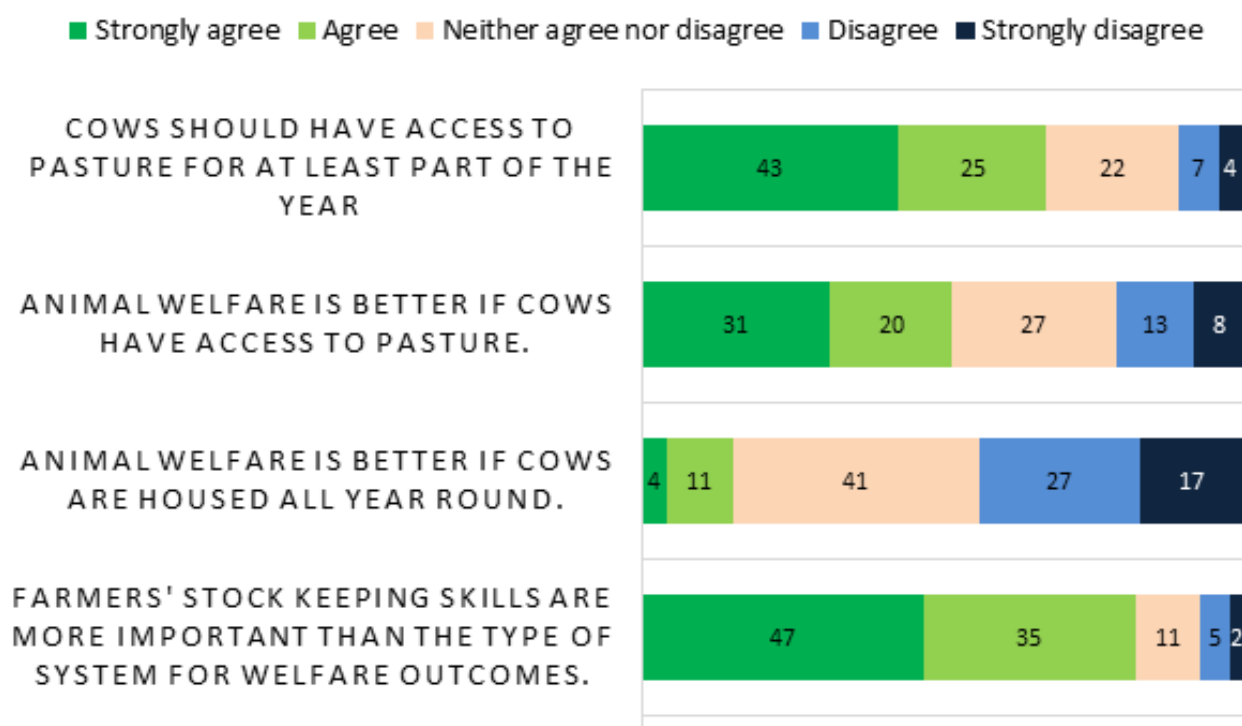


Figure 2. Attitudes towards production systems.

high given the dominant view from stakeholders that it does not matter if cows graze or not, but economic, environmental and animal welfare outcomes depend on management, described above. This view that management is more important than system for welfare outcomes was strongly endorsed by respondents. However, this view did co-exist with the majority view that cows should graze. In the past, the question of public opposition to year-round housing of dairy cows has been framed as the industry accepting indoor dairy farming and the practice being rejected by the public⁴⁰. The results from this study suggest that the picture is more complicated.

Given that more respondents agreed cows should have access to pasture than agreed that animal welfare was better if cows had access to pasture, this suggests that the farmers' views go beyond animal welfare concerns. The interviews explored farmer views in more detail.

Farmer interviews: Indoor is fine

While the survey showed majority support for cows to graze, in the interviews, a preference for grazing did not necessarily coincide with negative attitudes towards indoor dairy farming. A farmer who indicated 'strongly agree' for the survey statement that cows should graze for part of the year, said:

F2: If you go to housed cows, all year round, they always look well. They do always look well. Probably because they've no got the vagaries of the wintertime.

Judging animals by eye is an important way farmers assess how 'good' another farm or farmer is⁴¹. Here the farmer agrees with one of the arguments in favour of year round housing that it 'protects' cows from bad weather.

Similarly, a farmer who strongly agreed that cows should graze, and that welfare was better if cows graze states:

F16: I got a bit snooty about them being indoors all the time, but actually, I've seen some bloody good farms with some really well looked after cows indoors. And if it's done really, really well, I don't have an issue with it at all. I think it's fine.

While NGO employees quoted above framed indoor dairy farming as a different type of relationship with the cow, where they are not treated as sentient beings, but rather a component in a milk manufacturing process, the farmer interviewees generally did not see indoor dairy farming as creating or being created by a fundamentally different type of relationship between farmer and animal. A farmer whose system was based around grass production states:

F17: And a couple of my other friends I went to college with, they've gone the opposite, you know, gone to America and down the high, you know, housed their cows. And I do think that's the way the industry is, it's only the two extremes that make money.

By 'the two extremes' he means year round housing or a low-cost grass-based system. Here, the motivation for operating a low-cost grazing system and a high-input indoor system is the same: operating a profitable dairy business. Another farmer states that all farmers operate in a sector where food is undervalued, which means it can be difficult to prioritise welfare.

F10: I think the biggest change I'd like to see is that food is more valued. [...] What we receive for our product is not really that, you know, it's difficult to make a living from it, to be honest, because the margins that we are on. Whereas I think if food, almost seen as having more value and we could earn a bit more money from it, we'd actually, you'd see better welfare, and everything else, just because there's more money in the system.

Poll Shows"; Lever, "Press Release: YouGov Poll Shows Strong Desire for Pasture Promise Free Range Milk alongside Sustainably Sourced Coffee Beans."

40 Jack Yates, "13 Milk Myths and Misconceptions Debunked," *Farmers Weekly*, February 2017, <https://www.fwi.co.uk/business/13-milk-myths-misconceptions-debunked>.

41 Rob J F Burton, Sue Peoples, and Mark H. Cooper, "Building 'Cowshed Cultures': A Cultural Perspective on the Promotion of Stockmanship and Animal Welfare on Dairy Farms," *Journal of Rural Studies* 28, no. 2 (2012): 174–87, <https://doi.org/10.1016/j.jrurstud.2011.12.003>.

That is not to say that farmers did not recognise the idea of animals being treated as components in a factory process, but year-round housing of cows was not a clear line along which to draw that distinction. All farmers need to relate to animals in terms of what they can produce and how much money they can make. There are lots of ways farmers relate to their stock: care, individual care in smaller herds, professional pride, an interest in breeding, a link to their own family history, etc⁴². An indoor farmer gives a traditional description of ‘good farming’ as stock keeping skills that come from being born and bred on a farm:

F7: I think it’s born into you. Maybe I’m slightly wrong here because, well, I’ll explain in a minute but, when I was little, my first recollections were going down to the byer where my dad had cows and I just watched the cows, I watched their mannerisms, I knew if they were happy, I knew if they were starving, knew they were agitated, you know, you get to know, just by looking at a cow, just if it’s sick, if it’s happy, you know. And, that is, that is bred into you.

The way most farmer interviewees spoke about indoor farming, despite their bigger size and change in management, they did not represent a fundamental change in how farmers relate to their animals compared to conventional grazing systems.

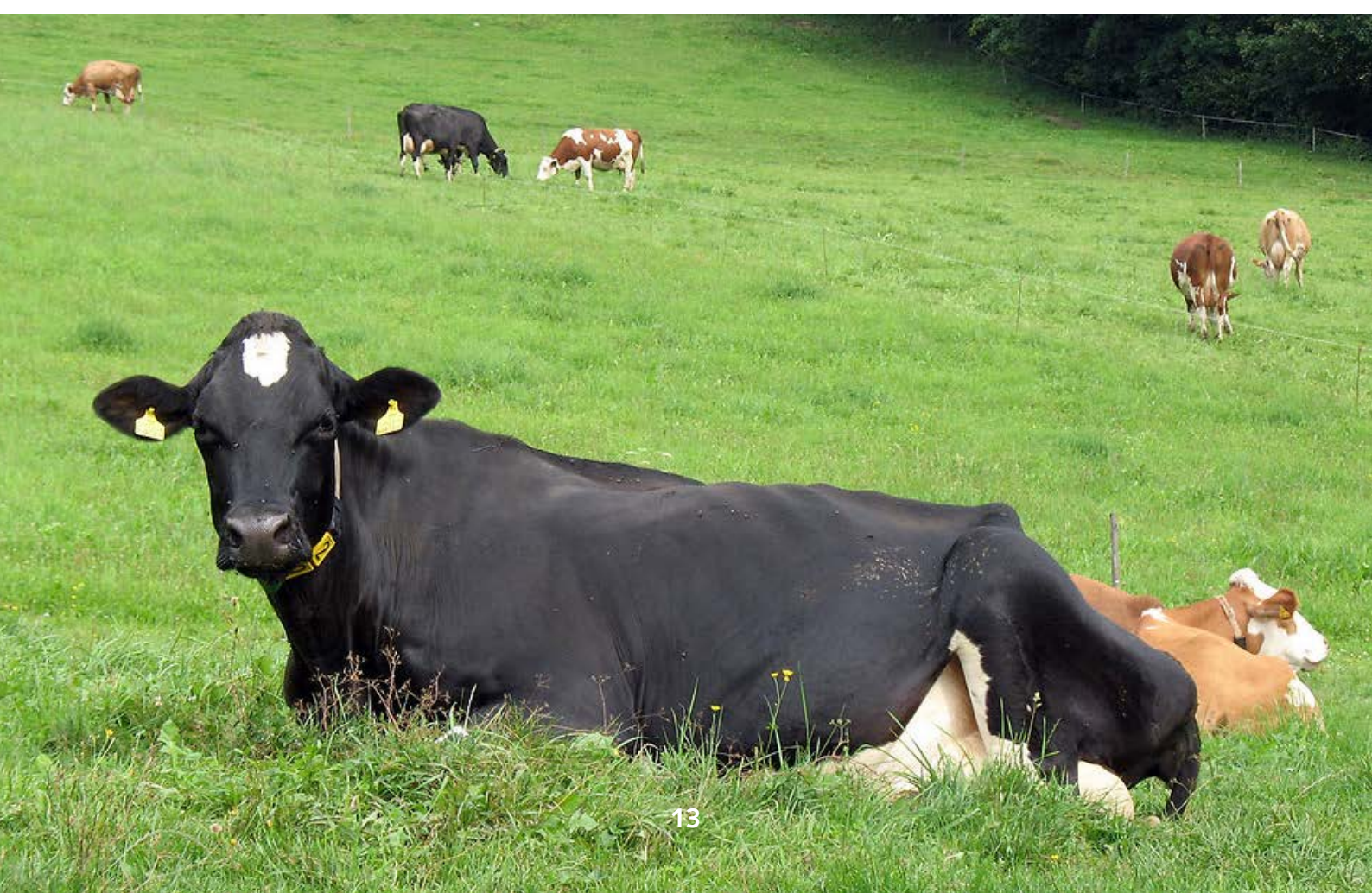
Farmer interviews: Preferences for cows to graze

Among farmers I interviewed, positive attitudes towards cows grazing were about their own experiences on their own farm.

F20: We like being grazing farmers. We like having our cows outside. We prefer to see them outside than in the shed.

F15: We’ve got a really good grazing platform, and we really like to see cows out at grass. [laughs] You know. It’s a personal preference really. And I wouldn’t ever want to be in a situation where I couldn’t do that.

42 Rhoda Wilkie, *Livestock, Deadstock: Working with Farm Animals from Birth to Slaughter* (Pennsylvania: Temple University Press, 2010).



Farmers' preferences were often linked to what they perceived as the cows' preferences for grazing:

F4: I like to see them out, and I think they like being out. That's where they will keep going.

I asked farmers how they felt about working outside, and all interviewees describe the positive experience of being outside in nature. The cows grazing was part of this experience:

F16: I like the countryside. I like the noise, from the birds. I like the growth. I like the cows going out, that's the number one thing.

F19: I'd be really, really disappointed if we, if our cows were in all the time, because I like having them outside. I just like that part of it, you know, to get out there in the field with them, and, especially on, you can't beat a nice sunny day, going and getting the cows in.

A farmer links the cows going out to the changing of the seasons:

F15: And I like the distinction between seasons as well, you know, the fact that you're in during the winter, there's something very nice and very good for morale when you see the cows going out to grass.

While the idea of grazing being a 'natural' behaviour for cows was rejected by mainstream industry stakeholders because cows could no longer be considered free from human interference, the idea of grazing being 'natural' did have resonance for some farmer interviewees:

F2: I don't feel it is particularly natural to have them inside all the time.

F15: Our cows can graze grass. I mean, some of these guys that house all years round say, 'I can't turn them out', their cows won't graze grass. Well, I just find that completely bizarre.

F20: But, for an animal such as a cow which is a designed grazer, I think, they ought to be outside.

Any ideas of cows preferring to graze were described as dependent on the routine on the farm and the weather. Many farmers told stories of cows knowing when it was time to go out in spring and becoming increasingly impatient.

F8: I don't know whether it's the sunshine or whether it's the increase in temperature or whether they can smell the grass, I have no idea. But if you open the door at the bottom of the shed, even if you're just going out to see the slurry store or something [...] they'll just all come to the gate and start to roar. They just know. Dad used to say, in Ireland, we used to stock graze and he used to carry the fence post across the yard, they could hear the post clattering, as soon as they heard that, they started roaring.

Equally, farmers talked about cows being happy to come inside in autumn:

F8: But, likewise, in the back end when we close them in in September, about two days later, I open the door for something, and no a single cow moves.

Thus, while arguments made by key stakeholder in favour of cows grazing focused on cow welfare in terms of health, wellbeing and naturalness, if farmers had a preference for cows to graze, it was primarily about the lived experience of taking pleasure in working outside with the cows. Farmers described cows' preferences for grazing as being based around the routine and weather on the farm. Here cows are framed as domesticated animals whose desires to graze (or not) are shaped by what's comfortable and feasible on the farm, as much as by their ancestry as grazing animals.

Grass-fed milk labels

An industry stakeholder states that the 'free range' dairy supply chains were the direct result of the charities' campaigning efforts after the controversy raised by the Nocton dairy application:

N3: And we met with supermarkets so there was quite a lot of dialogue we had with major supermarkets in the UK. And one of the positive outcomes of the campaign was that, with the establishment of the free-range dairy farmers' milk, that was, Asda then agreed to provide shelf space in their supermarkets and sell free range dairy farmers' milk.

These labels were seen as a consumer rights issue:

N3: It's unethical for people, or for supermarkets not to provide the amount of information on milk as they do on other products, so we still want to see milk labelled as to the means of production.

Among the mainstream dairy stakeholders, I encountered some antipathy towards grass-fed milk labels because of the view described above that systems differences do not dictate, or are not even necessarily correlated with welfare outcomes.

I4: It needs to be clear and accurate, and consumers need to understand exactly what they are talking about, actually saying indoor or outdoor doesn't necessarily link to welfare at all, it's very much about how that's managed and so there needs to be clear evidence as to say why something is being labelled as it is.

Unlike free range poultry production where chickens have the option to be inside or outside, when cows are 'free range' they stay outside. A stakeholder states that cow choice is the optimum and being outside, potentially without shelter is not ideal:

A2: Free range is not outdoor access, which is implied by free range, it's not absolutely what cows want.

An industry stakeholder frames grass-fed milk as a way for retailers to differentiate themselves rather than as a legitimate ethical issue for consumers or cows:

I9: I think what would, the most dangerous thing is the milk buyers, the retailers, coming up with contract specific rules, which is what they're doing, and doing it on perception of what their customers want. I'm not sure it is necessarily what the customers want. I think a lot of the time, it's what they're telling the customers they should want, because, of course, they're all trying to differentiate, aren't they? It's quite a big threat, I think, to dairy farming, and there's more and more pressure to graze cows.

Because many consumers do not know much about how milk is produced and may not be aware that some cows are housed all year round, some interviewees said that promoting grass-fed milk risked creating controversy and further dividing the industry:

I1: You were saying all our cows spend at least six months outside grazing in fields, most people think that's the case anyway, so you are then raising the potential question of Joe Public as to "hang on, does that mean the rest of the milk get produced by cows that are indoors all day?" So I said, "You risk educating people to the detriment of the industry!" [...] I can't really agree with a free-range dairy, not from a farming perspective but because of the potential damage it could have on public perception which then could have a big influence on the industry as a whole.

The farmers I interviewed appeared to have a more pragmatic, and generally positive attitude towards grass-fed labels than the conventional key stakeholders. Most farmers I spoke to focused on the marketing and profitability potential, rather than any underlying premise about the benefits of grazing.

F14: Yeah, I think they're good really. [...] to add value to differentiate from bog-standard own brand milk is a good thing, really. If you can say to a supermarket, "This is our product and it has this label", then you could control the price, whereas if you say "We will sell this as a commodity to you", and you can put [supermarket brand] on the side of it, then they control the price.

A farmer who operates an indoor system states that if they grazed, they would be interested in grass-fed labels, and another indoor farmer states it makes sense for grazing farmers to capitalise on the opportunity:

F5: There's free range milk, it's just another label. But if we were free range, we would.

F6: If that is the system you're on and you can take advantage of it.

While this is from a qualitative interview sample and cannot be directly generalised to a larger group of farmers, the fact that stakeholder interviewee fears about grass-based labels stoking division were not reiterated by farmer interviewees makes sense in the context of nuanced views described above about indoor and grazing systems.

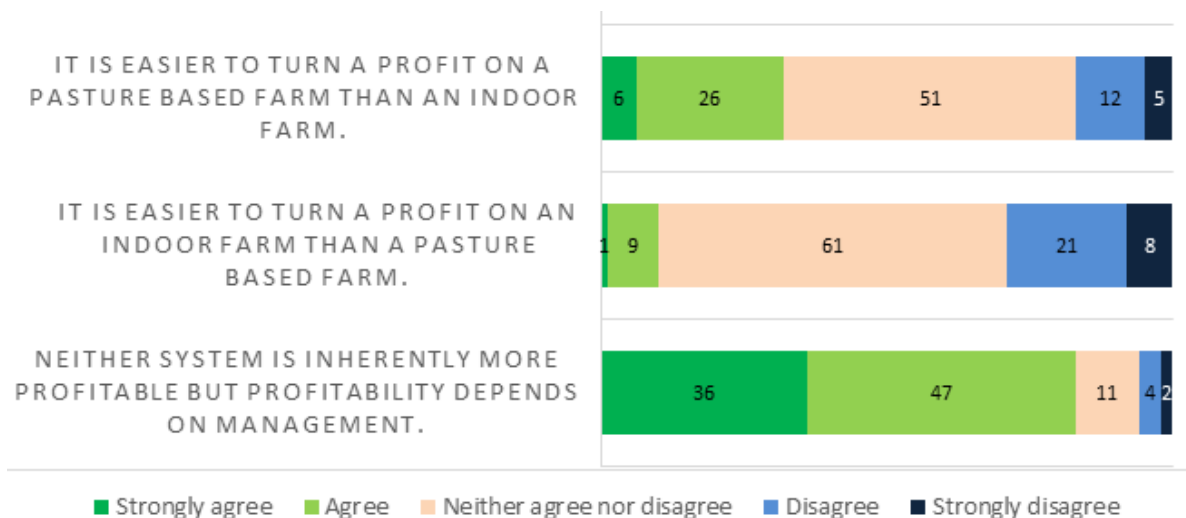


Figure 3: Attitudes towards environment sustainability and profitability of systems

Economics and farm origin stories

Grass is best

As well as being beneficial for consumers, charities and alternative supply chain actors positioned grazing as economically beneficial for farmers. World Animal Protection released a report in 2010 about the economic benefits of grazing: grass is a low-cost feed and maximising milk from grass maximises profits⁴³. This goes against the mainstream view that systems differences do not determine economic outcomes described above, but it is the mainstream view in Ireland whose dairy sector is based on grazing⁴⁴.

According to some of these stakeholders, grass is currently an under-utilised resource:

OS: And what do you see as the role of grass and grazing in the UK dairy sector as a whole? How important do you think that is?

I8: I think it's extremely important and I think it's, in some cases unfortunately, it's perhaps ignored, to the industry's detriment. UK is two thirds pasture, it's a cheap food, feedstuff, grows with sunshine and rain.

In the Scottish farmer survey, more respondents agreed or strongly agreed (32%) that profitability was easier in a pasture-based system compared to an indoor system (10%). Though the majority of respondents, 83%, strongly agreed or agreed that profitability was more dependent on management than system.

I spoke to farmers in Scotland, England and Wales who would call their system grass-based: they aimed to maximise milk from grazed grass and forage and put a lot of effort in grass management – measuring grass, calculating grass budgets, investing in grazing infrastructure, breeding cows suited to a grass-based diet etc. Many of them were spring calving. They reiterated arguments made about the beneficial economics of grass-based systems:

F12: So if you're asking me why do we like pasture, it's the free time it gives you. Low capital cost. Higher cash returns. The return on capital is higher. You have less capital. Your margin per litre is higher. So that means you have the more robust business in terms of coping with a volatile milk price.

Many grass-based interviewees said that information and resources on grazing in the UK had improved, but many told stories about starting a grass-based system with contacts and information from abroad, primarily Ireland and New Zealand.

43 WSPA, "Weighing up the Economics of Dairy Farms: A Briefing by the World Society for the Protection of Animals," 2011.

44 Orla Shortall, "Cows Eat Grass, Don't They? Contrasting Sociotechnical Imaginaries of the Role of Grazing in the UK and Irish Dairy Sectors," *Journal of Rural Studies* 72, no. September (2019): 45–57, <https://doi.org/10.1016/j.jrurstud.2019.10.004>.

F14: It was all from our discussion group, really. Our New Zealand consultants. They were very keen on it. And it was a big eye opener for us in the very early days. [...] Especially when we started off those, the Moorepark [Irish research institute Teagasc] open day booklets were like gold dust really. They were fantastic, and still to this day, [...] I probably look at more Irish things than UK things in general.

F17: Then I went off travelling, and, it sounds a bit ironic now, but, when I was in New Zealand, I thought the whole [grass-based] system was a stupid idea. [laughter] I couldn't quite understand how they made any money, because having come, just come straight out of agricultural college, you know, at the time, this system wasn't promoted at all, it was talked about briefly in about one lecture and that was it.

Interestingly, grass-based farmers said that they were marginalised in the UK dairy sector:

F12: At the time of the change, about 2000, turn of the century, to go spring calving milk from grass, it was considered madness, and so, we were laughed at, sneered at, it was considered odd. Some of the discussion group certainly wouldn't own up to the fact that they were going spring calving, because it was considered a failure, to make the system work, the existing system.

What he means here by a 'failure to make the system work' was a year-round calving system using cows with Holstein genetics, bred to increase yield from concentrate feed. This farmer said that things were different now: having a grass-based system was more mainstream. Though others felt they were still marginalised:

UKF14: We'd still be seen as pariahs amongst the average, general, auction-going type farmer, I think. We'd still be seen as something negative. For doing things differently.

F17: I feel like we're a bit of a kicking bag for most of the problems in the industry, you know, for the spring flush that comes every year.

The 'spring flush' is the extra milk production in spring which was seen to contribute to a spring surplus of milk that lowered everyone's milk price.

From the interviews I did get a sense of a divide between farmers in a grass-based system and farmers in a 'conventional' higher-feed-input system. Grass-focused farmers told stories of how they came to farm in a way outside the norm. They were sceptical of higher-feed-input systems and in their stories, were grateful that they didn't follow a conventional path. This farmer's account is worth quoting at length:

F16: Indoor systems? Erm. I suppose, I think a lot of people end up there by accident, to be honest with you. [...] And we nearly ended up there by accident. If I go back, like, twenty years, I was having a conversation with a sales rep for a semen company, and I said, the unpalatable news, for him, that his Holsteins were shit. [laughter] And he didn't like it much. And he said, "What do you mean?" And I said they just don't last. He said, "Well, you haven't got the right facilities." He was clearly riled by what I said, which is fair enough. And I said, "Well, what sort of facilities do you want?" He said, "Well, they need rubber floors." I said, "Well, they're not indoors that long." He said, "But really, to make the most out of them, they need to be indoors all the time. You need to seriously think about bringing those indoors all the time, and feeding them." And he's right. To that degree, it makes sense. Fortunately for me, and unfortunately for him, I was also a member of the grazing group, and they'd all roll their eyes back in their heads when they hear this talk. Because they're business focused. So, the critical thing, for me, at that point, was that, in terms of the Holstein, it would make sense to do what he said, to keep them in, and so you could feed them properly, they're not great grazers and, and you'd get the most output from them, you get an awful lot of milk. But in terms of me actually making a profit, it would be a bit of bloody disaster. Because, just too much money spent, too much infrastructure required, and then you've got the possibility of three times a day milking. And then, is your parlour adequate? And on and on and on and on it goes, and can you grow enough forage for them, do you have to buy that in as well too?

According to this farmer, following advice to make the most of the Holstein's potential would've made his system complicated and expensive, and ultimately unprofitable. This is the story told about higher-feed-input systems in Ireland⁴⁵. A similar story was told by several of the grass-based interviewees.

45 Shortall.

As well as higher-feed-input systems being built around the potential of the Holstein cow, according to one farmer, there were concerted commercial attempts to move farmers away from a focus on grass:

OS: so, a couple of people have talked about the variability of nutrition from grass, so how do you sort of manage that, [laughs] why are you laughing there?

F14: Because it's just an excuse [laughter] not to graze grass, basically. That is the nonsense that feed companies will tell you. Famously, [feed company] who are a big feed merchant, took out a double page spread in Dairy Farmer Magazine or whatever it was called, basically describing grass as poison. [laughter] It basically said spring grass will give your cows ketosis and acidosis and they will fall over dead if you feed it, feed our feed instead.

So, in addition to grass-based farmers having skills, facilities and networks which are different from their higher-feed-input peers, they also had different beliefs, diagnoses of problems in the industry and 'origin stories' of their farm system.

Grass isn't best

The 'origin story' of higher-feed-input farmers was that they followed advice they received, invested in Holstein cows, and expanded their farm through milk yield and cow number targets:

F7: Nine years ago [...] that was another threshold moment and we had to decide whether we went out at that time, but my son wanted to further his career and keep dairying and so that was the decision that was made, you know, ten year ago, twelve year ago, to go and get a grant, and we were fortunate to get a grant, to build a new complex, new parlour, new cow accommodation. My goal was three hundred cows



producing thirty three point three litres, which is ten thousand litres a [year], and that was the goal, and we achieved that.

OS: Might be a silly question but, why did you want to go towards higher yields?

F15: I think that sort of came, as I say, with the improvement in genetics so we had a cow with terrific genetic potential that we weren't realising. So, there seemed little point in having this animal that, you know, could produce the goods if you weren't actually doing it. And it's a way of, you know, we felt, of generating more cash. You know, and I think that's what's driven a lot of decisions in the last ten years, fifteen years, is the necessity of increasing turnover, to try and maintain profit.

This is the 'mainstream' trajectory for UK dairy farmers: investing in Holstein cows, infrastructure and feed to maximise their productivity and ultimately stay profitable. The grass-based farmers above said that this system was complicated, high cost and driven by commercial interests. The farmers I spoke to operating a higher-feed-input system did not share this view, but attributed any difficulties making money to low milk prices because of power imbalances with milk buyers who set the price and the public not valuing milk enough.

Higher-feed-inputs farmers were to some extent ambivalent about the role of grass. They told stories about grass as variable, unpredictable and difficult to build a stable milk supply on. Again, the analysis isn't looking at the truth or falsity of these claims, but how grass is positioned within the UK dairy sector.

Farmer14 quoted above described the nutritional variability as a myth devised by feed companies. An indoor farmer however sees it as real, weather dependent and part of cows' grazing habits and preferences:

F7: Cows are very wasteful. They'll dung on it, they'll tramp on it. [...] If it's pouring rain, they'll stand in the corner and shelter and they won't eat as much dry matter because it'll all be wet, you see. [...] If you put them out in a pouring wet day, the milk will be down five hundred litres, you know, on that day, and the next day, they'll go out, lovely and sunny and it'll go back up. There's such a fluctuation, and our milk buyer wants a regular, consistent supply of milk.

Weather and geography were significant reasons why people might try to rely less on grass as a feedstuff.

F7: And I mean, managing grassland in the north east of Scotland, we've such a short growing season, basically from the middle, well, from the beginning of May to, the grass varies in quality sort of mid-July to August, so there's a very, very short window that you can graze cattle, in my opinion, successfully. But even, I don't know if it is successfully because the weather here [sighs] oh, nay that great.

A grass-focused farmer says he can see why keeping the cows indoors makes sense as a way to escape weather variability:

F16: I don't get the economics of it [indoor dairy farming], and I like to see cows outdoors. But, you know, I understand why they put them indoors, because it's a nightmare out there, isn't it? You know, the weather in this part of the world is.... [laughter] You know, what you going to get? You going to get frost, snow, ice, drought?

Thus, farmers who had followed a grass-based or a higher-feed-input trajectory had different networks, beliefs about the benefits of grass and origins stories of their farms and diagnoses of problems within the dairy industry. These different narratives can be seen as a reflection of individual circumstances and preferences, but I think they also point to divisions between different camps of stakeholders and farmers about the role of grass. Below we'll see how divisions might have an impact on environmental supply chain mechanisms.

The environment

Conflicting accounts

There are different accounts of why a grass-based or a higher-feed-input system might result in lower greenhouse gas emissions per litre of milk.

The narrative in favour of higher-feed-input systems was that higher yields dilute the greenhouse gas production per litre of milk.

I7: Generally, the more intensive you feed cows, the higher concentrate or grain dependent their diet, broadly speaking, the less greenhouse gas emissions you get. So the more forage you have in your diet, the greater greenhouse gas emissions per litre, from the data I've seen and the conversations I've had, as I understand it.

Pro-grazing stakeholders framed grass-based systems as more sustainable because of carbon sequestered in soil:

I8: And also recognising there's different sources of methane. So, methane belched out by cattle is part of a natural cycle of photosynthesis, grass species using carbon dioxide to grow, that are being fermented within the animal, belched out and sort of going round and round. Which has been going on for thousands of years, long before humans came along. But as soon as new methane is introduced to that cycle, so feeding grain that's required fossil fuels et cetera, or soya being shipped around and grown and deforestation et cetera, then that introduces new methane to that system, and that's when it can, cannot be so good.

It is worth noting that there was a difference between grass-based systems that were focused on sustainability, like organic or the Pasture Fed Livestock Association, and grass-based systems that were focused on production. Pro-grazing stakeholders often spoke about the benefits of 'low-input' and 'extensive' grass-based systems. The standards for farmers within the Pasture for Life certification scheme recommend that artificial fertiliser only be used when there is a soil fertility need that cannot be met by other sources⁴⁶. Whereas conventional grass-based farmers I spoke to would not necessarily identify with a low-input framing, but did aim to maximise grass production in line with the systems operated in New Zealand and Ireland:

F14: We were only growing sort of, nine to ten tons per hectare, because there was no, there was no pressure so we weren't really putting a lot of fertilizer on or anything else. [...] And we went from growing nine or ten tons of dry matter per hectare to, we can do sixteen to eighteen today.

Thus, in the UK 'grass-based' farming is not a homogeneous category, but some systems have an explicitly sustainability focus and some have a production focus. Within the grass-based 'camp' however everyone agreed soil carbon sequestration generally makes grass-based systems, whether extensive or intensive, lower carbon than higher-feed-input systems.

There were suggestions that governments were beginning to pay more attention to the potential environmental benefits of grass:

I5: I can see a mood swing within our own Department of Agriculture, focusing on more grass-based systems. You can actually begin to, can actually begin to see that, but it will take a couple of years to come through. Which is going to require a mindset because they were, it was all about getting bigger and providing grant aid funding to become more efficient on your farm, and was going to have to, there will be a change, for farmers, will require a policy change.

OS: Where do you think that swing is coming from?

I5: It's the environment.

If this is the case and 'public money for public goods' focuses on the use of grass in dairy farming, the way that grass is used will need to be considered, as described above 'grass-based' systems are homogenous in the UK. A government employee talks about encouraging certain types of environmentally friendly grazing practices.

G1: We'd really like to encourage people to move towards different swards, so much more leguminous sward than currently. And again there are example farms out there that are doing that and doing really well, still get three cuts of silage and so on but with very little external input other than manure.

It is beyond the scope of this report to go into detail about different framings of environmental sustainability (there are other issues including ammonia emissions, nutrient pollution, biodiversity and soil health). But it is

⁴⁶ Pasture for Life, "Certification Standards for Ruminant Livestock," 2020, <https://www.pastureforlife.org/media/2020/08/PfL-Standards-Update-Version-4.0-FINAL-v2.pdf>.

worth noting that different ways of calculating emissions can advantage or disadvantage farmers in different systems. A grass-based farmer says that the carbon calculations done by his milk buyer suit higher-feed-input systems rather than grass-based systems:

F12: It all comes down to how the calculations are done, concentrate feed doesn't have all the carbon inputs included, we think, whereas grass does, giving high concentrate feeding cows an advantage especially when no sequestration is allowed for grassland. Which is why we believe that [milk buyer] has designed its climate check to suit its core base.

Given the description above that grass-based and higher-feed-input farmers fell into different 'camps', farmer 12 interprets the calculations as favouring the majority of higher-feed-input farmers.

This shows the limitations of the 'system differences don't matter' narrative. The dominant narrative is that it's not important or helpful to distinguish between systems in relation to economics, the environment or animal welfare. As described above, systems differences *do* matter to farmers for different reasons including a potential need to incorporate environmental differences between systems into greenhouse gas calculation methods.

Conclusion

For me, the research wasn't about the truth of claims about the economic, environmental and animal welfare benefits of different systems, or lack of differences between systems, but listening to stories told about grazing and housing. I can see the pragmatism and necessity of the 'any system can work' story: it doesn't pit farmers against each other, and it paints farmers as autonomous individuals rather than victims of a system. But to me it also lacks imagination somewhat and ignores stories about why systems differences do matter. Farmers who grazed got satisfaction from seeing and working with their cows outside. The way greenhouse gas emissions are calculated needs to be sensitive to system differences to avoid penalising some farmers over others. Farmers' origins stories, networks and belief systems were aligned with being a particular 'type' of farmer: grass-focused or focused on yield through feed.

I found it interesting how much the story told about indoor farming from animal welfare campaigners differed from the story I heard from farmers. Campaigning groups framed indoor dairy farming as a type of 'industrial' or 'factory' farming because the animals are treated as components rather than sentient beings. The farmers I spoke to (indoor or grazing) generally didn't see major differences between the systems in terms of how cows were treated and the relationships between cows and people. This could be part of a desire to band together to defend against what they see as increasing outside criticism. And also, because I think everyone is in (roughly) the same system facing (roughly) the same pressures: making money from cows with volatile, and according to the farmers, inadequate milk prices, while trying to respect the cows, navigate an often challenging relationship with the public and government and try to enjoy their job.

While the question of indoor and grazing systems was about the place of the cow, stories about grass were about the position of the farmer. For the grass-based farmers, grass is a way to eke out some autonomy in a system where all parts of the supply chain are controlled by actors more powerful than farmers. In extensive grass-based systems like organic or the Pasture Fed Livestock Association, this is even more so because farmers don't need to rely on fertiliser for grass growth. The stories told by grass-focused farmers were similar to the ones I was hearing in Ireland that grass was the foundation of dairy farming. And grass was underused and underappreciated in the UK dairy sector in general. Whereas higher-feed-input farmers saw grass as difficult, variable and unreliable. And the difficulty of being a dairy farmer isn't necessarily because they have bought into an expensive system, but because of power inequalities with milk buyers and milk being undervalued by the public. To me, it was these stories that made grass more 'politicised' among farmers than stories about indoor and grazing systems.

There was more pragmatism among farmers than stakeholders about grass-fed labels. If grass-based labels could make the economic environment farmers operate in a bit easier and reward them for a practice they enjoyed, then the farmers I spoke to welcomed them. The key stakeholders I spoke to the other hand were often sceptical, possibly because of the framing of indoor dairy farming from outside of the industry.

The unease and anxiety that I read into controversies about indoor dairy farming that sparked my initial interest still stand: cows aren't valued enough, farmers' work isn't valued enough, most of us are out of touch with how our food is produced and we're in the midst of an environmental crisis. To these larger problems I can only suggest solutions which other people have pointed to: finding ways to better value animals in dairy farming and fairly remunerate farmers, including through shorter supply chains; public money from public goods or contracts that reward farmers for animal welfare and environmental outcomes. Livestock farming is facing a need for transition because of the environmental crisis, and any just transition needs to include discussion of the role of grass and grazing. Grass is part of the narrative about how the industry represents itself and the choices people make and systems they build.

Appendix 1. Documents analysed

I searched for documents to analyse from April to July 2018. I looked for documents from government, NGO and agricultural organisations and individuals from 2010 onwards which expressed the organisation or individual's policy or position around animal welfare, economic and/or environmental issues in UK dairy farming. There were a small number of documents pre-2010 which I included because they were of relevance to the research questions.

Government	<p>Defra (2012) <i>Progress towards a sustainable future for livestock farming</i>. London.</p> <p>Defra (2018a) <i>Clean Air Strategy 2018</i>. London.</p> <p>Defra (2018b) <i>Health and Harmony: the future for food, farming and the environment in a Green Brexit</i>. London.</p> <p>Expert Working Group on Sustainable Land Management (2016) <i>Delivering Our Future , Valuing Our Soils : A Sustainable Agricultural Land Management Strategy for Northern Ireland</i>. Belfast.</p> <p>FAWC (2009) <i>Farm Animal Welfare in Great Britain: Past, Present and Future. Farm Animal Welfare in Great Britain: Past, Present and Future</i>. London. DOI: 10.1016/j.rvsc.2007.04.021.</p> <p>FAWC (2010) <i>The welfare of dairy cows housed all year round and/or in very large herds</i>. London.</p> <p>National Assembly for Wales (2017) <i>Research Briefing: The dairy sector</i>. Cardiff.</p> <p>POST (2012) <i>Livestock Super Farms. POSTnote</i>. London. Available at: http://www.parliament.uk/business/publications/research/briefing-papers/POST-PN-404%5Cnpapers2://publication/uuid/76133D41-99B9-48FE-96CA-4DB6C6AA83AA.</p> <p>Richardson A (2015) <i>A Review of the Dairy Sector in Wales</i>. Cardiff.</p> <p>Scottish Government (2013) <i>Scottish Dairy Review : "Ambition 2025 "</i>. Edinburgh.</p> <p>Scottish Government (2015) <i>Dairy Action Plan</i>. Edinburgh.</p>
Industry	<p>Agri-Food Strategy Board (2012) <i>Going for Growth: A strategic action plan in support of the Northern Ireland Agri-Food Industry</i>. Belfast.</p> <p>AHDB Dairy (2015) Evidence Report: GB herd performance 2014/15. (December): 9–11.</p> <p>AHDB Dairy (2017) <i>Delivering a more competitive industry through optimal dairy</i>. Stoneleigh.</p> <p>Andersons (2017) <i>Dairy Outlook 2017</i>. Melton Mowbray.</p> <p>CHAWG Dairy Cattle Welfare Subgroup (2018) <i>GB Dairy Cattle Welfare Strategy 2018-2020</i>. London.</p> <p>Dairy Roadmap (2015) <i>Dairy Roadmap 2015</i>. Dairy UK.</p> <p>Dairy UK (2017) <i>The white paper</i>. London.</p> <p>DairyCo (2013a) <i>Dairy statistics</i>. Kenilworth. Available at: http://www.dairyco.org.uk/non_umbraco/download.aspx?media=1438.</p> <p>DairyCo (2013b) <i>Managing Costs: Key findings of the Milkbench+ dairy benchmarking programme regarding the efficiency of dairy production in the UK</i>. Kenilworth.</p> <p>DairyCo (2014) <i>Milkbench Evidence Report 2012/13</i>. Available at: http://dairy.ahdb.org.uk/resources-library/market-information/milkbenchplus/milkbenchplus-evidence-report-2014/#.VaJy__IVhBc.</p> <p>Dawson P, Lancaster B, Newberry R, et al. (2014) <i>Leading the way: The British Dairy Industry's Sustainable Growth Plan</i>. London. DOI: 10.1037/e515422010-040.</p> <p>NFU (2010a) <i>Dairy Cow Welfare Strategy. October</i>. Stoneleigh.</p> <p>NFU (2010b) Dairy farming systems in Great Britain. Available at: http://www.thedairysite.com/articles/2549/dairy-farming-systems-in-great-britain/ (accessed 14 September 2016).</p> <p>NFU (2013) <i>Compete to Grow: A vision and strategy for the British Dairy Industry</i>. Kenilworth.</p> <p>The Dairy Group (2012) <i>Dairy Cow Housing Report prepared for Arla , Morrisons and DairyCo</i>. Taunton.</p>
Research	<p>Arnott G, Ferris CP and O'Connell NE (2017) Review: welfare of dairy cows in continuously housed and pasture-based production systems. <i>Animal</i> 11(2): 261–273. DOI: 10.1017/S1751731116001336.</p> <p>Davies G (2013) <i>Pasture Utilisation - Yiel from the Field</i>. Taunton.</p> <p>Jackson A (2012) <i>Can we learn to love the megadairy? Politics, planning and PR</i>. Taunton.</p> <p>Levitt T (2018) <i>Put a label on it: why the future of milk is a branded one Tom Levitt</i>. Taunton.</p>

NGO	<p>Atkins (2011) <i>Application for Planning Permission for an Intensive Dairy Unit (Ref 10 / 1397 / FUL) at Nocton Heath , Lincolnshire Objection on Behalf of Compassion in World Farming and the World Society for the Protection of Animals.</i></p> <p>CIWF (n.d.) <i>Report on the welfare of EU dairy cows.</i> Surrey.</p> <p>Compassion in World Farming (2011) <i>RE: Planning Application No. 10/1397/FUL Erection of an intensive dairy unit North of Dunston Heath Lane and West of B1188 Nocton Heath Lincoln I.</i> Godalming.</p> <p>RSPCA (2017a) <i>Dairy cattle: to pasture or not to pasture ?</i> Horsham.</p> <p>RSPCA (2017b) <i>The Welfare of Dairy cows.</i> Horsham.</p> <p>Viva (2005) <i>The dark side of dairy.</i> Bristol.</p> <p>World Animal Protection (2016) <i>Full Fact Milk Making the right choices.</i> London.</p> <p>WSPA (2011) <i>Weighing up the economics of dairy farms: a briefing by the World Society for the Protection of Animals.</i></p>
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Appendix 2. Details of Scottish survey results

Descriptive statistics of demographic and farm system variables are shown in table 1. The respondent median herd size was 160 cows. The average herd size in Scotland is currently 201 cows⁴⁷, which is similar to the mean of 206 in the sample. The sample average milk production per cow per year was very similar to the national average: 7966 litres compared to the UK average of 7825 litres⁴⁸. Calving pattern was similar to the UK dairy farmer population: 80% of respondents carried out year round calving compared to 79% of the UK dairy population⁴⁹.

Table 1. Respondent descriptive statistics.						
Responses (n)	Gender (%)		Time in farming (%)			
	Male	Female	<10 years	10-20	20-30	>30
254	96	4	4	8	21	67
Cow numbers (n)						
Median	Mean	Max	Min	IQR		
160	206	1300	29	240-120		
Milk yield (litres)						
Median	Mean	Max	Min	IQR		
8000	7966	16000	3000	9000-68000		
Education (%)						
GCSE equivalent	A-level equivalent	Certificate	Diploma	Degree	Postgraduate degree	
23	11	20	25	19	1	
Ownership structure (%)						
Owner	Manager	Employee	Family	Partner	Other	
92	2	<1	<1	5	<1	
Full time labour units						
Organic (%)	Conventional (%)	Median	Max	Min	Interquartile range (IQR)	
6	94	3	17	0.5	4-2	
Land owned						
(n)	Median (ha)	Max (ha)	Min (ha)	IQR (ha)		
222	141	809	9	200-98		
Land rented						
(n)	Median (ha)	Max (ha)	Min (ha)	IQR (ha)		
159	70	600	2	120-30		
Total land						
(n)	Median (ha)	Max (ha)	Min (ha)	IQR (ha)		
247	180	1293	18	280-120		
Calving pattern (%)						
Year round calving	Spring calving	Autumn calving	Spring and autumn calving			
80	5	5	10			

47 Gemma Mackenzie, "Number of Scottish Dairy Herds Still Declining," The Press and Journal, 2019.

48 AHDB Dairy, "Average UK Milk Yield," 2018.

49 AHDB Dairy, "Delivering a More Competitive Industry through Optimal Dairy."

Expanded since 2015 (%)		Plan to expand in future (%)					
51		33					
Means of expansion since 2015							
More land	More cows	More concentrate	Different breeds	Change calving	Change grass management	Improve health/fertility	Partnership
23	84	20	3	9	24	40	0
Means of future expansion							
14	77	17	5	5	24	54	4
Housing and grazing system (%)							
Year-round grazing	Summer grazing, winter housing with minimal additional feed	Summer grazing, winter housing with additional feed	Year-round housing some lactating cows	Year-round housing all lactating cows	Year-round housing all cows (including followers)		
2	38	41	4	12	3		

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