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Commercial practice of out-wintering dairy heifers in Great Britain

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Abstract
The majority of dairy cattle in Great Britain (GB) are housed during winter but replacement heifers are out-wintered on some farms, a practice that may reduce the need for high capital-cost housing and facilitate herd expansion. Dairy farmers that were out-wintering replacement heifers in GB in 2012 were surveyed to determine current practice and attitudes. A typical system involved heifers strip grazing pasture or a crop, with baled grass silage as supplementary feed; strongly resembling outdoor wintering systems in New Zealand. Many used more than one grazed forage; predominantly, pasture on 68%, kale on 53% and fodder beet on 33% of farms. Supplementary feed was 44% of the diet in younger, and 35% in older heifers. Although farms were approximately three times larger than the national average and 60% were expanding, expanding herd size was not the primary reason for out-wintering, with the main reasons being to reduce cost and improve animal health and welfare. Farmers that out-wintered heifers typically reported good animal average daily gain of 0.6 kg/d and high body condition; however, this contrasts with some measured performance in GB. Farmers may benefit from accurate feed allocation and monitoring heifer live weight during winter to ensure high performance.

Keywords: live weight, body condition, pasture, brassica, fodder beet

Introduction
Great Britain (GB) has a temperate climate that facilitates a wide range of dairy-management systems (March et al. 2014). Systems range from spring block-calving with rotational grazing, to all-year-round (AYR) calving, continuously housed cattle. However, in excess of 99% of dairy cows in GB are housed during the winter months (March et al. 2014). As in many parts of the world, the average herd size has been increasing (AHDB Dairy 2020), and as herd size increases, greater pressure can be placed on existing cattle housing, with the potential for poorer animal health, welfare and production (Thompson et al. 2020). Wintering cattle outdoors, known as out-wintering, is a farmer-led innovation within GB (Barnes et al. 2013), and is an option to mitigate increasing costs of production, release existing housing and facilitate herd expansion across a range of dairy systems.

New Zealand has a climate comparable to that of Great Britain yet wintering dairy cattle outdoors on forages grazed *in-situ* is normal commercial practice in New Zealand (Holmes et al. 2002). This practice also occurs in other temperate climates such as Ireland. Winter diets are composed of pasture, brassicas and/or fodder beet supplemented with conserved forage (Keogh, French, McGrath, et al. 2009a, b). Much of the research regarding animal performance in *in-situ* out-wintering systems has focused on mature cattle, revealing that the choice of winter forage, allowance, and level of supplementary feed can influence both winter and subsequent lactation performance (Keogh, French, McGrath, et al. 2009b, Keogh, French, Murphy, et al. 2009, Rugoho et al. 2014). The effects of out-wintering systems on replacement heifers has been less well studied. McCarrick & Drennan (1972) found the performance of yearling Friesian steers was not affected by out-wintering on a sawdust pad compared with winter housing. In contrast, yearling dairy heifers out-wintered on woodchip pads had reduced performance, but higher-quality welfare compared with animals housed over winter (Boyle et al. 2008). Sustainable out-wintering systems must therefore combine satisfactory animal and economic performance with high-quality animal welfare and low environmental impact (Barnes et al. 2013, French et al. 2015).

Currently little is known about the practice of out-wintering replacement heifers, or the performance of these heifers in GB. Therefore, the aim of this study was to identify the reasons, practice and outcomes of out-wintering from a farmers' perspective, to help inform future research and knowledge transfer. Information for this study was obtained by surveying farmers who out-winter replacement heifers in GB.

Materials and Methods
Survey questionnaire
In 2012, a list of GB dairy farms that were out-wintering dairy cattle was compiled from AHDB-Dairy (the dairy farmer levy body in GB), regional grassland societies, and dairy farmer discussion groups. A questionnaire

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was drafted with consultation with AHDB-Dairy, and piloted on five farmers. The final questionnaire, introductory letter, and free-post envelope were posted to 120 farms. An online version of the questionnaire was available simultaneously, and was publicised via Twitter and relevant Facebook discussion 'e-groups'. The study received ethical approval by the Harper Adams University Ethics Committee. Farmers who did not respond were followed up with postal correspondence and additional questionnaires 3 and 16 weeks later. The survey closed 6 months after the launch, at which time 70 usable questionnaires had been returned. South West England accounted for 30% of returned questionnaires, 27% from the West Midlands, 13% North West England, 10% for both Scotland and Wales, and the remaining 10% from regions in the east of England.

The questionnaire was comprised of questions in four main categories:

Farm characteristics. Participants were asked to provide details regarding farm location, animal numbers, breed, production, reproduction and other characteristics including climate, soil texture and drainage and whether they were expanding cow numbers.

Management of out-wintering system. On a five-point Likert scale (from 1 — 'not important' to 5 — 'extremely important'), participants were asked to indicate how important various factors were in selecting fields for out-wintering heifers. Participants were also asked a series of questions on crop type (including pasture) and supplementary feed offered to heifers <1-year-old (R1) and >1-year-old (R2), and multiple-option questions on out-wintering management of fields, animals and feeds.

Reasons for out-wintering. On a five-point Likert scale, from 1 — 'not important' to 5 — 'extremely important', participants were asked to indicate how important a series of eight factors were in their decision to out-winter heifers in place of housing.

Performance and success of out-wintering. Participants were asked to indicate if heifers gained, maintained or lost body condition score (BCS) whilst out-wintering, and to state the BCS at calving typically achieved by the heifers. Participants were asked if they monitored heifer live weight (Lwt), and to provide an average change in Lwt over the winter. The average daily Lwt gain (ADG) between mating and calving were also calculated for R1 and R2 heifers where possible from the values provided for Lwt and age of heifers at mating and calving. On a five-point Likert scale, from 1 — 'much better' to 5 — 'much worse', participants were also asked how various factors of out-wintering compared to housing their heifers.

Respondents were asked to provide responses for the most recent winter except for numbers of animals, where they were asked to provide numbers for three years in order to quantify expansion of herd size.

Data handling and analysis

Data were analysed in R (R Core Team, 2020) for descriptive statistics of questionnaire responses in the first instance and for differences between groups in cases where relationships could be described. Groups treated as factors were: 1. farms either expanding (n=42) or not expanding (n=23) herd size; 2. farms with a spring block-calving (spring, n=48), all-year-round (AYR, n=10), and split spring/autumn-block (split, n=10) calving pattern. There was one farm with an autumn-block and one with an "other" calving pattern (calving in November and December), and both these were excluded from the analysis by calving pattern. Continuous variables were tested for normality and homogeneity of variances prior to analysis by ANOVA, and Games-Howell test subsequently performed *post hoc*, whilst proportional data were analysed by GLM with a *quassi poisson* distribution due to over-dispersion, and Likert-type questions were analysed using ordinal regression.

Results

The average milking herd was 368 ± 25.2 (mean ± SE) cows (n=67), ranging from 35 to 1100 cows (Table 1), and mean herd size did not differ (P=0.377) among herds that were either expanding or not expanding. Expanding herds had increased cow numbers by 12% per annum in the previous two years. The length of calving block for seasonal calving herds was 11.7 ± 0.38 weeks (n=47), whilst the calving interval for AYR herds was 399 ± 9.0 days (n=10). Spring calving herds had the highest proportion (P<0.05) of cross bred cows in the herd, whereas AYR herds had the highest proportion (P<0.05) of Holstein-Friesians. Milk production was highest, and fat and protein % lowest in AYR compared to spring calving herds (P<0.05).

The mean replacement rate was 20 ± 1.0% (n=68), whist the number of R1 and R2 heifers reared was 132 ± 12.5 (n=70) and 121 ± 11.1 (n=69) respectively, with no difference (P>0.05) between herds expanding or not expanding. The Lwt of heifers was 316 ± 7.0 kg (n = 61) at mating, and 459 ± 7.9 kg (n=62) at calving, equating to 60% and 88% of mature Lwt at mating and calving respectively, although heifers in AYR herds were older at calving (P<0.05) than in spring herds. The average daily gain (ADG) from mating to calving was calculated as 0.54 ± 0.020 kg/d (n=56).

The typical winter climate was classified as "cold & wet" by 24% of participants, "cold & dry" by 10%, "mild & wet" by 50%, and "mild & dry" by 10%, with 6% of participants not able to classify a typical winter climate for their location. Areas used for out-wintering

Table 1 Characteristics (mean ± SE) of dairy herds by calving pattern[1] from responses in a survey of farmers out-wintering replacement dairy heifers in Great Britain.

	Spring	AYR	Split	P value
Milking herd				
Herd size, cows	388 ± 33.0	248 ± 49.9	384 ± 45.4	NS
Milk volume, L per cow	4788 ± 141.2^{b}	7600 ± 538.1^{a}	5588 ± 409.3^{b}	< 0.001
Milk solids*, kg	391 ± 11.1^{b}	561 ± 32.9^{a}	445 ± 29.9^{b}	< 0.001
Fat, g/kg	46 ± 0.05^{a}	42 ± 0.15^{b}	45 ± 0.18^{ab}	0.010
Protein, g/kg	36 ± 0.03^{a}	33 ± 0.04^{b}	35 ± 0.07^{ab}	< 0.001
SCC[2], ×1000	174 ± 7.1	191 ± 17.4	192 ± 14.6	NS
Mature Lwt[3], kg	512 ± 6.1^{b}	607 ± 26.8^{a}	515 ± 21.6^{b}	< 0.001
Replacement rate, %	20 ± 1.0	21 ± 2.0	20 ± 2.0	NS
R1[4] heifers reared	145 ± 15.2^{a}	57 ± 11.5^{b}	145 ± 41.2^{ab}	0.046
R2[5] heifers reared	119 ± 11.9^{a}	68 ± 13.2^{b}	171 ± 47.8^{ab}	0.040
Breed, % of herd				
Crossbred	65 ± 4.6^{a}	4 ± 1.6^{c}	38 ± 9.8^{b}	< 0.001
Holstein-Friesian	28 ± 4.0^{b}	85 ± 9.5^{a}	49 ± 9.8^{b}	< 0.001
Jersey	5 ± 2.2	8 ± 7.0	13 ± 9.8	NS
Other	2 ± 0.9	3 ± 2.2	1 ± 0.9	NS
Heifers at mating				
Age, months	15.1 ± 0.29	17.6 ± 1.48	15.2 ± 0.55	NS
Lwt, kg	303 ± 6.0	368 ± 29.3	326 ± 21.5	NS
% of mature Lwt*	59 ± 1.0	62 ± 4.0	64 ± 3.0	NS
Heifers at calving				
Age, months	23.8 ± 0.07^{b}	27.8 ± 1.25^{a}	24.7 ± 0.55^{ab}	< 0.001
Lwt, kg	449 ± 5.7	526 ± 38.8	452 ± 31.1	NS
% of mature Lwt*	88 ± 1.0	89 ± 4.0	88 ± 3.0	NS
BCS, 1 to 10	5.9 ± 0.12	6.2 ± 0.65	5.9 ± 0.52	NS
ADG*, kg/d	0.54 ± 0.016	0.55 ± 0.124	0.52 ± 0.094	NS

[1] Spring block-calving n=48; All-year-round (AYR) calving n=10; Spring/Autumn block-calving n=10.
[2] Somatic cell count
[3] Live weight
[4] Rising one-year-old
[5] Rising two-year-old
* Calculated from questionnaire responses. Average daily Lwt gain (ADG) calculated between mating and first calving.
Means (± standard error of the mean), with different superscripts within a row differ (P<0.05).

were reported as predominantly (68% of farms) freely drained with mainly (60% of area) light textured soils, followed by moderately drained (26% of farms) with mainly (70% of area) medium textured soils, and poorly drained (6% of farms) with mainly heavy soils (80% of area). The principal criterion for selecting out-wintering fields was the type of soil, with 29% of farmers indicating this was extremely important, 28% very, 32% moderately, 3% slightly, and only 9% not important. Steps taken to avoid soil pugging of out-wintering fields were predominantly back-fencing previously grazed areas (34%) and selecting a free-draining field for out-wintering (32% of responses). Steps taken to avoid run-off from out-wintering fields were most commonly selecting a free-draining field (33%), avoiding steep fields (24%), and using buffer strips to catch run-off (21% of responses).

Both R1 and R2 heifers were out-wintered on 70% of farms, whilst 3% only out-wintered R1 and 27% only out-wintered R2 heifers (n=66). More than one type of forage was used for winter grazing on 67% of the participating farms, with grazed pasture used as an out-wintering forage on 68% of the farms, kale on 53%, fodder beet on 33%, hybrid brassicas on 29%, turnips on 27%, and swedes on 3% of farms. For both R1 and R2 heifers, pasture was the most prevalent grazed forage, whilst kale was the most common purpose sown forage crop (Figure 1A). Fodder beet was less prevalent for R1 heifers; 9.5% compared with 17.7% of responses for R2 heifers.

The pre- and post-grazing pasture cover for out-wintered heifers were 3280 ± 91 (n=41) and 1450 ± 34kg DM/ha (n=39) respectively. Kale yields were stated as 10 ± 1.1t DM/ha (n=8), whilst fodder beet yields were 21 ± 1.3t DM/ha (n=16). Crop utilisation was reported to be 83 ± 1.3% (n=60). Farmers stated that supplementary feed was offered at an average rate of 44 ± 3.5% of DM (n=12) to R1 heifers, and 35 ± 3.5% of DM (n = 29) to R2 heifers. The most prevalent supplementary feed offered to out-wintered heifers was baled grass silage (Figure 1B), and supplementary feed utilised was stated to be 88 ± 1.5% (n=65). The quantity of feed offered to both R1 and R2 heifers during the out-wintering period is presented in Table 2, including the estimated dry matter intake (DMI) calculated from questionnaires with sufficiently completed responses.

Grazed-forage management was predominantly strip grazing (Figure 2A). The supplementary feed was most commonly stored in the field (62%), but was also delivered daily to heifers (25%), delivered weekly (11%), with other options 3% of responses, and was most commonly offered from a ring feeder (43%) or on the ground (32% of responses). A dry lying area was achieved mainly by the choice of out-wintering field, and by allowing for a grass run-back or wide headland area (Figure 2B). Severe weather was commonly managed by allocating an additional area or offering additional supplementary feed (Figure 2C), however a fifth of responses indicated no change in management was implemented to manage severe weather. Low body condition or underweight heifers were predominantly housed or out-wintered in a separate group (Figure 2D).

The major reasons for out-wintering replacement heifers were to reduce costs, followed by: improving animal health and welfare; alleviating pressure on buildings, and; reducing labour input (Figure 3). The overall ranking of reasons did not change (P>0.05) for farmers either expanding or not expanding herd size.

When asked how out-wintering heifers compared with housing heifers for a number of factors, the majority (97%) scored out-wintering better for costs and profit, whereas, milk production in first lactation was believed to be the same by 56% of participating farmers (Figure 4).

During the out-wintering period, 59% of farmers believed that their heifers gained body condition,

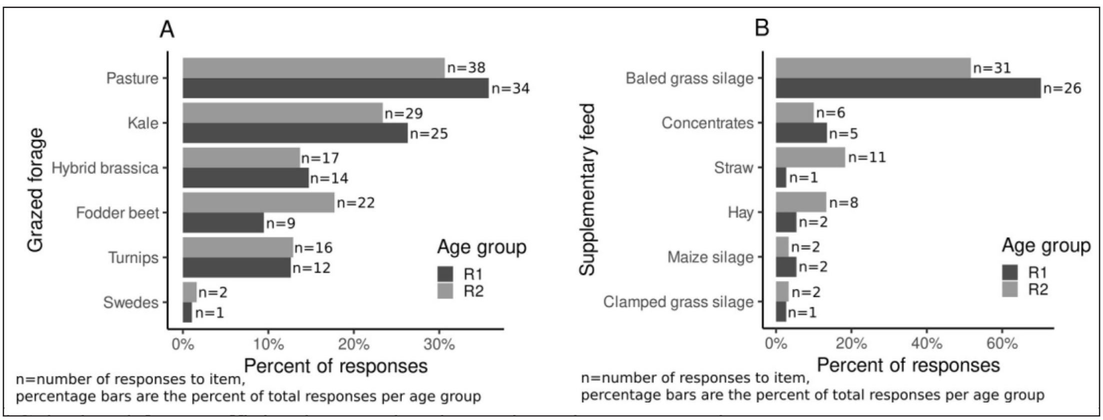

Figure 1 Grazed forages (A) and supplementary feeds (B), used for out-wintering replacement dairy heifers in Great Britain.

Table 2 Quantity of feed offered and estimated intake (mean ± SE) of dairy heifers from responses in a survey of farmers out-wintering replacement dairy heifers in Great Britain.

	Grazed forage offered		Supplementary feed offered		Dry matter intake*	
	kg DM/day	n[1]	kg DM/day	n	kg DM/day	n
R1[2] heifers	4.7 ± 0.48	17	3.4 ± 0.52	31	5.7 ± 0.32	14
R2[3] heifers	9.1 ± 0.80	38	4.5 ± 0.40	42	9.2 ± 0.40	28

* Calculated from sufficiently completed questionnaire response data
[1] number of farmers responding
[2] Rising one-year-old heifers
[3] Rising two-year-old heifers

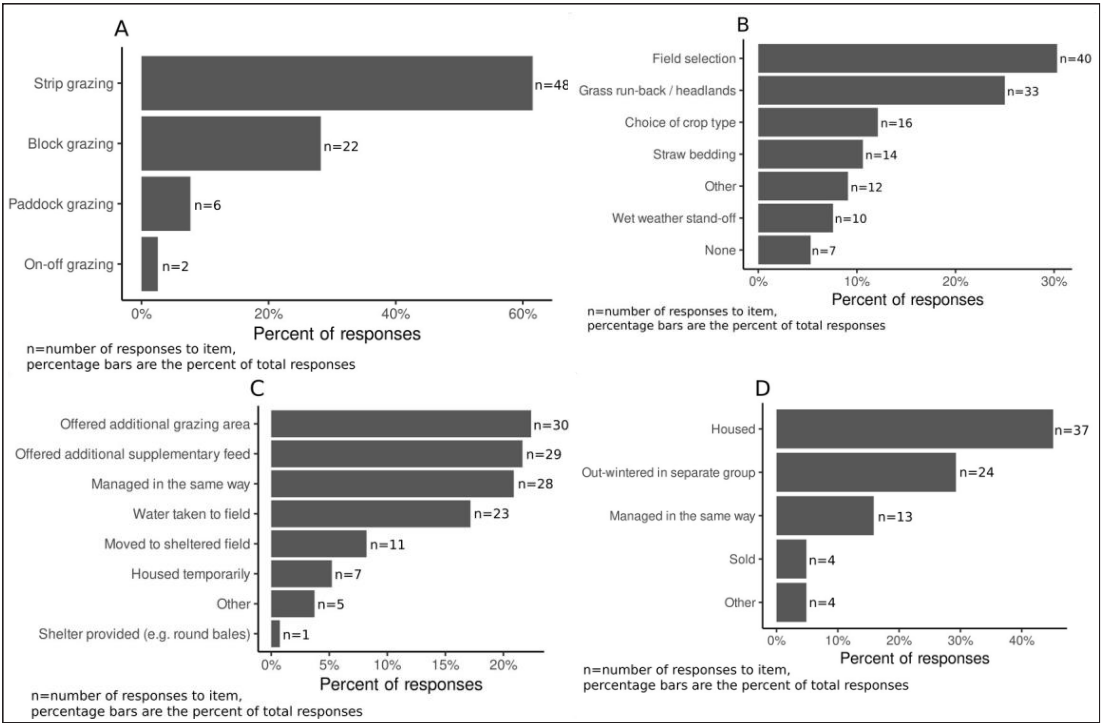

Figure 2 Out-wintering management practices for grazing (A), providing dry lying (B), severe weather (C), and for poor performing (D) replacement dairy heifers in Great Britain.

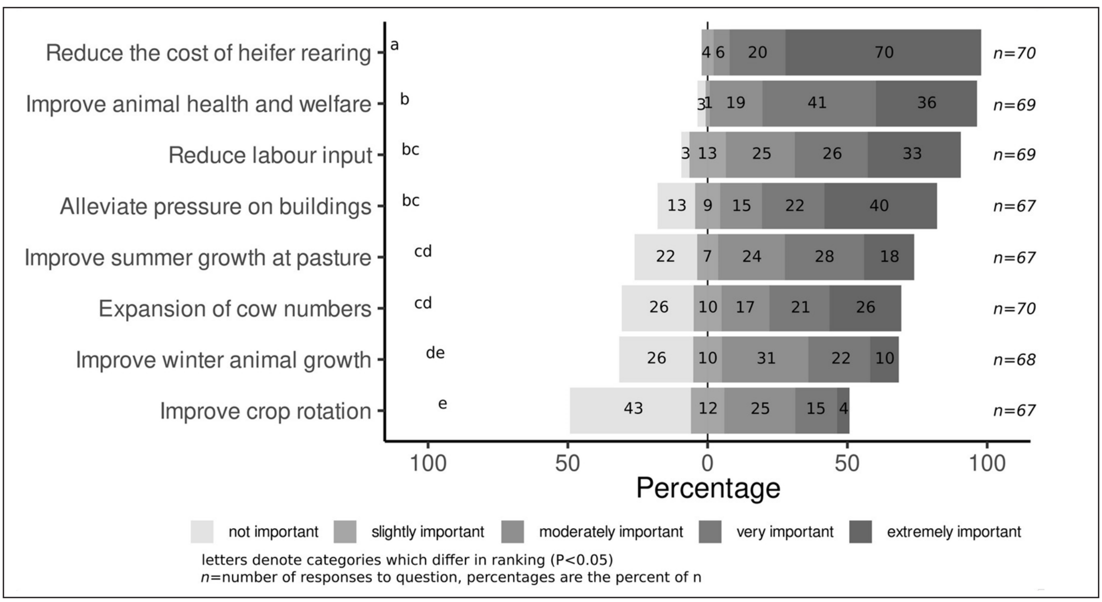

Figure 3 Reasons for out-wintering heifers scored on a Likert scale by farmers out-wintering replacement dairy heifers in Great Britain.

37% believed they maintained condition, whilst only 4% indicated that their heifers lost condition through the winter. Some Lwt monitoring was undertaken on 17% of participating farms during the winter. Those monitoring Lwt had an ADG in R1 heifers of 0.56 ± 0.038kg/d (n=10) ranging from 0.40 – 0.80 kg/d, and 0.61 ± 0.072kg/d (n=7) ranging from 0.38 – 0.90 kg/d in R2 heifers.

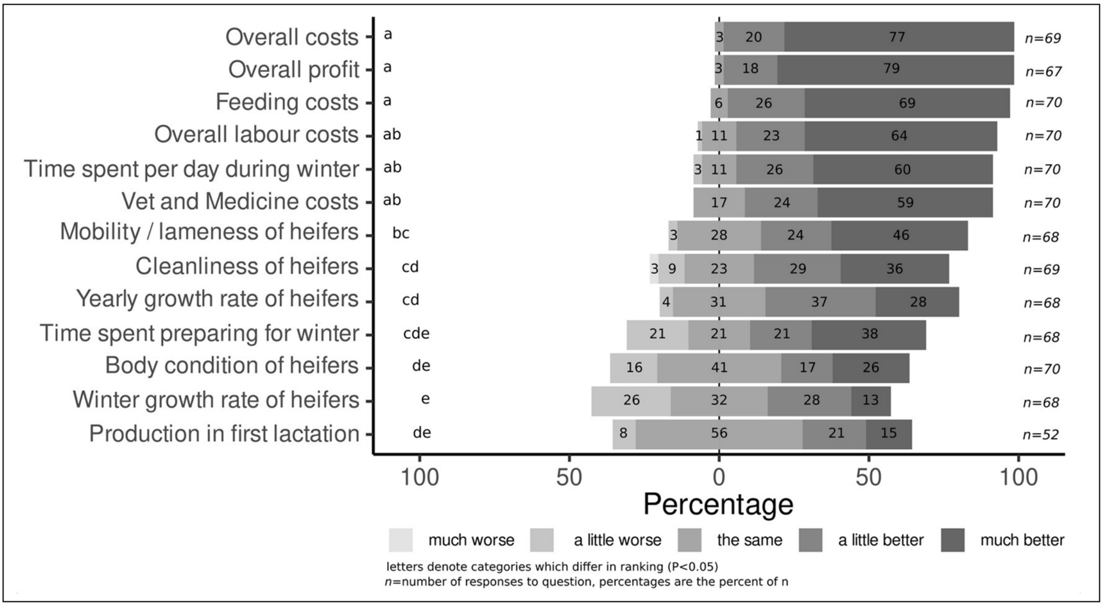

Figure 4 Farmer ranked success of out-wintering compared with housing of heifers scored on a Likert scale by farmers out-wintering replacement dairy heifers in Great Britain.

Discussion

This survey targeted farmers who were currently practising out-wintering of dairy cattle in GB, with nearly 69% having a spring calving pattern and rotationally grazing pasture comparable to a typical NZ system (Holmes et al. 2002). Only 4% of farms in GB are spring calving (AHDB Dairy 2017), with the current survey representing approximately 10% of these. However, a range of system types participated in this study, including those with AYR and split calving patterns supplying milk year-round. It is possible that only farmers with successful out-wintering systems responded to the survey, although there was a high return rate for the questionnaire. This study therefore provides a valuable description of out-wintering systems for dairy heifers in this segment of the GB dairy industry from a practising farmer viewpoint.

The average herd size managed by the respondents was approximately three times larger than the national average at the time of 123 cows (AHDB Dairy 2020). Sixty percent of respondents were expanding herd size by an average of 12% per annum over the previous two years. More heifers were reared than needed for a 20% replacement rate so it is likely that the additional cows were largely obtained by rearing additional replacement heifers. The cost of obtaining heifers represents the second largest annual expense on dairy farms, and a recent survey on the cost of rearing heifers in GB reported that the average dairy farm does not gather a return on investment until after 1.5 lactations (Boulton et al. 2015a). As a proportion of total rearing expenses, the top three costs involved with rearing heifers from weaning are feed (36%), labour (25%), and bedding (9%) (Boulton et al. 2015b). Much of the cost of rearing dairy cattle in GB is associated with winter where the majority are housed (March et al. 2014), and therefore must use conserved forages and purchased feed, and are associated with high operating costs of cattle housing. Given the importance of successful heifer rearing, it is perhaps unsurprising that farmers surveyed in this study overwhelmingly felt that overall cost and profit were much better as a result of out-wintering, and their number-one reason cited for out-wintering was to reduce the cost of heifer rearing. Similarly, in a series of workshops with dairy and livestock farmers practising out-wintering, Barnes et al. (2013) reported that farmers discussed lower variable costs, in particular animal health-related costs, as reasons for out-wintering, although out-wintering required high stockmanship skill and management to be successful. In the current survey, improved animal health and welfare was the second most important reason farmers were out-wintering heifers, along with reduced labour input and less pressure on buildings from high housing density. The similarity of scores of these three reasons probably indicates that they are related, as housing involves additional labour tasks, for example, bedding, scrapping and mucking out stalls, yards and passageways, to reduce disease incidence and maintain welfare standards.

Typical out-wintering systems used by the farmers in this study involved heifers strip grazing pasture or a forage crop *in situ*, supplemented with baled grass silage that had been placed in the field prior to grazing. Forage crops were typically kale, or other brassica. However, for older age groups of heifers, fodder beet was the second most frequently chosen crop. The most frequently used wintering forage in Canterbury, NZ has been documented as kale, closely followed by fodder beet, and supplemented with straw or pasture silage (Edwards et al. 2017), and farmers in NZ are advised to set crops up early with bales positioned appropriately (DairyNZ n.d.). Kale and fodder beet both have the advantage of a high nutritive value and yield in comparison to winter pasture, and thus less area is required for winter grazing (Atkins et al. 2018; Keogh, French, McGrath et al. 2009b). However, kale has well documented anti-nutritional factors, including high levels of S-methyl-cysteine sulphoxide (SMCO) and glucosinolates, whilst there is a high concentration of water-soluble carbohydrates, low protein and low mineral concentration in fodder beet, rendering additional forage supplementation essential (Barry 2013, Waghorn et al. 2018). In the current survey, use of straw as a supplementary feed made up less than 3% of responses for R1 heifers, but 18% for R2 heifers. Despite straw being readily available in GB, its low use in the current survey contrasts with that in Canterbury, NZ, where straw was reported to be frequently fed to dry cows (Edwards et al. 2017). Straw is high in functional fibre, but recent research suggests that it is not suitable as a supplement with fodder beet (Waghorn et al. 2018, Pacheco et al. 2020).

The Lwt of heifers is important for productivity and longevity regardless of feeding system, with 60% and 90% of mature Lwt at mating and calving respectively often cited as optimum targets (Roche et al. 2015). Very few of the farmers surveyed were monitoring Lwt (17%), yet nearly 90% were able to state values for Lwt at mating and calving and a value for mature Lwt, indicating a belief that their heifers reach target weights. Atkins et al. (2020) reported that the final Lwt of crossbred heifers on nine GB dairy farms that were out-wintering was 424 kg, comparable with the 22-month Lwt of heifers in NZ (Handcock et al. 2019), and that reported in the current survey. Evidence from Lwt measurements in NZ reveals that heifers in seasonal calving systems do not gain weight linearly, but have reduced ADG during the summer and winter, probably reflecting reduced feed quality and quantity in comparison to spring (Handcock et al. 2019). Winter ADG of crossbred heifers in NZ has been reported to be 0.24 kg/d (Handcock et al. 2019), similar to the 0.25 kg/d reported for crossbred heifers out-wintered in GB (Atkins et al. 2020), but far lower than values reported by farmers in the current survey. There is evidence that some farmers were accounting for seasonality of ADG, as less than half believed that winter ADG was better in out-wintered heifers than housed, whilst approximately two thirds felt that the yearly ADG of out-wintered heifers was greater. Slower growing animals may exhibit ‘compensatory growth’, although evidence suggests there is little difference in subsequent performance of out-wintered and housed animals (McCarrick & Drennan 1972, Atkins et al. 2018).

Out-wintering performance is largely dependent on feed allocation (Keogh, French, McGrath et al. 2009b), and the utilisation and quantity of grazed forage and supplementary feed offered to heifers in the current study was high, and as a result, the predicted feed intake was high. For example, a mean intake for R2 heifers in the current study was 9.2 kg DM/d, which for a 400 kg heifer was calculated to result in an ADG of approximately 1.2 kg/d (Nicol & Brookes 2007). There are a number of potential sources of error when estimating an average feed intake, including accuracy of crop or pasture yield assessments, errors in field area or grazing days, uncertainty of supplementary feed allocation, or under/over estimation of feed utilisation. A survey of dry cows grazing kale in Canterbury, NZ revealed that DMI is typically lower than targeted by farmers, which the authors attributed to inaccuracy in feed allocation (Judson & Edwards 2008). Supplementary feed wastage can range from 4 to 46% in good weather conditions, and is increased in wet weather and with increasing feed allocation (Stockdale 2010), so the 88% utilisation estimated by surveyed farmers here may be an over estimation, although the mean crop utilisation of 83% is similar to the 80% reported by Judson and Edwards (2008). More accurate feed allocation combined with Lwt monitoring may help improve heifer performance on farms.

In addition to feed allocation, various animal and environmental factors can impact the performance and welfare of out-wintered heifers. High body condition insulates cattle from cold weather and can increase time spent feeding due to reduced time sheltering from wind and rain, and, whilst the ability to lay down is generally considered important from a welfare perspective (French et al. 2015), lying can also provide an important function of reducing the surface area exposed to wind and rain and reduce heat loss (Redbo et al. 2001;Tucker et al. 2007). Wet, muddy soil is unattractive as a lying area as it increases heat loss, causes soiling of the animals’ coat, further reducing its insulative qualities, and can increase the risk of intramammary infection (Holmes et al. 1978, Boyle et al. 2008). In the current survey, farmers reported that their heifers either gained or maintained BCS over the winter, and the majority felt that out-wintered heifers had the same or better BCS at calving in comparison with housed heifers. However, Atkins et al. (2020) reported that heifers in GB lost about half a NZ BCS unit and calved at the approximate equivalent of BCS 4. Other studies have reported BCS can increase during winter in out-wintered heifers, but that BCS may be lower in comparison to housed heifers (Boyle et al. 2008; Atkins et al. 2018). Surveyed farmers provided a dry lying area mainly by selecting appropriate fields and commonly providing grass areas where animals could lay down. Straw bedding was sometimes provided in the field, but this was not a routine practice. Cleanliness of out-wintered heifers was generally considered to be better in comparison to housed heifers by the surveyed farmers. A likely explanation for this is that heifers naïve to cubicle beds can take time to learn how to use the cubicles correctly and become soiled from lying in passageways where manure collects (Boyle et al. 2008). However, higher dirtiness scores have been reported in heifers grazing fodder beet in comparison to when they are housed on straw bedding (Atkins et al. 2018).

Conclusions/Practical implications/Relevance

Systems for out-wintering replacement dairy heifers in GB strongly resemble outdoor wintering systems in NZ. Although farms that out-winter in GB are larger than average and often expanding, increasing herd size is not the primary reason for out-wintering. Rather, these farmers are out-wintering heifers to reduce cost and to improve animal health and welfare compared to winter housing. Farmers who out-winter heifers typically report good animal performance although there was a lack of empirical measurement on many of these factors. Farmers may benefit from accurate feed allocation and Lwt monitoring to ensure high performance, whilst the similarity in systems provides potential for research and knowledge exchange between NZ and GB.

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